Technical Specifications

Type B-3 (Final) Submission

Volume One (Div 00-21)

F-16 Mission Training Center (MTC)

New Jersey Air National Guard – 177th FW
Atlantic City Air National Guard Base
Egg Harbor Township, NJ

177TH FIGHTER WING

NGB Contract: FA8903-21-D-0003
Task Order: W50S8F22F0018
AC ANG Base: AQRC 189015
May 15, 2025

ATKINS
BLACK & VEATCH
FSB JOINT VENTURE

ARCHITECTURAL SPECIFICATION RESPONSIBILITY	
FRANKFURT, SHORT, BRUZA - ARCHITECTS AND ENGINEERS OKLAHOMA CERTIFICATION OF AUTHORITY NO. ca00199 Expiration Date: JUNE 30, 2027	
I hereby certify that the applicable portions of this project plans and specifications were prepared by me or under my responsible control and that I am a duly Licensed Architect under the laws of the State of Oklahoma.	
Seal and Signature	**Responsible For**
 MICHAEL TURNER ARCHITECT	DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS SECTION 002213.00 20 – SUPLEMENTARY INSTRUCTIONS TO OFFERORS SECTION 004100 – BID SCHEDULES DIVISION 01 - GENERAL REQUIREMENTS SECTION 011000 – SUMMARY SECTION 011400 – WORK RESTRICTIONS SECTION 012000 – PRICE AND PAYMENT PROCEDURES SECTION 013000 – ADMINISTRATIVE REQUIREMENTS SECTION 013123.13 20 – ELECTRONIC CONSTRUCTION AND FACILITY SUPPORT CONTRACT MANAGEMENT SYSTEM (eCMS) SECTION 01 32 01.00 10 – PROJECT SCHEDULE SECTION 01 32 17.00 20 – COST-LOADED NETWORK ANALYSIS SCHEDULES (NAS) SECTION 013300 - SUBMITTAL PROCEDURES SECTION 013339.10 – SUSTAINABILITY REQUIREMENTS AND REPORTING SECTION 013526 – GOVERNMENTAL SAFETY REQUIREMENTS SECTION 014200 – SOURCES FOR REFERENCE PUBLICATIONS SECTION 014500 – QUALITY CONSTROL SECTION 014535 – SPECIAL INSPECTIONS SECTION 015000 – TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS SECTION 015800 – PROJECT IDENTIFICATION SECTION 017419 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL SECTION 017800 – CLOSEOUT SUBMITTALS SECTION 017823 – OPERATION AND MAINTENANCE DATA SECTION 019100.15 – BUILDING COMMISSIONING SECTION 019119 – BUILDING ENCLOSURE COMMISSIONING DIVISION 02 - EXISTING CONDITIONS SECTION 024100 – DEMOLITION DIVISION 03 - CONCRETE SECTION 033000 – CAST-IN-PLACE CONCRETE DIVISION 04 - MASONRY SECTION 042000 – UNIT MASONRY DIVISION 05 - METALS

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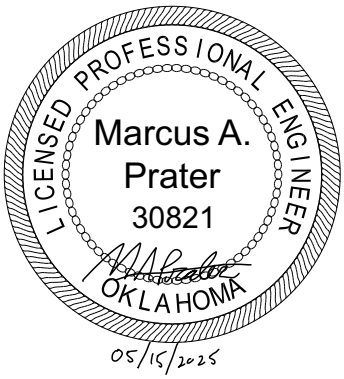
	SECTION 096723.15 – FUEL RESISTIVE RESINOUS FLOORING, 3-COAT SYSTEM SECTION 096800 – CARPETING SECTION 096913 – RIGID GRID ACCESS FLOORING SECTION 097720 – FIBERGLASS REINFORCED WALL PANELS SECTION 099000 – PAINTS AND COATINGS DIVISION 10 – SPECIALTIES SECTION 101400.20 – INTERIOR SIGNAGE SECTION 101401 – EXTERIOR SIGNAGE SECTION 102113 – TOILET COMPARTMENTS SECTION 102600 – WALL AND DOOR PROTECTION SECTION 102813 – TOILET ACCESSORIES SECTION 104416 – FIRE EXTINGUISHERS SECTION 105116 – CELL PHONE LOCKERS SECTION 105301 – MANUFACTURED CANOPY DIVISION 11 – SPECIALTIES SECTION 110150 – FALL PROTECTION SYSTEMS SECTION 119411 – ROOFTOP CABLE FALL PROTECTION SYSTEM DIVISION 12 – FURNISHINGS SECTION 122413 – ROLLER WINDOW SHADES

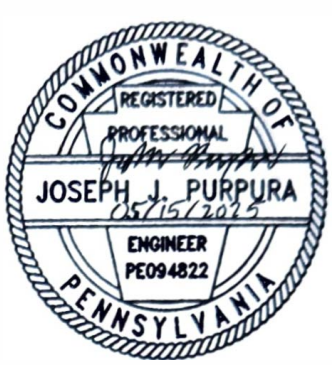
CONSULTANT SPECIFICATION RESPONSIBILITY	
FRANKFURT, SHORT, BRUZA – ARCHITECTS AND ENGINEERS OKLAHOMA CERTIFICATION OF AUTHORITY NO. CA1072 Expiration Date: JUNE 30, 2026	
I hereby certify that the applicable portions of this project plans and specifications were prepared by me or under my direct supervision and that I am a duly Licensed Engineer under the laws of the State of Oklahoma (if applicable).	
Seal and Signature	**Responsibility**
 LIANE OZMUN, PE	DIVISION 21 – FIRE SUPPRESSION SECTION 211313.00 10 – WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION SECTION 213000 – FIRE PUMPS

CONSULTANT SPECIFICATION RESPONSIBILITY	
BLACK AND VEACH – ARCHITECTS AND ENGINEERS OKLAHOMA CERTIFICATION OF AUTHORITY NO. Expiration Date:	
I hereby certify that the applicable portions of this project plans and specifications were prepared by me or under my direct supervision and that I am a duly Licensed Engineer under the laws of the State of Oklahoma (if applicable).	
Seal and Signature	**Responsibility**
 ADAM SCHULTZE, PE	DIVISION 22 – PLUMBING SECTION 220000 – PLUMBING, GENERAL PURPOSE DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING (HVAC) SECTION 230548.00 40 – VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC SECTION 230700 – THERMAL INSULATION FOR MECHANICAL SYSTEMS SECTION 230900 – INSTRUMENTATION AND CONTROL FOR HVAC SECTION 230913 – INSTRUMENTATION AND CONTROL DEVICES FOR HVAC SECTION 230923.02 – BACNET DIRECT DIGITAL CONTROL FOR HVAC AND OTHER BUILDING CONTROL SYSTEMS SECTION 231120 – FACILITY GAS PIPING SECTION 233000 – HVAC AIR DISTRIBUTION SECTION 235200 – HEATING BOILERS SECTION 236410 – WATER CHILLERS, VAPOR COMPRESSION TYPE SECTION 236426 – CHILLED, CHILLED-HOT, AND CONDENSER WATER PIPING SYSTEMS SECTION 238123 – COMPUTER ROOM AIR CONDITIONING UNITS SECTION 238300.00 20 – ELECTRIC SPACE HEATING EQUIPMENT

CONSULTANT SPECIFICATION RESPONSIBILITY	
FRANKFURT, SHORT, BRUZA – ARCHITECTS AND ENGINEERS OKLAHOMA CERTIFICATION OF AUTHORITY NO. 1072 Expiration Date: JUNE 30, 2026	
I hereby certify that the applicable portions of this project plans and specifications were prepared by me or under my direct supervision and that I am a duly Licensed Engineer under the laws of the State of Oklahoma (if applicable).	
Seal and Signature	**Responsibility**
 MARCUS PRATER, PE	DIVISION 25 – INTEGRATED AUTOMATION SECTION 250511.04 – CYPERSECURITY FOR MODERATE IMPACT FIRE PROTECTION CONTROL SYSTEMS SECTION 250511.25 – CYPERSECURITY FOR FACILITY-RELATED CONTROL SYSTEMS (BSC), ELECTRICAL POWER METERING, AND HVAC SYSTEMS

CONSULTANT SPECIFICATION RESPONSIBILITY	
BLACK AND VEACH – ARCHITECTS AND ENGINEERS OKLAHOMA CERTIFICATION OF AUTHORITY NO. Expiration Date:	
I hereby certify that the applicable portions of this project plans and specifications were prepared by me or under my direct supervision and that I am a duly Licensed Engineer under the laws of the State of Oklahoma (if applicable).	
Seal and Signature	**Responsibility**
 WILLIAM HOWEN, PE	DIVISION 26 – ELECTRICAL SECTION 260513.00 10 – MEDIUM VOLTAGE CABLES SECTION 260573 – POWER SYSTEM STUDIES SECTION 260800 – APPARATUS INSPECTION AND TESTING SECTION 261219.10 – THREE-PHASE, LIQUID-FILLED PAD-MOUNTED TRANSFORMERS SECTION 262000 – INTERIOR DISTRIBUTION SYSTEM SECTION 262413 - SWITCHBOARDS SECTION 262923 – ADJUSTABLE SPEED DRIVE (ASD) SYSTEMS UNDER 600 VOLTS SECTION 263534 – ELECTROMAGNETIC FILTERS SECTION 263600 – MANUAL TRANSFER SWITCHES SECTION 264100 – LIGHTNING PROTECTION SYSTEM SECTION 264214.00 10 – CATHODIC PROTECTION SYSTEM SECTION 265100 – INTERIOR LIGHTING SECTION 265600 EXTERIOR LIGHTING

CONSULTANT SPECIFICATION RESPONSIBILITY	
BLACK AND VEACH – ARCHITECTS AND ENGINEERS OKLAHOMA CERTIFICATION OF AUTHORITY NO. Expiration Date:	
I hereby certify that the applicable portions of this project plans and specifications were prepared by me or under my direct supervision and that I am a duly Licensed Engineer under the laws of the State of Oklahoma (if applicable).	
Seal and Signature	**Responsibility**
 WILLIAM HOWEN, PE	DIVISION 27 – COMMUNICATIONS SECTION 271000 – BUILDING TELECOMMUNICATIONS CABLING SYSTEM SECTION 213000 – FIRE PUMPS DIVISION 28 – ELECTRONIC SAFETY AND SECURITY SECTION 281005 – ELECTRONIC SECURITY SYSTEMS (ESS) SECTION 283176 – INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM, ADDRESSABLE

CONSULTANT SPECIFICATION RESPONSIBILITY	
ATKINS, BLACK, AND VEATCH – ARCHITECTS AND ENGINEERS OKLAHOMA CERTIFICATION OF AUTHORITY NO. Expiration Date:	
I hereby certify that the applicable portions of this project plans and specifications were prepared by me or under my direct supervision and that I am a duly Licensed Engineer under the laws of the State of Oklahoma (if applicable).	
Seal and Signature	**Responsibility**
 JOSEPH PUPURA, PE	DIVISION 31 – EARTHWORK SECTION 310000 – EARTHWORK SECTION 311000 – SITE CLEARING SECTION 311100 – CLEARNING AND GRUBBING DIVISION 32 – EXTERIOR IMPROVEMENTS SECTION 320116.71 – COLD MILLING ASHPHALT PAVING SECTION 321123 – AGGREGATE BASE COURSE FOR FLEXIBLE PAVING SECTION 321216.16 – ROAD-MIX ASHPALT PAVING SECTION 321500 – AGGREGATE SURFACING SECTION 321619 – CONCRETE CURBS, GUTTERS AND SIDEWALKS SECTION 321723 – PAVEMENTS MARKINGS SECTION 323113 – CHAIN LINK FENCES SECTION 329219 – SEEDING DIVISION 33 – EXTERIOR IMPROVEMENTS SECTION 331100 – WATER UTILITY DISTRIBUTION PIPING SECTION 331123 – NATURAL GAS AND LIQUID PETROLEUM PIPING SECTION 333000 – SENAITARY SEWERAGE SECTION 334000 – STORMWATER UTILITIES SECTION 337102 – UNDERGROUND ELECTRICAL DISTRIBUTION

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DOCUMENT 00 22 13.00 20

SUPPLEMENTARY INSTRUCTIONS TO OFFERORS
02/14

PART 1 GENERAL

1.1 CONTRACT LINE ITEMS

The terms Offeror and Bidder and versions thereof (offer/bid) have the same definition as used within this contract.

Provide the Contract Line Item (CLIN) lump sum price for the following items:

CLIN 0001 - BASE BID Price includes the following:

CLIN 0001. Price for the entire work for the F-16 MTC (Simulator) and Sitework (Excluding ESS Systems) in accordance with the Contract Documents, but excluding work described in Contract Line Items (CLIN) 0004 through 0011.

CLIN	DESCRIPTION	TOTAL PRICE FOR CLIN 0001
0001	Base Bid - F-16 MTC (Simulator Facility) (Excluding ESS Systems) and Sitework	$_____

CLIN 0002 - Price includes the following:

Price for providing all work in connection with the Advantor ESS (ACS/IDS/CCTV) System complete. Furnish and install Secure Area portions of Advantor ESS System in accordance with the Contract Documents, including all material, equipment and labor.

CLIN	DESCRIPTION	TOTAL PRICE FOR CLIN 0002
0002	Advantor ESS System - Secure Area	$_____

CLIN 0003 Optional Line Item No 1 - Price includes the following:

Price for Site Demolition, provide new bituminous and concrete pavements, and striping, west parking area (43 spaces) complete, in accordance with the Contract Documents, including all material, equipment and labor.

CLIN	DESCRIPTION	TOTAL PRICE FOR CLIN 0004
0003	Site Demo, New Pavements & Striping (33 spaces). All transformers, pads, sidewalks, U.G. utilities need to be demoed and removed for both RSS's as part of this optional line item.	$_____

CLIN 0004 Optional Line Item No. 2 - Price includes the following:

Price for providing all work in connection with resurface and re-stripe bituminous parking pavement and parking lot islands cleanup - South parking area (64 Spaces) complete in accordance with the Contract Documents, including all material, equipment and labor.

CLIN	DESCRIPTION	TOTAL PRICE FOR CLIN 0005
0004	Resurface & Re-stripe Pavement, and Parking Island Planter Cleanup (77 Spaces)	$_____

CLIN 0005 Optional Line Item No. 3 - Price includes the following:

Price for providing all work in connection with additional Masonry Veneer, complete. Furnish and install all additional masonry veneer (in lieu of insulated metal wall panel system) in accordance with the Contract Documents, including all material, equipment and labor. Primary scope references include Drawings, Building Elevations.

CLIN	DESCRIPTION	TOTAL PRICE FOR CLIN 0005
0005	Additional Masonry Veneer	$_____

CLIN 0006 Optional Line Item No. 4 - Price includes the following:

Price for providing all work in connection with the Vertical Building Entry Monolith, complete. Furnish and install vertical building entry monolith (base bid: no monolith),(Entry Canopy to remain in Base Bid)in accordance with the Contract Documents, including all material, equipment and labor.

CLIN	DESCRIPTION	TOTAL PRICE FOR CLIN 0006
0006	Vertical Building Entry Monolith	$_____

CLIN 0007 Optional Line Item No. 5 - Price includes the following:

Price for providing all work in connection with Mechanical Equipment Yard: provide Masonry Wall, complete. Furnish and install masonry wall (2 segments only in lieu of chain-link fence with visual slats) in accordance with the Contract Documents, including all material, equipment and labor.

CLIN	DESCRIPTION	TOTAL PRICE FOR CLIN 0007
0007	Mechanical Yard Walls	$_____

CLIN 0008 Optional Line Item No. 6 - Price includes the following:

Price for providing all work in connection with Concrete Surface at Mechanical Yard, complete. Furnish and install concrete surface at mechanical yard (in lieu of 2" Stone Surface with underlayment fabric)in accordance with the Contract Documents, including all material, equipment and labor.

CLIN	DESCRIPTION	TOTAL PRICE FOR CLIN 0008
0008	Concrete Surface at Mechanical Yard	$_____

CLIN 0009 Optional Line No. 7 - Price includes the following:

Price for providing all work in connection with Illuminated Unit Insignia Sign, complete. Furnish and install illuminated unit insignia sign with controls (Base bid: no insignia sign) in accordance with the Contract Documents, including all material, equipment and labor.

CLIN	DESCRIPTION	TOTAL PRICE FOR CLIN 0009
0009	Illuminated Unit Insignia Sign	$_____

CLIN 0010 Optional Line Item No. 8 - Price includes the following:

Price for providing, Furnish and install additional concrete pavement to support simulator install complete. Provide additional concrete pavements to support simulator install (Base bid: turf grass), identified as O.L.I. No. 8 in accordance with the Contract Documents, including all material, equipment and labor.

CLIN	DESCRIPTION	TOTAL PRICE FOR CLIN 0010
0010	Additional Concrete Pavement for Sim Install	$_____

Total Price (CLINS 0001, 0002, 0003, 0004, 0005, 0006, 0007, 0008, 0009, and 0010). $_____

1.2 GENERAL BID NOTES

1.2.1 Notes

a. Offeror' s shall provide a price for all items on the Price Schedule.

b. A firm fixed price is required for each item and no provision will be made for economic adjustments.

c. Options will be evaluated in accordance with FAR 52.217-5 Evaluation of Options.

d. Evaluation of the Options will not obligate the Government to execute any or all of the Options.

e. Should the Government choose to exercise the Option, the contract completion date shall not change.

g. The Offeror's price is valid for at least 120 days from the receipt of proposals.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Document --

SECTION 00 41 00

BID SCHEDULES
01/07

PART 1 GENERAL

1.1 BASIS OF BIDS

1.1.1 Options

This contract will be solicited with Optional Line Items. A description of the Optional Line Items is contained in Specification Section 00 22 13.00 20, "Supplementary Instructions to Offerors".

-- End of Document --

SECTION 01 11 00

SUMMARY OF WORK
08/15, CHG 2: 08/21

PART 1 GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

1.1.1 Project Description

The work includes Construction of the F-16 Mission Training Center (MTC) (Flight Simulator) which consists of (4) Simulator Bays with supporting spaces, site construction, and related work, as indicated in the contract documents.

1.1.2 Location

The work is located on the Atlantic City Air National Guard Base in Egg Harbour Township, New Jersey as indicated in the Contract Documents.

1.1.3 Phased Construction

a. It is preferred and anticipated that Test and Balance (TAB) and Building Systems Commissioning (Cx) take place at the very end of construction utilizing actual sim system loads. TAB and Cx will require coordination with the Base Contracting Officer, regarding scheduling movement of the simulators into the building, to avoid delaying completion of hte job, and to avoid the use of load banks for testing.

b. Very limited access will be allowed in the facility upon initiation of the install.

PART 2 PRODUCTS

2.1 KEY ROLE DESCRIPTIONS

The following key role descriptions are introduced below and are described in more detail in subsequent sections of the contract documents. The below list is not inclusive of all key roles, staffing or positions required under this contract.

a. CONTRACTING OFFICER
Contracting Officer (KO) or Government: The Government official having overall authority for administrative contracting actions for the construction contract. Certain contracting actions may be delegated to the Contracting Officer's Representative (COR), the construction agent.

b. SSM
Site Security Manager (SSM) is the Government's responsible security authority for construction. The SSM has oversight on all aspects of project security, and controls all security assets on the project to include but not limited to security personnel supervision and maintaining all necessary records related to the construction project. The SSM is a key point of contact for coordination of security related items with the contractor's security CSM.

c. 177 CES
177th Fighter Wing is the U.S. Air Force's host unit at Atlantic City, ANGB, New Jersey and is integral to coordination with Base access, operations and security. 177CES is the Civil Engineering Squadron, 177 SFG is the Security Forces Group, 177 WG/PA is the Public Affairs Office.

d. CONTRACTOR
Contractor (KTR)is responsible for providing all materials, equipment and labor required to perform all work outlined in the Contract Documents.

e. CONTRACTOR SECURITY MANAGER
Contractor's Security Manager (CSM) is the Contractor's employee who is primarily responsible for all security matters for the contractor and subcontractors and interfaces with the Contracting Officer who coordinates with the SSM, 177 SFG and others.

f. (AO)Accrediting Offical
Person Designated by the Cognizant Security Authority (CSA) that is responsible for all aspects of secure management and operations to include security policy implementation and oversight.

g. (CTTA) Certified TEMPEST Techinical Authority:
U.S. Government employee who has met established certification requirements in accordance with NSTISSC-approved criteria and has been appointed by a U.S. Government department or agency.

h. 177 CES
177th Fighter Wing is the New Jersey Air national Guard host unit at Atlantic City, ANG Base, New Jersey .

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 14 00

WORK RESTRICTIONS
11/22, CHG 1: 02/23

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2024) Safety -- Safety and Health Requirements Manual

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-260-01	(2019)Airfield and Heliport Planning and Design, with Change 1, 5 MAY 2020

1.2 DEFINITIONS

1.2.1 State

"State" when used in reference to states of the United States also includes the Territory of Guam.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Construction Phasing Plan; G

Submit the plan as outlined. Contractor shall utilize general guidelines set forth on the Contract Drawings when writing the plan.

Resume for Contractor's Security Manager; G

Site Layout Plan

Submit for approval a detailed scaled drawing showing the layout of the construction site plan prior to starting work. As a minimum the drawing shall include the locations of office and storage trailers, equipment storage and material staging areas, construction laydown/batch plant area, locations of escorts, construction entrance(s) including placement of safety and project signs (i.e. hard hat area, etc.), workers parking area, and trash

dumpsters and containers and emergency/fire access. The submittal shall also include photographs of the site prior to disturbance by the start of work. Photos must be taken in accordance with project photography requirements.

Contractor's Employee Restriction; G

Contractor Vehicle Access Requirements; G

Purchase Orders; G

List Of Contact Personnel; G

Personnel List; G

Contractor Access Passes; G

Activity Regulations

1.3.1 SPECIAL SCHEDULING REQUIREMENTS

a. Permission to interrupt any Activity roads, railroads, or utility service must be requested in writing a minimum of 21 calendar days prior to the desired date of interruption.

1.4 CONTRACTOR ACCESS AND USE OF PREMISES

The Construction Contractor shall limit use of the premises to the work within designated site areas as indicated to allow for continued U.S. Government operations in adjacent facilities.

Maintain adjacent existing buildings scheduled to remain in use in safe and weather-tight conditions throughout the construction period. Repair damage caused by construction operations. Take precautions to protect the buildings, its occupants and the public during the construction period.

Keep public areas in new construction, such as hallways, lobbies and restrooms, free from accumulation of waste material, rubbish, construction debris and construction materials.

Existing materials and equipment that are removed as part of the construction operations, and that are not reused or designated to be salvaged as U.S. Government property, shall become the property of the Construction Contractor and shall be removed from the site. Storage or sale of excess salvageable materials and equipment is not permitted on site.

At its own expense, the Construction Contractor shall provide a gate guard for access to uncontrolled and unsecured gates.

General: During construction, adjacent structures and drives will be occupied by the U.S. Government. The Construction Contractor shall take the necessary means to ensure continuous access to these existing facilities. Permission to interrupt any Activity roads, railroads, or utility service must be requested in writing a mininum of 21 day calendar days prior to the desired date of interruption. Arrange for the use of the site and premises to allow:

1. Occupancy.

2. Work by others.
3. Work by the U.S. Government.
4. Use of the site and premises by building users and the public.

Provide access to and from the site as required by law and by the U.S. Government:

1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
2. Do not obstruct roadways, sidewalks, or other public ways without permit.

Existing building spaces may not be used for construction materials or equipment storage.

Utility Outages and Shutdown:

1. Limit disruption of utility services to adjacent existing facilities affected by project construction activities to hours that they are unoccupied.
2. Do not disrupt or shut down life safety systems, including, but not limited to, fire sprinklers and fire alarm system, without 7 days notice to the U.S. Goverment and Base Crash/Fire Rescue.
3. In such cases where life safety systems need to be shut down, coordinate a fire watch with the U.S. Government.
4. Prevent accidental disruption of utilty services to other facilities.

1.4.1 Activity Regulations

Ensure that Contractor personnel employed on the Activity become familiar with and obey Activity regulations including safety, fire, traffic and security regulations. Keep within the limits of the work and avenues of ingress and egress. Ingress and egress of contractor vehicles at the time of activity is limited to the Main gate on Langley Road. To minimize traffic congestion, delivery of materials must be outside of peak traffic hours (6:30 to 8:00 a.m. and 3:30 to 5:00 p.m.) unless otherwise approved by the Contractoring officer. Wear appropriate personal protective equipment (PPE) in designated areas. Do not enter any restricted areas unless required to do so and until cleared for such entry. Ensure all Contractor equipment, include delivery vehicles, are clearly identified with their company name.

1.4.1.1 Subcontractors and Personnel Contacts

Provide a list of contact personnel of the Contractor and subcontractors including addresses and telephone numbers for use in the event of an emergency. As changes occur and additional information becomes available, correct and change the information contained in previous lists.

1.4.1.2 NO SMOKING POLICY

Smoking is prohibited within and outside of all buildings on installation, except in designated smoking areas. This applies to existing buildings, buildings under construction and buildings under renovation. Discarding tobacco materials other than into designated tobacco receptacles is considered littering and is subject to fines. The Contracting Officer will identify designated smoking areas.

1.4.2 WORKING HOURS

Regular working hours will consist of an 9 hour period, between 7 a.m. and 5 p.m., Monday through Friday, excluding Government holidays.

1.4.3 WORK OUTSIDE REGULAR HOURS

Work outside regular working hours requires Contracting Officer approval. Make application 15 calendar days prior to such work to allow arrangements to be made by the Government for inspecting the work in progress, giving the specific dates, hours, location, type of work to be performed, contract number and project title. Based on the justification provided, the Contracting Officer may approve work outside regular hours. During periods of darkness, the different parts of the work must be lighted in a manner approved by the Contracting Officer. Make utility cutovers after normal working hours or on Saturdays, Sundays, and Government holidays unless directed otherwise.

1.4.4 GENERAL CONSTRUCTION AND FINISH WORK

General construction and finish work of the secure area must be preformed by U.S. firms using U.S. citizens. General construction includes construction activities such as building sitework, utilities, foundations, structure and enclosure or shell, including doors, windows and facade work. Finish work includes construction activities such as insulation, floor, partition and ceiling systems; cabinet work; conveyor systems; specialties; building furnishings, fixtures and equipment; and mechanical and electrical services and equipment includung those specialized for fire protection, security, communication, control, energy conservation safety, comfort, convenience, and similar purposes.

1.4.5 ELECTRONIC SECURITY SYSTEMS EQUIPMENT

Electronic Security Systems equipment such as processing contol units, workstation, field panels, sensors, high security locks, card readers,cable installation, and system programming, testing and training must be preformed by U.S. companies using U.S. citizens who have been subjected to a trustworthiness determination.

1.4.6 Occupied Buildings

The Contractor shall be working around existing buildings which are occupied. Do not enter the buildings without prior approval of the Contracting Officer.

The existing buildings and their contents must be kept secure at all times. Provide temporary closures as required to maintain security as directed by the Contracting Officer.

The Government will remove and relocate other Government property in the areas of the buildings scheduled to receive work.

1.4.7 Utility Cutovers and Interruptions

a. Make utility cutovers and interruptions after normal working hours or on Saturdays, Sundays, and Government holidays. Conform to procedures required in paragraph WORK OUTSIDE REGULAR HOURS.

b. Ensure that new utility lines are complete, except for the connection, before interrupting existing service.

c. Interruption to water, sanitary sewer, storm sewer, telephone service, electric service, air conditioning, heating, fire alarm, compressed air, are considered utility cutovers pursuant to the paragraph WORK OUTSIDE REGULAR HOURS.

d. Operation of Station Utilities: The Contractor must not operate nor disturb the setting of control devices in the station utilities system, including water, sewer, electrical, and steam services. The Government will operate the control devices as required for normal conduct of the work. The Contractor must notify the Contracting Officer giving reasonable advance notice when such operation is required.

e. Connection to Existing Sanitary Sewerline: Provide positive verification that the existing line conveys sanitary sewer; verify line is not incorrectly connected to the storm dran. Obtain installation's Sanitary Sewer Connection permit 2 weeks prior to connection and in accordance with Section 33 30 00 SANITARY SEWERAGE

1.5 BASE CIVIL ENGINEERING WORK CLEARANCE REQUEST, AF FORM 103

Prior to commencing construction work or whenever the ground surface is to be disturbed deeper than 3 inches or when erecting structures or operating equipment near overhead lines, the Prime Contractor performing work shall be responsible for obtaining from the 11 CES Customer Service Office and having in their possession at all times, while digging, an approved AF Form 103.Prior to commencing construction work or whenever the ground surface is to be disturbed deeper than 3 inches or when erecting structures or operating equipment near overhead lines, the Prime Contractor performing work shall be responsible for obtaining from the 177 CES Customer Service Office and having in their possession at all times, while digging, an approved AF Form 103.

a. The AF Form 103 Dig Permit attached to this section is only valid for the 30 calendar days. The Contractor is required to renew the dig permit on a monthly basis and shall maintain marked utilities to the satisfaction of the Contracting Officer or his duly authorized representative.

1.6 BASE REGULATIONS

The Contractor shall conform to all Base Regulations and directives. As far as possible, those that pertain to security, safety, traffic, fire, and personnel clearances, insofar as they apply to the Contractor's activities, will be identified specifically at the pre-performance conference. The Contractor shall be responsible for providing and placing barricades, providing traffic control, safety watchmen and lighting and safety devices during all construction activities

1.7 GOVERNMENT OCCUPANCY

The U.S. Government will occupy adjacent existing buildings and site during the entire period of construction. Cooperate with the U.S. Government's representatives during construction operations to minimize conflicts and facilitate U.S. Government usage. Perform the Work in a

manner that does not interfere with the U.S. Government's operations.

The U.S. Government reserves the right to occupy and to place and install equipment in completed areas of the building prior to Substantial Completion, provided such occupancy does not interfere with completion of the Work. The U.S. Government's installation of equipment and partial occupancy shall not constitute acceptance of the total Work.

1. Prior to partial U.S. Government occupancy, mechanical and electrical systems for the space shall be fully operational, and required inspections and tests shall be successfully completed.
2. Upon occupancy, the U.S. Government will assume responsibility for maintenance and custodial service for the occupied portions of the building.
3. The warranty period for only the occupied portion of the building will commence on the date of occupancy by the U.S. Government.

1.8 CONTRACTOR ACCESS PASSES

All Contractor employees must initially be sponsored on Base for up to 5 days. The Contractor shall provide the following information to the Contracting Officer who will work with the Base CES Construction Management Office at least 48 hours (not including Government holidays or weekends) prior to entry for sponsorship:

Name; Social Security Number; Drivers License Number and State of Issue; Vehicle Info (Make/Model/Color/Year); License Tag Number and State; Name of Company; Date and Time of Arrival.

On the date of arrival personnel can enter through the Main Gate to enter the Base. If any of the Contractor's employees are expected to be on Base longer than 5 days they must schedule with the Contracting Officer who will work with the Base CES Construction Management Office to obtain a Long Term Contractor's Badge request form. The hours of operation are typically Monday thru Friday 0600 - 2200 hrs, except holidays. All Contractor employees applying for a security badge shall be subjected to a background check through the National Crime Information Center conducted by the Security Forces Squadron. These Base access procedures are subject to change.

Refer to paragraph 1.36 for additional requirements for access passes.

1.8.1 One-Day Passes

Personnel applying for One Day passes at the Base Visitor Control Offfice are subject to daily mandatory vehicle inspection, and will have limited access to the installation. The Government is not responsible for any cost or lost time associated with obtaining daily passes or added vehicle inspections incurred by non-participants in the DBIDS.

1.9 CONTRACTOR VEHICLE ACCESS REQUIREMENTS

All contractor vehicles except cars or empty pick-up trucks must enter and exit through the Main Gate and will be subject to a search which will include all vehicle compartments and transported containers. Monday thru Friday the Main Gate is open 0500 - 2300 hrs; Saturdays, Sunday, down-days, and Federal Holidays closed. If commercial entry is required outside the established hours, contact the Contracting Officer who will work with the Base Security Force Squadron Police Services to make

alternative arrangements. Contractors are advised that such searches may result in delays averaging 30 to 60 minutes depending upon the day of the week and time of day. Contractors must coordinate diligently for delivery of perishable deliveries such as concrete or bituminous material. Time sensitive deliveries such as concrete or bituminous material will be given priority over other deliveries and will be moved to the front of the line.

Refer to paragraph 1.37.2 for additional requirements for deliveries.

1.10 SUBCONTRACTORS AND PERSONNEL CONTACTS

Furnish a list of contact personnel of the Contractor and subcontractors including addresses and telephone numbers for use in the event of an emergency. As changes occur and additional information becomes available, correct and change the information contained in previous lists.

1.11 Antiterrorism (AT) Level 1 Training

All Contractor Employees, to include subcontractor employees, requiring access to US Government installations, facilities, and controlled access areas shall complete AT Level I training within 10 calendar days after contract start date. Certificates of completion for each affected Contractor Employee and subcontractor employee will be maintained by the Contracting Officer Representative. AT Level I may be accomplished by completing the Force Protection computer-based training (CBT) course on the Advanced Distributed Learning System (ADLS) or Joint Knowledge Online at http://jko.jten.mil. Tracking for each Contractor or subcontractor employee is the responsibility of the Construction Contractor's Security Manager who will provide a monthly report to the Contracting Officer.

1.12 STORAGE OF FLAMMABLES

Suitable secure storage space shall be provided by the Contractor, outside the immediate building area for the storing of flammables/combustibles of any type. No storage will be permitted inside of the building. The storage space shall be properly identified in accordance with applicable Federal, National and Local Regulations as outlined by the Base Fire Department. Flammable or combustible liquids being used inside the building will be kept to a minimum and removed from the building during unused periods.

1.13 FIRE ALARM

For work operations which require any Base fire detection, alarm or suppression system to be disabled, the Contractor shall request in writing a minimum of 3 work days in advance and prior to taking the system out of operation, so that the Contracting Officer may notify the CE Customer Service Unit of the requirement. The Contractor shall also verify that the fire department has in fact been notified, prior to taking systems out of service. Comply with AFI 91-203 Air Force Consolidated Occupational Safety Instruction. The Contractor may contact the BCE for further information.

1.14 COORDINATION OF WORK OPERATIONS

The Construction Contractor shall provide a full time non-labor project superintendent who must be approved by the U.S. Government's Contracting Officer's Representative. For the duration of the project, the superintendent shall not be withdrawn, become part-time or replaced without the written permission of the U.S. Government's Contracting Officer's Representative.

Security Checklist: The Construction Contractor shall fill out and submit the Consent for Background Check (Section 00 6000, Exhibit I) for each employee that is to work within the New Jersey Air National Guard installation including but not limited to the Construction Contractor's administrative staff and workforce, delivery drivers, and subcontractors. Security checklist must be received by the U.S. Government a minimum of seven (7) days prior to base admittance. All construction personnel shall coordinate with the U.S. Government for the procurement of Defense Biometric Identification System (DBIDS) access cards.

1.15 SITE SECURITY MANAGER (SSM) INSPECTION OF SECURE AREAS

The site security manager is the responsible security authority for the construction. The SSM has oversight on all aspects of project security, and controls all security assets on the project to include but not limited to security personnel supervision and maintaining all necessary records related to the construction project. The SSM is accountable to the accreditation authority. The SSM for the F16 MTC Project will be provided to the contractor after award of the contract.

a. All enclosed spaces (including but not limited to: ductwork, wall cavities, column enclosures, ceiling plenums, floors, etc.) pertaining to secure areas must be inspected by SSM or designated government personnel prior to closure. If it has been determined that a portion of the work has been enclosed without such inspections, the SSM may request partial demolition or removal of materials to verify that no unauthorized materials were introduced. The contractor shall be responsible for all cost associated with such selective demolition and any rework required.

b. Approximately 30 days prior to scheduled installation of electronic signal systems (communication lines, protected distribution systems, signal lines, monitoring units, or terminal devices for fire alarms, mass notification, access control, and intrusion detection systems); the Contractor shall notify the Contracting Officer, the Resident Officer in Charge of Construction (ROICC) and SSM and request government installation of lock cores in all doors within the affected area.

c. Prior to installation of any electronic signal system, the contractor shall demonstrate to the SSM that physical, acoustic, and electronic security requirements have been properly met. Requirements include construction of the building envelope and interior walls, doors, and locking hardware, and the installation of mechanical and electrical infrastructure with appropriate separations, sound attenuation, and treatment of penetrations.

d. Once the COR and SSM certify the above security requirements have been met, the Government will install cores in the appropriate door locks and place certain areas of the building in a "secure lockdown" status. Secure lockdown is required prior to completion of all the contractor's work efforts in these areas.

e. The SSM may request partial demolition or removal or materials to verify that no unauthorized materials were introduced. If the inspection finds any unauthorized material the contractor shall be responsible for all costs associated with any rework required.

f. Contractor access to these locked down areas will require government escort by the SSM other designated government personnel.

1.16 NOTIFICATION

The Contractor shall notify the Contracting Officer in writing, when planning to be absent from the project site for more than two work days. Prior to returning to the project, the Contractor shall notify the Contracting Officer.

1.17 CONTRACTOR'S EMPLOYEE PARKING

The Contractor's employees shall park only in areas assigned by the Contracting Officer.

1.18 SPEED LIMIT

The base speed limit is 25 miles per hour unless posted otherwise. Speeding tickets and fines are issued for violations and shall be the driver's responsibility.

1.19 CONTRACTOR'S EMPLOYEE RESTRICTION

Contractor employees shall be restricted to areas of the base within the scope of this work; plus, direct routes to and from the site as may be approved at the pre-performance conference with regard to work scheduling and material handling. The Contractor's employees will have in their possession at all times a valid picture ID and their base identification pass.

1.20 WORK HOURS

Work for all operations shall be performed during the normal work week, Monday thru Friday, 0700 to 1530. The Contractor may request extended hours in advance to work outside of normal duty hours.

The Main gate is not open on Mondays and weekends. Their typical gate hours are 0600 to 1900 Tuesday through Friday, which is subject to change given mission requirements. Coordination for Mondays will be made by CE once the construction schedule is received. Work shall not be scheduled for any Federal Holiday. Requests for permission to work on Saturdays, Sundays, and/or Federal holidays shall be submitted to the Contracting Officer for approval in writing, a minimum of 5 work days in advance of the proposed scheduled change.

1.21 SEVERE WEATHER WARNING REQUIREMENTS

When notified by the Contracting Officer that a severe weather warning has been issued for the area in which construction is being performed, the Contractor shall immediately take action to tie down, or otherwise secure, structures, materials, and equipment on the job site that could become missiles as a result of strong surface winds, thunderstorms, or other weather-related conditions. This requirement is applicable twenty-four (24) hours a day, seven (7) days a week.

1.21.1 Weather Protection and Temporary Heating

The Construction Contractor shall furnish, install and maintain temperature and weather protection to include, but not necessarily limited

to, temporary shelters, insulated mats and heat as may be required to properly protect all parts of construction to include, but not necessarily be limited to, underground utilities, footings, foundations, masonry and all above- and below-ground parts of the structure. The temporary shelters, insulated mats and heat will be provided to ensure continuous progress is made on the project. The Construction Contractor shall pay for all utility costs associated with the temperature and weather protection. The Construction Contractor shall be responsible for repairs and maintenance to the temporary heating system or units and protection during the period of building construction or remodeling. Where existing or new air ducts are used; the Construction Contractor, at termination of such use, shall deliver them to the U.S. Government in as-new condition by cleanout out the ducts and replacing all filters.

1.22 ENVIRONMENTAL PROTECTION

The Contractor shall provide and maintain environmental protection during the life of the contract as defined herein. Environmental protection shall be provided to correct conditions that might endanger the environment during normal construction operations. Fully conform to Section 01 57 19 ENVIRONMENTAL CONTROLS . The Contractor shall try, as economically deemed feasible to procure materials with recycling content. The Contractor shall try to identify and actively minimize the use of hazardous materials.

1.23 HAZARDOUS MATERIAL CONTROL FORM

Hazardous Material Control Form: The Construction Contractor shall provide a listing of all hazardous materials that shall be used on the project utilizing the Contractor Hazardous Materials Approval Form - obtain from base civil engineer. The Construction Contractor shall provide a completed Contractor Hazardous Materials Approval Form to the U.S. Government's representative prior to beginning any construction activities on the 1st day of each month for the duration of the construction performance period and on the last day Construction Contractor is at the project site. At the conclusion of the project after all work has been accomplished, and as part of project closeout procedures, the Contractor shall provide a listing of all hazardous materials that were used on the project and the respective quantities that were used by completing the Contractor Hazardous Materials Usage Tracking Form (Exhibit G).

The Construction Contractor will establish hazardous material (HM) storage and distribution system when HM is to be used. All HM required to support the contract will be reported to Hazardous Material Pharmacy (HMP) using the Contractor HM Identification Form. Additional HM needed by the Construction Contractor will be identified to the U.S. Government's Contracting Officer's Representative and approved by the HMP.

The Construction Contractor and all subcontractors that will use HM for their work must register with the U.S. Government's Base HMP prior to start of work to support the installation's compliance with Executive Order 12856 (requires Federal Facilities to comply with the Emergency Community Right to Know Act).

1.24 TRUCK HAULING ON BASE

The Contractor shall be responsible for covering open-bodied vehicles transporting sand, gravel, fill materials, dirt, construction debris, rubble, or other material which may become airborne and create air pollution on Base. Alternate means, approved by the Contracting Officer,

may be employed to achieve the same results as would coverings. All dirt, rubble or debris carried onto existing base pavements by Contractor operations shall immediately be removed by the Contractor. Vehicles transporting sand, gravel, fill materials, dirt, construction debris, rubble, or other materials which may become a FOD hazard while operating on the airfield must follow a designated haul route approved by the Contracting Officer and the Airfield Manager. When hauling these materials on/across any aircraft movement area, the contractor must provide a Tymco or similar type sweeper (sweeper with vacuum capability) to ensure no debris is inadvertently left on the aircraft movement areas. If any other method of sweeping is devised that equates to the efficiency of a vacuum sweeper, it must be approved by the construction inspector and airfield management before being implemented.

1.25 CONSTRUCTION AREA

1.25.1 Construction Area Contractor Security Management

Provide security and facilities to protect the work, and the U.S. Government's operations from unauthorized entry, vandalism, or theft.

Limit access to the site to persons involved in the work.

Provide temporary fencing to secure access to the flight line and as required to secure the work.

1. Flight Line Temporary Security Fencing:

    a. Utilize existing permanent security fencing and controlled gates to the extent possible.
    b. Other temporary security fencing shall be 6-foot tall, 2-inch chain-link fencing with terminal posts at terminations and corners and line posts evenly spaced b no more than ten feet apart. Bury posts no less than 30 inches deep encased in concrete.
    c. Remove temporary security fencing, and posts; fill and compact holes after the permanent security fencing is installed and gates are operational.

2. Temporary Construction Fencing:

    a. Provide temporary construction fencing to secure stored materials and construction equipment and to protect workers, Base personnel, consultants, and visitors.

Coordinate with the U.S. Government's security program.

1. The contractor shall designate an employee to serve as the Contractor's Security Manager who shall be responsible for all security matters for the contractor and subcontractors and interface with the Contracting Officer, SSM and Base SFG. Resume for Contractor's Security Manager with qualifications shall be provided for approval by the Contracting Officer in advance. Within twenty (20) days after the "Notice to Proceed" for the contract, the Contractor's Security Manager's names will be provided to the Government. The Contractor's Security Manager must report to an officer of the firm and not be subordinate to the Project Superintendent or the Project Manager. The Contractor's Security Manager, as a minimum, must be a United States Citizen, be an employee of the prime contractor and and demonstrate experience and ability to

perform this role to the satisfaction of the Contracting Officer.

2. The contractor will provide weekly to the Contracting Officer, who will in turn provide the SSM, the current week's activity schedule, and a three week look ahead schedule to forecast upcoming activities. This will be augmented by daily oral update to the SSM and Contracting Officer. The three week look ahead schedule shall indicate the type of work to be done, locations where work shall be performed, a summary of the materials to be received, the number of trucks to arrive and scheduled arrival times, and the identification of vendors/truck carriers. Variances to this plan will be provided as part of the daily update to the SSM and Contracting Officer.

3. The Contractor's Security Manager may designate other personnel to serve as assistants from either the prime contractor or any subcontractor. Assistant names shall be provided to the Government in writing by the prime contractor.

4. The Government may request that any Contractor's Security Manager/Assistant be removed due to the non-adherence of the contractual security provisions, non-performance of duties, and/or findings of criminal activity.

1.25.2 Security Procedures

Provide security and facilities to protect the work, and the U.S. Government's operations from unauthorized entry, vandalism, or theft.

Provide secure storage for materials for which the U.S. Government has made payment and which are stored on site.

Deliver all material in the original packages, containers, crates and bundles, bearing the name of the manufacturer and the brand. Except as otherwise specified herein, the mixing, installation, and application of materials shall be in strict accordance with the printed directions of the manufacturer and supplier.

Store materials off the ground, under cover from dampness. Exercise care in handling units to avoid chipping, abrasion and breakage. Locate storage piles, stacks, or bins to protect materials from damage, rust, contamination and avoid being disturbed.

Materials stored on-site or materials installed that are absorptive shall be protected from moisture damage.

Building construction materials that show visual evidence of biological growth due to the presence of moisture shall not be installed on the building project.

Limit access to the site to persons involved in the work.

Provide temporary fencing to secure access to the flight line and as required to secure the work.

1. Temporary Construction Fencing:

a. Provide temporary construction fencing to secure stored materials and construction equipment and to protect workers, Base personnel, consultants, and visitors.

Coordinate with the U.S. Government's security program.

Any relocation of the emergency/fire access gate required for the contractor's operation will be the contractor's responsibility and must be coordinated with the Contracting Officer prior to movement. The contractor's construction phasing plan shall identify any possible/expected gate relocation and describe the contractor's method for maintaining the secure perimeter fence. The contractor shall provide a two week notification for approval before any fence relocation. The contractor shall also be responsible for relocating the fence as required to complete utility crossings and road work while maintaining a secure perimeter fence. The contractor's construction phasing plan will identify all fence utility crossing and road work and describe the contractor's method for completing the work and maintaining the secure perimeter fence, including security measures to maintain site security for trenching beneath the fence for utilities.

Upon completion of the facility, the contractor shall remove the temporary construction fence.

1.26 STAGING AREA

The staging area and haul route on civil plans GC101 and C-012 have been developed and are included in the contract documents. Daily construction work site and staging area clean up shall be accomplished by the Contractor. This clean up shall include the placing of construction material and equipment in a neat and orderly arrangement. Rubbish, debris, rubble and garbage shall be disposed of daily off base and shall not be permitted to accumulate. If the Contractor has any dumpsters in the staging area, they shall be clearly marked with a sign "for private use only, not for use of base personnel" and have lids which should remain closed when possible. Dumpsters shall be emptied when contents mound to height of sides. At the end of the work day, the Contractor shall inspect the site to ensure that all paper, cardboard and similar materials are removed to provide a litter free appearance. Upon completion of all work outlined in the contract drawings and specifications, the Contractor shall remove from the confines of the Base, all construction materials and equipment.

A. The siteshall be kept in a clean and tidy condition at all times during the work and all rubbush removed from the premises. No final payment will be made until all rubbish and debris has been removed. No burning will be permitted on the premises.

B. Traffic areas will be brushed amd cleaned at regular intervals to reduce the potential for Foreign Object Damage (FOD) to aircraft.

1.27 STAGING AREA SECURITY

The Contractor's assigned staging area shall be secured and shall be completely enclosed by the Contractor with minimum 8-foot high temporary screen fencing with 3 strand barbed wire outriggers and brown fabric covering. The fence shall have a minimum of two 8-foot wide access gates on opposing sides of the site. The temporary staging area fence shall provide a neat and professional exterior appearance, shall be installed in a true and plumb manner with posts in augured post holes, and shall be chain link with well-secured, intact brown windscreen fabric free of slits and tears. All fencing fabric shall sufficiently obscure the staging area

from viewing from the outside. The fence shall be provided prior to any placement of contractor items in the staging area by the contractor. The Contractor shall maintain all Contractor material and construction items as well as construction dumpsters within the confines of his staging area. The Contractor shall be required to maintain the appearance and order of the assigned staging area, both within and without, during the entire duration of the construction contract. During the growing season (April thru October), the Contractor shall mow and trim all grass areas within the staging area fence and to a 3-foot minimum distance outside of the fence boundary to maintain neat grassy areas of reasonable length. Grass height shall never be allowed to exceed 6 inches. Grass shall not be allowed to grow up along the temporary fence line. Assume that assigned staging areas will be on grassy areas. Security and maintenance of the staging area and contents thereof is the Contractor's sole responsibility. The staging area fence shall be maintained by the Contractor during the life of the contract. All fabric or chain link tears or breaks shall be repaired immediately. And all fencing upon completion and acceptance of the work shall remain the property of the Contractor and shall be removed from the work site. The Contractor shall restore the staging area to its original condition when the staging area is vacated. Vandalism: The Contractor shall be responsible for safeguarding the construction site and the staging area, and all construction equipment and materials against vandalism and theft.

1.28 PROCUREMENT AND STORAGE OF BUILDING/FINISHING MATERIAL

The contractor is required to comply with the "Buy American Act." Should the contractor propose a material or equipment item that is not in compliance with this Act, the contracting officer must consult with the Contracting Officer, including the SSM, prior to approval. Construction material will be kept in a locked container retained by the contractor on the Government compound, or within the Construction Zone controlled within or adjacent to the fenced-in/cordoned area with surveillance security support provided over the area. The Construction Zone, to include the construction yard and construction staging locations, are indicated in the Contract Documents. Job trailers for contractor and/or government personnel shall be located as shown in the Contract Documents.

Construction materials to be used in parking lots, sidewalks, drainage structures, underground utility conduits, and other exterior site features are not required to be delivered to or stored within the secure Construction Zone.

1.29 DELIVERY AND PROTECTION OF MATERIALS

A. Deliver all materials in the original packages, containers, crates and bundles, bearing the name of the manufacturer and the brand. Except as otherwise specified herein, the mixing, installation, and application of materials shall be in strict accordance with the printed directions of the manufacturer and supplier.

B. Store materials off the ground, under cover from dampness. Exercise care in handling units to avoid chipping, abrasion and breakage. Locate storage piles, stacks, or bins to protect materials from damage, rust, contamination and avoid being disturbed.

C. Materials stored on-site or materials installed that are absorptive shall be protected from moisture damage.

D. Building construction materials that show visual evidence of biological growth due to the presence of moisture shall not be installed on the building project.

1.30 TEMPORARY STABILIZED CONSTRUCTION ENTRANCE

The project requires a temporary stabilized construction entrance at non-paved areas when exiting to paved areas. The entrance shall be constructed as required by the Sediment and Storm Water Management Plan permit drawings. The contractor shall maintain the temporary stabilized construction entrance such that it functions adequately in the removal of sediment from construction vehicle tires. Stones in the entrance shall be periodically rotated or changed to ensure construction vehicle tires are clean when leaving the site.

1.31 MARKING OF EQUIPMENT, TRAILERS AND TEMPORARY OFFICES

The Contractor shall ensure that equipment and trucks used on the job, are conspicuously marked with both name and telephone number of owner or leaser. All Contractor temporary offices and trailers shall have signs affixed to the exterior, which state the name of the contracting firm, and a name and number of the responsible contracting firm official. The letter size of the firm name shall be a minimum of 8" high with all lettering professionally and neatly prepared.

1.32 OCCUPIED FACILITY

The Contractor will be working around a nearby, existing facility which is occupied and/or in use. The existing facilities must remain fully functional during construction operations. The Contractor shall confine work operations and personnel to the specified areas of construction unless otherwise authorized by the Contracting Officer.

1.33 LANDSCAPE PROTECTION

Provide protection for all existing landscape features such as trees, shrubs, bushes, plantings and sod in and around the area of construction. No existing trees, shrubs, bushes, or other items shall be affected in any way, by Contractor actions, unless required by specifications. Prior to any demolition or construction in proximity to any existing landscape feature, the feature shall be protected by fencing, barricades, temporary removal and/or other approved devices. No movement or operation of heavy equipment within a tree shadow area or drip line shall be permitted. Any features which require pruning or trimming in order to place new construction materials or to allow clearance for new materials or equipment, shall be pruned or trimmed in a workmanlike manner. All damaged items shall be replaced in kind with new, by the Contractor.

1.34 SECURITY AND SITE ACCESS REQUIREMENTS

Work to be accomplished under this contract is on a secure base and the contractor will not be granted unlimited access. The contractor shall contact the Contracting Officer a minimum of five workdays prior to commencement of work to arrange for security passes and to become acquainted with security requirements. The contractor shall not deviate from any and all indicated security requirements.

1.34.1 Site Access Requirements

1.34.1.1 Site Access

1. Access to the Construction Zone and surrounding limits of construction will be controlled by a perimeter security fence and controlled by contractor security personnel during work hours. During construction, all contractor personnel and construction vehicles on site shall be kept within the confines of either the security construction area or the parking area, unless specifically authorized to work outside it. Contractor security personnel will control construction site access to ensure only properly vetted contractor employees are accessing the construction complex area. The Contracting Officer will provide the contractor with a list of government personnel, and their consultants/contractors who require periodic access to the Construction Zone.

2. The contractor shall provide an Entry Control Point (ECP) to the Construction Zone, and shall man and operate it at all times when the gate is open. The ECP facility shall consist of a guard booth providing weather protection for the entry controller and workspace for maintaining paperwork associated with entering and exiting the Construction Zone. The guard booth shall provide a minimum of 80 square feet of space and shall be weather tight, insulated with electricity, lighting, heat and cooling. Guard booth may be a prefabricated structure with windows on all sides and an entrance door. The ECP shall have area lighting at a minimum of 2.0 foot candles at ground level to facilitate ID checks and vehicle inspections. The contractor shall remove guard booth from the site when construction is complete.

3. Contractor security will provide a construction badge with photograph to each person requiring access to the construction site, after validating they are on the construction site Entry Authority List (EAL). Badging will only occur after validating the member via an official identification card containing a picture (e.g. driver's license, passport, permanent resident card, etc.).

4. Daily, the Contractor's Security Manager shall review the EAL and badge access log and immediately notify the Contracting Officer who will notify the SSM of any discrepancies. All contractors and visitors inside the Construction Zone shall wear their construction site badges, displayed above the waist, so they are visible at all times.

5. The contractor shall develop the contractor EAL for all contractor, visitors, government personnel and government support consultants and contractors requiring access to the Construction Zone. The COR/SSM shall provide the contractor with the name, organization, and expected length of involvement with the project for all government personnel requiring such access, and shall update such information as required over the duration of the project. Government and support personnel on the EAL may sponsor visitors, and assume responsibility for verifying the visitor's authorization to enter. All visitors not on the EAL must be logged into the construction site by use of an AF Form 1109, Visitor Control Log as provided by the government. Government personnel and the Contractor's Security Manager shall mutually process visitors in and out of the construction in accordance these procedures. Additionally, the contractor security

and SSM will provide unrestricted access to appropriate HQ AMC Physical Security Division (HQ AMC/A4S), AFDW, 177TH FW, AFCEC, 177th FW CE, and Accreditation Authority personnel. These personnel will visit the site to validate physical security construction methods. Personnel will be identified by the SSM.

6. The contractor shall maintain at the ECP sufficient spare sets of PPE (hard hats, vest, safety glasses/goggles, etc.) to be issued to visitors entering the construction zone.

7. The contractor shall update the EAL weekly with any additional personnel requiring access, or personnel no longer requiring access, and submit it to the Contracting Officer monthly. The EAL and records associated with its creation and maintenance are subject to government review at any time.

8. The construction superintendent and contractor security will confirm to Security Desk that the construction site is properly secured at the end of the duty day. The purpose of this check is to ensure all contractor employees have departed, all vehicles and equipment are properly secured, all privately owned vehicles have been removed from the site, and the boundary has been properly maintained prior to locking/securing the gates for the night, weekend or holiday.

9. During non-duty hours the construction site perimeter will be randomly patrolled by Security Forces.

10. The SSM or designee will conduct periodic security inspections for the duration of the project to ensure compliance with construction design and security standards. The SSM or designee, including contractor security may randomly search tool boxes, containers, and personnel for prohibited items. A combination of human, military working dogs, or technology may be used to conduct inspections. Any personnel found in possession of any prohibited or restricted item will be denied access and may be turned over to an appropriate law enforcement agency.

11. Upon contracting officer direction, a meeting will occur between the government and contractor to specify a date whereby contractor security will be replaced with government personnel.

1.35 Security Checks

Contractor personnel requiring access to the Base will submit to a National Crime Information Center (NCIC) criminal history check on a yearly basis. These checks will be conducted by the Government at no cost to the contractor. Refusal to submit to the NCIC check, failure to report adverse information, or adverse information found in the initial or any subsequent security check will result in denial of base access for that contractor. Examples of disqualifying reports are convictions of:

a. Murder
b. Assault with intent to commit murder, rape or aggravated sexual abuse, kidnapping or hostage taking
c. Possession, distribution, or intent to distribute a controlled substance
d. Illegal use, possession, manufacture of weapons or explosives subversion, espionage, treason, or disloyalty toward the US, or any outstanding wants or warrants

e. Any felony involving robbery, burglary, theft, or arson
f. Acts involving a threatened aggravated assault
g. Violence at international airports or conspiracy to commit any of the above.

The preceding is not intended as an all-inclusive list. Historical patterns of behavior that have the potential of interfering with the security, orderly administration, and discipline of base operations are also cause for denial of access in accordance with DoD 5200.8-R and AFMAN 31-113. The NCOIC of the Visitor Control Center, or higher, will be the final approving authority for base access. Mitigating conditions, such as the incident being an isolated event, the incident not being recent, pressure or coercion that is no longer present, age/maturity level at the time of the incident, and evidence of rehabilitation will be considered. This may need to be supported with documentation, i.e., police report, court records, etc. before making a final decision to allow access. Any requests for deviation from installation access criteria will follow established procedures as listed in the most current Atlantic City ANG Base Supplement to AFMAN 31-113

1.36 Access Passes

The Contractor, including all subcontractors and suppliers, shall register with the Contracting Officer who will coordinate with Security and the SSM for long term access pass (DBIDS card). The contractor shall provide on a weekly basis to the Contracting Officer and the SSM a spreadsheet containing each contractor's full name, date of birth, driver's license number, state of issue and required dates of installation access IAW with requirements and procedures outlined in AFMAN 31-113. The SSM will use the spreadsheet to create long term access requests for any contractor requiring access for more than 5 days in a 30 day period up to one year. The SSM or Contractors Security Manager will then provide the requests, with original signatures, to the individual contractors requiring access.

1.37 Personnel List

Submit for approval, at least 5 days prior to the desired date of entry, an original alphabetical list of personnel who require entry into Government property to perform work on the project, Furnish for each person:

a. Name
b. Date and place of birth
c. Citizenship
d. Home address

All employees of Contractors Sub-contractors, and Suppliers that need access to the job site will be required to submit a Base Security Form 48 - Consent for Background Check, Exhibit J) at least 5 business days prior to arrival. This requirement extends, but is not limited to all labor, equipment operators, delivery personnel, job foremen, inspectors, inclusive of anyone who requires site access.

1.37.1 Citizenship Requirement

The Contractor's Security Manager will confirm that all work is performed by U.S. companies using U.S. persons (an individual who has been lawfully admitted for permanent residence as defined in Title 8 U.S.C. 1 10l (a)(20) or who is a protected individual as defined by Title 8 U.S.C. 1

324b (a) (3)) before a request for base access is provided to the SSM/Contracting Officer. The government will not be responsible for work delays caused if contractor information is not complete or provided in a timely manner to allow validation of access, or if disqualifying information is revealed during validation.

1.37.1.1 DBIDS Registration Procedure

Each contractor authorized a DBIDS card will report to Security with the signed long term access request and a minimum of two forms of identification. At least one form of ID must be a state or federal government issued photographic identification card such as a driver's license or passport. Other forms of acceptable identification include but are not limited to Social Security cards, birth certificates, Veteran's Affairs ID cards, Naturalization Certificates, etc. All drivers must also provide their valid/current driver's license, vehicle registration and proof of insurance.

Registering for DBIDS cards takes anywhere from 10 minutes to one hour depending on customer load, system lag time, etc. On rare occasions background checking database systems experience outages. On those occasions, personnel may be denied unescorted access and be instructed to check back with the VCC on a daily basis to determine if the system is back in operation. If a contractor is immediately critical to construction operations, he/she may be escorted in the same vehicle with an authorized base escort.

1.37.1.2 Short-Term Passes

The Contracting Officer in coordination with the SSM can also submit contractors for short-term passes. These are contractors who will be entering the installation for five days or less in a 30 day period. Short term requests must be submitted at least 24 hours in advance of the access date.

The VCC uses the contractor request information provided to complete the NCIC for screening access and will notify the Contracting Officer and SSM of any issues that disqualify specific contractors or if additional information is needed about the specific contractor. Note: Any contractor with an active warrant will be denied installation access, detained, and turned over to civilian authorities.

1.37.1.3 DBIDS Card Return

DBID cards no longer needed by contractor personnel shall be returned to the Contractor Security Manager and will be turned into the Contracting Officer (or COR) who then turns it into the VCC within 48 hours

1.37.2 Delivery Vehicle Access

a. Base Access for all delivery drivers will follow short term access procedures as indicated in part 1.25.2.3 above unless the delivery driver will be a recurring delivery driver. In the case of a recurring delivery driver, the driver will be processed utilizing established long-term access pass procedures outlined in part 1.25.2.

b. Deliveries shall be through the base inspection facility at the Maingate. Vehicle operators should expect a minimum of 15 minutes to complete a vehicle inspection for access. Drivers shall proceed

directly to the construction site and secure the materials within the Construction Zone. Delivery and construction vehicles will also exit the base via the Maingate. Contractor shall stagger truck traffic to maximum extent technically feasible to minimize impact on vehicular travel.

c. Deliveries of time-sensitive construction materials such as concrete and asphalt may receive expedited access through the Maingate. The contractor will work with the Contracting Officer, to make the necessary arrangements.

1.38 Special Security Requirements

a. All construction will be performed by U.S. companies.

b. The contractor will be responsible to provide their own escorts when accomplishing work within the construction zone.

c. The contractor will provide, and update monthly, to the Contracting Officer and SSM a roster of all personnel who must access the construction site.

d. The following items and activities are prohibited from being brought to the construction site: firearms, knives, or other weapons, to include but not limited to, facsimiles of weapons, gun lighters, toy guns/weapons, baseball bats, batons, bicycle chains, blackjacks, brass knuckles, martial arts devices, ninja pins, throwing stars, or similar devices. Items normally used as a tool of the trade or in the normal course of construction such as sheet-rock knives, nail guns, including ammunition explosion nail guns, etc., will be permitted but must be disclosed to the Contractor or Government Security personnel controlling entry. Such explosives-related tools shall be transported, stored, handled, and used in accordance with industry best practices, state or federal laws and codes, and/or other Government provided instructions (whichever is most restrictive). The same approval requirements apply to nuclear density meters and similar equipment/tools.

1). The SSM reserves the right to prohibit any items, devices, or activities not covered in this list. Violations of the prohibitions and restrictions noted above by any contractor personnel will result in removal from the job site and debarment from Atlantic City ANG Base.

e. Use of photographic equipment is prohibited unless authorized by the Contracting Officer,for official purposes only; this does not prohibit the use of cell phones or mobile devices for purposes other than photography.

1). Throughout the project, personnel designated in writing by the SSM will document construction progress with photos and provide an associated narrative to illustrate the method of construction. This provision applies to all construction areas of the project.
2). During secure area construction, the assigned government representative and SSM shall have continuous approval for photography. The contractor shall work with the Contracting Officer and SSM to ensure photographs and other documentation are accomplished prior to activities such as concrete placement and wall/ceiling enclosure.

f. Other prohibited items include alcohol, explosives, and illicit drugs. All personnel entering the construction site are subject to inspection for prohibited items or unauthorized photographs.

1.39 HIGH VISIBILITY AREAS

Work performed under this contract is in a designated high visibility area.

1.39.1 Appearance of Workmen

All Contractor employees shall at all times wear appropriate work clothing and shall wear at all times the contractor's issued construction badge indicating the individual's name, company name, and bearing a picture of the individual. Workmen shall be neat, clean and presentable when working on base. The Contractor's vehicles shall display emblems indicating the company name. Work clothes shall consist of steel toe boots, shirt, and long pants, or long coveralls, and other safety equipment as required by the contractor's safety plan.

1.39.2 Objectionable Employees

The Contracting Officer, in writing, may require the Contractor to remove from the work site, area, or Base, objectionable employees. Objectionable employees include those employees not properly attired, those employees using profane language or employees which act in an unsafe or reckless manner.

1.39.3 Cleanliness

The Contractor shall protect Government property and furnishings that may be in, or adjacent to, the work area with appropriate clean drop cloths, barricades, dust-stops, or other provisions as determined by, or approved by, the Contracting Officer prior to starting work. The Contractor shall remove all debris, tools, materials and equipment and other items when work is completed in each particular area.

1.39.4 Daily Clean-Up

Daily construction site and staging area clean-up shall be accomplished by the Contractor. This clean-up shall include the placing of construction material and equipment in a neat and orderly arrangement on the site. Equipment and materials must not block access to existing facilities. Rubbish, debris, rubble, and garbage shall be disposed of daily. At the end of the work day, the Contractor shall inspect the site and area to ensure that all paper, cardboard, demolition products and similar materials are removed to provide a litter-free appearance. On-Base access routes utilized by construction equipment and/or delivery vehicles shall be maintained free from clay or mud balls, clods, and mud. During the growing season (April thru October), all grass areas in the Contractor's construction area, within 10 feet of Contractor staging and construction areas or within 10 feet of buildings or portions of buildings under construction shall be mowed and trimmed to maintain neat grassy areas of reasonable length, by the Contractor. Grass height shall never be allowed to exceed 6 inches (areas outside the airfield) and 14 inches (areas on the airfield).

1.39.5 Cleaning Roadways

All roadways adjacent to the construction site which accumulate construction dirt, debris, of dust shall be cleaned at least once every 5 work days or more often if determined necessary and directed by the Contracting Officer and/or COR in order to maintain a neat appearance.

1.40 DUMPSTER USE

The Contractor shall be fully responsible for securing construction dumpsters from potential filling or use by unauthorized personnel. Securing may be thru the use of lockable covers or by controlling access to the dumpsters thru the use of fencing that matches that specified for the Contractor staging area or by locating the dumpsters within the assigned staging area. Site dumpsters shall be emptied at least once every 7 calendar days, or as needed to keep the site free of debris and trash. Dumpsters are not allowed for use on airfield pavements. The Contracting Officer shall approve location of dumpster placement.

1.40.1 Dumpsters

The dumpsters shall be painted, free of graffiti, and be equipped with a securable cover. The cover shall be in place at all times except when trash is being deposited or removed.

1.40.1.1 Trash Containers

Trash containers shall consist of 55 gallon painted drums, free of graffiti, and have 'TRASH' printed in 10 inch high white lettering on the side of the container at two locations opposite each other. Trash container shall be emptied at least once a day. Trash container covers shall be in place at all times except when trash is being deposited or removed.

1.41 PHASING OF EXCAVATION FOR UTILITIES

Excavation shall not begin until materials and equipment for that specific portion of the job are on site and the Contracting Officer has granted approval for excavation. Requests for utility outages shall be in writing and shall be made a minimum of 21 days prior to the outage date. Backfilling of all excavations shall be accomplished only after inspection of the underground construction by the Contracting Officer and after approval by the Contracting Officer to begin excavation backfill is given. Coordinate request for utility installation and inspections with the Contracting Officer two work days in advance. Backfill performed prior to Contracting Officer's inspection of the installation shall be removed by the Contractor. Backfill shall be accomplished as soon as possible after installation of the utility.

1.41.1 Site Restoration

Rough grading of utility cuts shall be accomplished immediately after backfilling excavated trenches. Soil and sediment control measures shall also be provided immediately. Final grading, including the placing of new topsoil, as required, shall be accomplished as soon as possible. Required landscaping, sodding, or seeding, mulching and spreading of straw cover shall be accomplished at the earliest possible time after backfilling, but in no circumstance more than 7 calendar days after excavation is performed.

1.42 TRENCHING AND EXCAVATION

Excavation and related work shall be completed in scheduled phases between blocks or manholes for installations requiring testing. Work shall be barricaded in accordance with Corps of Engineer Manual EM 385-1-1 and AFOSH Std 127-66. For excavations in which testing is not required, the trenches shall be backfilled at the end of the day except for the last 15 feet. Backfilling must be accomplished daily; established structures and plantings must be avoided. Excavation shall not begin until material and equipment for the specified portion of the job is available on the site. Trenches or excavations which cut roads, parking lots, driveways and delivery routes shall be fully coordinated between the Contractor, Contracting Officer, Base Fire, Rescue and Security Police prior to excavation. The Contractor shall provide non-skid surface, steel road plates until the vehicle routes are permanently repaired. Excavations and the repair which will traverse completely across vehicle routes shall be scheduled in stages which will allow crossing of vehicles until road plates and/or permanent repairs are in place.

1.43 BARRICADES

Barricades are required in accordance with the quoted safety regulations. "Each job site will be clearly identified by signs, and protected by barriers suitably marked by reflective materials, and illumination for easy sighting after dark." This provision is required in accordance with AFOSH Standard 127-66, Chapter 4, para 4-1, f(1). Where steel plates are used over open trenches, they shall be secured to prevent vehicle damage. Unusual or specific requirements for signs or lighting are as required or specified in the specifications. When special requirements are indicated, they will take precedence over applicable Special Condition paragraphs. Safety signs shall be posted at all entrances to the construction site.

1.44 FENCES

All temporary and permanent construction fences (this includes fabric, chain link, snow, and black silt fencing), their fence posts, and stakes will be straight and fabric tight, not loose or drooping, and in good repair. All screen fences will be brown. Excess fabric and fencing will be removed and stored out of sight. Silt fencing will not be located within 100 feet of a runway edge, or 200 feet of a taxiway centerline without coordination with 89 OSS/OSA Airfield Management. Silt fencing located in the vicinity of the airfield will be no higher than 18 inches in height and will have wooden stakes unless previously coordinated with 89 OSS/OSA Airfield Management. Silt fencing located near apron edges and within aircraft wing tip clearances IAW UFC 3-260-01, Table 6-1, may require additional marking and/or lighting.

All construction equipment/vehicles shall be staged in the construction zone in an organized manner if not in use.

Pay particular attention to areas where the equipment/vehicles are in high visibility areas. Excavated areas need to be backfilled as soon as is practicable and the site restored. Utility flags should be removed from the site as soon as the construction is complete or sooner if placed in an area not impacted by construction. Utility flags should not be used on the airfield where than can become loose and pose a FOD hazard. Stakes used in identifying utilities should not be located within 100 feet of a runway edge, or 200 feet of a taxiway centerline without coordination with 89 OSS/OSA, Airfield Management. Limit the use of cones (and prevent their

use if at all possible). If they must be used, they must be in good condition and of a standardized size, appearance, and base approved color (no mixing of cone types).

1.45 GOVERNMENT FURNISHED EQUIPMENT

NOT USED

1.46 CATALYTIC CONVERTERS

No vehicle equipped with a catalytic converter shall be permitted to operate within 50 feet of any aircraft, on or near the taxiways or runways, around fuel spills, in POL areas, in munitions areas or in other potentially hazardous areas when identified with a placard.

1.47 TOOLS AND EQUIPMENT

All hand tools and equipment utilized by the Contractor must be suitable for use in the area required. Explosion proof equipment, special low noise equipment and other special equipment shall be provided as specified. Additionally, if the specific work area so dictates, the equipment used shall be Class 1, Division 1, suitable for Hazardous (Classified) locations. Loss of any tools, or equipment on the airfield, should be reported to Airfield Management Operations immediately. Type of tool, vicinity of where the tool was lost, and date and time tool was lost, should be provided. Airfield Management Operations will report the loss of tools or equipment to the Wing FOD Manager.

The SSM, or designee, including contractor security may randomly search tool boxes, containers and personnel for prohibited items.

1.48 REMOVAL AND SALVAGE

Materials produced in demolition or removed from the project, which are to remain the property of the Government and be classified as salvage or reused, will be removed and protected from damage.

1.49 PHOTOGRAPHY

Personnel are not authorized to take photography, video, or audio recordings unless approved by the Contracting Officer and Site Security Manager Contractor's Operations Security Plan. Cameras, cell phones, or any other electronic devices capable of taking photographs, video, and audio recordings are subject to confiscation if persons are caught taking unauthorized photographs or recordings. Contact Contracting Officer with list of personnel to take photographs at least 7 days prior for approval. The Contractor must follow all instructions provided and an authorization letter will be provided to those authorized.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

1.50 ATTACHMENTS

The following is a list of forms attached immediately after this section that will be utilized for all work performed on Atlantic City ANG Base,

New Jersey.

A. AF Form 3064 - Contractor's Progess Schedule
B. AF Form 3065 - Contract Progress Report
C. CED Form 66 - Schedule of Material Submittals
D. AF form 3000 - Material Approval Submittal
E. CES Form 18 - Base Civil Engineering Work Clearance Request
F. Contractor's Hazardous Materials Approval Form
G. Contractor Hazardous Materials Usage Tracking Form
H. CES Form 2 - Equipment/Warranty Summary
I. DD Form 1354 - Construction Information Real Property
J. A new Base Access Form is available upon request from the Base CE.

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CONTRACT PROGRESS SCHEDULE

(See Contractor's Instructions on Reverse)

Form Approved
OMB NO. 0704-0188

Public reporting burden for this collection of information is estimated to average 15 minutes per response. Including the time for reviewing instructions, searching existing data sources, gathering maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department Defense of Washington Headquarters Services, Directorate for information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project 0704-0188. Washington DC 20503. Please DO NOT RETURN your (form questionnaire) to either of these addresses. Send your completed (form questionnaire) to: SAF AQCO. Washington DC 20330-1000.

1. CONTRACT NO.		8. PROJECT TITLE BASEWIDE UTILITY MONITORING		10. APPROVAL RECOMMENDED BY:	
2. STARTING DATE				DATE SIGNED	INSTALLATIONS ENGINEERS'S SIGNATURE
3. COMPLETION DATE		9. SUBMITTED BY: Wade E Sand			
4. PURCHASE REQUEST NO.		DATE SIGNED 12/15/2008	CONTRACTOR'S NAME (Last, First, Middle Initial) ADDRESS (Street, City, State, Zip Code)	CONTRACTOR'S SIGNATURE	11. APPROVED BY:
5. PROJECT NO.					DATE SIGNED / CONTRACTING OFFICER'S SIGNATURE
6. ACTUAL STARTING DATE					
7. ACTUAL COMPETION DATE					

LINE NO.	WORK ELEMENTS	%	1-Nov													TOTALS
A	B	C	D	E	F	G	H	I	J	K	L					
1																0.00%
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INSTRUCTIONS TO CONTRACTORS

1. Prepare three copies of AF Form 3064, in accordance with these instructions and submit to the contracting officer at the time stated in the contract or as established by the contracting officer.

2. Blocks 1,2, and 3. Enter the contract number, starting date, and completion date as shown on the contract.

3. Block 8. Enter the title of the project as shown on the contract.

4. Block 9. Enter the name and address of your firm. The three copies submitted to the contracting officer must be dated and signed by the contractor or an authorized representative of the firm.

5. Lines 1 through 16. Major elements of work (whether unit price or lump sum contract) such as excavation, concrete work, carpentry, engineering, installation of communication electronic facilities, etc., will be shown in Column B in logical sequence and in sufficient detail to identify the element.

6. The percentage of each listed work element to the complete job will be shown opposite each element in Column C. As an example, if 3 work elements are shown: excavation, concrete work, and backfill, and it is estimated that excavation is 50% of the total job, concrete 30%, and backfill 20%, these percentages will be shown opposite each element. The total must equal 100%.

7. Columns D through Q will be used to show planned periodic progress, as required by the contracting officer, during the period of the contract. Only the top half of the space under these columns will be used by contractors. Using the example cited above and assuming that the contract period for performance is 8 weeks, and it is planned to accomplish 10% of the excavation work the 1st week and 20% each week until excavation is complete, 10 would be shown in the upper half of Line 1 under Column D, 20 under Column E and 20 under Column F for a total of 50%. If it is planned to accomplish the concrete work during the 4th, 5th, and 6th weeks in equal amounts, 10 would be enteredd under columns G, H, and I on Line 2. Assuming the backfill will be accomplished during the 7th and 8th weeks, 10 would be entered under Columns J and K on Line 3. If the contract extends beyond 14 weeks, additional copies of AF Form 3064, with appropriate alterations, may be spliced on as a continuation of performance record.

8. Total amount or work planned at intervals as shown in Columns D through Q will be totaled and entered in the top half of the space under the appropriate column on Line 16. Again, using the example cited above, the totals under Column D through K would read 10, 20, 20, 10, 10, 10, 10, 10, for a total of 100%. These totals will be used to lot an overlay graph using Lines 67 through 15, beginning with Column D and extending to the right that number of columns (weeks) authorized by the contract for performance time.

9. Beginning at the lower left corner, Line 15, Column D, the graph will be plotted using a broken or dotted line showing the cumulative total progress for planned intervals. Again, using the example cited above, the dotted line would, for the 1st week, extend from Line 15 to Line 14 under Column D for 10%. The second week the dotted line would extend from Line 14 to Line 12 under Column E for 20%, making a cumulative total of 30%. The dotted line should end (100%) at the intersection of Line 5 and Column K.

10. In the event the contract is modified by the contracting officer under terms of the contract, changing the progress of work as originally scheduled, adding or deleting work or changing the original completion date, a revised progress schedule will be prepared and submitted to the contracting officer for approval. In preparing the revised schedule, the amount of work completed will be considered, together with the changed new completion date set forth in the contract modification. Considering these factors, the work under the contract will be rescheduled over the new total performance time in the same The new completion date will be entered in Block 3. "First Revised Schedule," "Second Revised Schedule," etc., will be entered immediately underneath the form title. Time of submission of the revised schedule will be determined by the contracting officer.

11. At such, intervals as may be established by the contracting officer, the contractor will submit to the contracting officer AF Form 3065 "Contract Progress Report," indicating the percentage of work accomplished for each work element during the established reporting period. Accurate reports are of the utmost importance to the contractor and th the Government, since the percentage of completion, or progress, thus reported is used in administration of the contract and maybe used in connection with approval of partial payments under the contract. Care should be taken to plan the work in such manner that it can be accomplished as stated in this schedule. If for any reason it becomes known that any part of the progess under this contract will be delayed, this fact should be reported to the contracting officer immediately.

CONTRACT PROGRESS REPORT

CONTRACTOR	ADDRESS

REPORT	PERIOD COVERED	PROJECT NO.	CONTRACT NO.	COMPLETION DATE

LINE NO.	WORK ELEMENT	% OF TOTAL JOB	% COMPLETED THIS PERIOD	% COMPLETED CUMULATIVE
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
	TOTAL			

REMARKS

At the Contracting Officer's discretion and according to the payments clause of the contract, the information provided on this form may be used for computing progress payments.

PROGRESS OR COMPLETION CERTIFICATE

I hereby certify that the contractor has satisfactorily completed the indicated percentage of the contract per contract specifications.

SUBMITTED BY BASE CIVIL ENGINEER'S OFFICE

NAME AND TITLE	SIGNATURE	DATE

REVIEWED BY OR FOR CONTRACTING OFFICER

NAME AND TITLE	SIGNATURE	DATE

August 2 '14 Version	SCHEDULE OF SUBMITTALS	Project Number:----------	Project Title:----------	Contract Number: TBD

LINE NUMBER	SPEC SECTION	ITEM OR DESCRIPTION OF ITEM	DOCUMENTS REQUIRED												SCHEDULE					DISPOSITION				REMARKS
			CERTIFICATIONS	FORMS AND REPORTS	SHOP DRAWINGS	PRODUCT DATA	Manufacturer'S Recommendations	SAMPLES	COLOR SELECTION	MANUFACTURER'S WARRANTY	O & M DATA	INSTALLATION DATA	RECORD DRAWINGS	COORDINATION DRAWINGS	WIRING DIAGRAMS	REQUIRED SUB-MISSION DATE	DATE TO A-E	DATE TO BCE	DATE TO CONTRACTING	DATE TO CONTRACTOR	NO EXCEPTIONS NOTED	APPROVED WITH COMMENTS	APPROVED WITH CORRECTIONS	REJECTED - RESUBMIT	
1		Safety Plan "addendum"		X												Prior to NTP									
2		Quality Control Plan "addendum"		X												Prior to NTP									
3		Bonds SF25 & SF25a (if required)		X												Prior to NTP									
4		Work Clearance Request "CES 18"		X												Prior to NTP									
5		"Schedule of Values"		X												Prior to NTP									
6		Project Schedule		X												Prior to NTP									
7		SF 1413s		X												Prior to NTP									
8		Apprentice Documentation (if necessary)		X												Prior to NTP									
9		Weekly Payrolls		X												Weekly									
10		Security Checklist to 114fw.sfscontractors@ang.af.mil		X												Prior to NTP									
11		Progress Reports		X												As Required									
12		"Initial" Hazardous Material Reports		X												Prior to NTP									
13		"Monthly" Hazardous Material Reports		X												Monthly									
14		"CloseOut" Hazardous Material Reports		X												At CloseOut									
15		Disposal and Recycling Receipts		X												As Available									
16		Warranty Summary "CES 2"		X												At CloseOut									
17		Real Property Worksheet for DD 1354		X												At CloseOut									
18		Warranty Letter	X													At CloseOut									
19		Release of Claims	X													At CloseOut									
20																									
21																									
22																									
23																									

August 2 '14 Version	SCHEDULE OF SUBMITTALS	Project Number:----------	Project Title:----------	Contract Number: TBD

LINE NUMBER	SPEC SECTION	ITEM OR DESCRIPTION OF ITEM	DOCUMENTS REQUIRED												SCHEDULE					DISPOSITION				REMARKS
			CERTIFICATIONS	FORMS AND REPORTS	SHOP DRAWINGS	PRODUCT DATA	Manufacturer'S Recommendations	SAMPLES	COLOR SELECTION	MANUFACTURER'S WARRANTY	O & M DATA	INSTALLATION DATA	RECORD DRAWINGS	COORDINATION DRAWINGS	WIRING DIAGRAMS	REQUIRED SUB-MISSION DATE	DATE TO A-E	DATE TO BCE	DATE TO CONTRACTING	DATE TO CONTRACTOR	NO EXCEPTIONS NOTED	APPROVED WITH COMMENTS	APPROVED WITH CORRECTIONS	REJECTED - RESUBMIT	
1		Safety Plan “addendum”		X												Prior to NTP									
2		Quality Control Plan "addendum"		X												Prior to NTP									
3		Bonds SF25 & SF25a (if required)		X												Prior to NTP									
4		Work Clearance Request "CES 18"		X												Prior to NTP									
5		"Schedule of Values"		X												Prior to NTP									
6		Project Schedule		X												Prior to NTP									
7		SF 1413s		X												Prior to NTP									
8		Apprentice Documentation (if necessary)		X												Prior to NTP									
9		Weekly Payrolls		X												Weekly									
10		Security Checklist to 114fw.sfscontractors@ang.af.mil		X												Prior to NTP									
11		Progress Reports		X												As Required									
12		“Initial” Hazardous Material Reports		X												Prior to NTP									
13		“Monthly” Hazardous Material Reports		X												Monthly									
14		“CloseOut” Hazardous Material Reports		X												At CloseOut									
15		Disposal and Recycling Receipts		X												As Available									
16		Warranty Summary "CES 2"		X												At CloseOut									
17		Real Property Worksheet for DD 1354		X												At CloseOut									
18		Warranty Letter	X													At CloseOut									
19		Release of Claims	X													At CloseOut									
20																									
21																									
22																									
23																									

MATERIAL APPROVAL SUBMITTAL

(See Instructions on Reverse)

Form Approved
OMB No 9000-0062
Expires May 31, 2005

Public reporting burden for this collection of information is estimated to average 20 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to the Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project OMB No 9000-0062, Washington DC 20503. Please DO NOT RETURN your form to either of these addresses. Send your completed form to: SAF/AQCP, 1060 Air Force Pentagon, Washington DC 20330

TO: *(Contracting Officer)*	**FROM:** *(Contractor)*	DATE *(YYYYMMDD)*
CONTRACT NUMBER	SUBMISSION NUMBER	SUBMITTAL ☐ NEW ☐ RESUBMITTAL
PREVIOUS SUBMISSION NUMBER	PROJECT NUMBER	

TO BE COMPLETED BY CONTRACTOR			FOR GOVERNMENT USE ONLY			
ITEM NO.	SPECIFICATION SECTION/ PARA NO./DRAWING NO.	DESCRIPTION OF MATERIAL *(Include Type, Model Number, Catalog Number, Mfg., etc.)*	AP-PROVED	DISAP-PROVED	SEE REVERSE	INITIAL
			☐	☐	☐	
			☐	☐	☐	
			☐	☐	☐	
			☐	☐	☐	
			☐	☐	☐	
			☐	☐	☐	
			☐	☐	☐	
			☐	☐	☐	
			☐	☐	☐	
			☐	☐	☐	
			☐	☐	☐	

BY COMPLETING THIS FORM, THE UNDERSIGNED CONTRACTOR CERTIFIES THAT THE MATERIAL COMPLIES WITH ALL SPECIFICATIONS OF SUBJECT CONTRACT.

DATE *(YYYYMMDD)*	TYPE OR PRINT NAME AND TITLE	SIGNATURE

FOR GOVERNMENT USE ONLY

TO: *(Base Civil Engineering Officer)*

For Evaluation and Action

DATE *(YYYYMMDD)*	TYPE OR PRINT NAME AND GRADE	SIGNATURE

TO: *(AF Contracting Office)*

RECOMMEND ☐ APPROVAL ☐ DISAPPROVAL AS INDICATED ABOVE AND SUBJECT TO ANY APPLICABLE COMMENTS ON THE REVERSE

DATE *(YYYYMMDD)*	TYPE OR PRINT NAME AND GRADE	SIGNATURE

TO: *(Contractor)*

☐ APPROVED ☐ DISAPROVED AS INDICATED ABOVE AND SUBJECT TO ANY APPLICABLE COMMENTS ON THE REVERSE SIDE. REQUEST RESUBMITTAL ON DISAPPROVED ITEMS WITHIN _____ DAYS OF DATE SHOWN BELOW.

DATE *(YYYYMMDD)*	TYPE OR PRINT NAME AND GRADE	SIGNATURE

COMMENTS

(Number to correspond with applicable Item Number on reverse)

INSTRUCTIONS TO CONTRACTORS

1. The term "material" is defined as articles, supplies, raw materials, equipment, parts, components, and end items that are to be incorporated into the work required by the contract.

2. This form is to be used by contractors for submitting Shop Drawings, Equipment Data, Manufacturer's Literature and Certificates and samples of Materials to the Government for approval in accordance with the provisions of this contract. Unless otherwise specified, it is to be prepared in 4 copies, signed, and provided to the contracting officer with appropriate attachments.

3. Item(s) to be approved will be clearly tabbed or identified. Data pertaining to item(s) to be approved will be clearly identified or tabbed, particularly where documents are voluminous, in order to properly evaluate the materials or articles to be incorporated in the work. Each attachment will be numbered to correspond with the item number shown on the face of this form.

4. Requests submitted shall be numbered consecutively, by contract, in the space entitled "Submission No.". This number, in addition to the Contract No., will be used to identify each Material Approval Submittal. Resubmissions will be indicated in the appropriate block and the insertion of previous submission number and data in addition to a new submission number. A single submission should be used for all work of a section of the specifications, but in NO instance should the submission include work for more than one (1) contract. Submittals requiring priority handling will be submitted by separate submittal using the form and so marked across the face of the form.

5. This Material Approval Submittal is not valid unless it is signed by the contracting officer. This approval is required as called for by the contracting officer under the terms of this contract.

BASE CIVIL ENGINEERING WORK CLEARANCE REQUEST

DATE PREPARED

1. PROJECT NO.: _____ LOCATION: _____
W.O./J.O. NO.: _____ CONTRACT NO.: _____
DESCRIPTION OF WORK: _____

2. TYPE OF FACILITY/WORK INVOLVED

	A. PAVEMENTS		B. DRAINAGE SYSTEMS		C. RAILROAD TRACKS		D. FIRE DETECTION AND PROTEC-TION SYSTEMS		E. UTILITY ___ OVERHEAD ___ UNDERGROUND
	F. COMM ___ OVERHEAD ___ UNDERGROUND		G. AIRCRAFT OR VEHICULAR TRAFFIC FLOW		H. SECURITY		I. OTHER (Specify)		

3. INSTRUCTIONS: The BCE work clearance request is used for any work (contract or in house) that may disrupt aircraft or vehicular traffic flow, base utility services, protection provided by fire and intrusion alarm systems, or routine activites of the installation. This form is used to coordinate the required work with key base activities and keep customer inconvenience to a minimum. It is also used to identify potentially hazardous work conditions
in an attempt to prevent accidents. The work slearance request is processed just prior to the start of work. If delays are encountered and the conditions at the job site change (or may have changed), this work clearance request must be reprocessed.

4. DATE CLEARANCE REQUIRED	5. DATE CLEARANCE TERMINATED	
6. REQUESTING OFFICIAL (Signature)	7. PHONE NO.	8. ORGANIZATION

CLEARANCE REVIEW

9.	ORGANIZATION	REMARKS	REVIEWER
OFF-BASE ORGANIZATIONS	A. Electric Utility		
	B. Gas Utility		
	C. Water Department		
	D.		
	E. Federal Aviation Administration		
BASE CIVIL ENGINEERING	F. Drainage Systems		
	G. Pavements, Grounds, Railroads		
	H. Water Distribution		
	I . Environmental Impact		
	J. Cathodic Protection		
	K. Sanitary Sewers		
OTHER ON-BASE ORGANIZATIONS	L. Security Police		
	M. Safety		
	N. Communications		
	O. Base Operations		
	P. Fire Department		
	Q. Other (Specify)		

10. REMARKS

REQUESTED CLEARANCE

_____ APPROVED _____ DISAPPROVED

DATE	SIGNATURE OF PROJECT MANAGER

Contractor HAZMAT Approval Form

Public reporting burden for this collection of information is estimated to average 20 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to the Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project OMB No 9000-0062, Washington DC 20503. Please DO NOT RETURN your form to either of these addresses. Send your completed form to: SAF/AQCP, 1060 Air Force Pentagon, Washington DC 20330-1060.

TO: (Contracting Office Representative)	FROM: (Contractor)	Date: (YYYYMMDD)
Submission Number:	Contract Number:	Submittal
Previous Submission Number:	Project Number:	☐ New ☐ Resubmittal ☐Closeout

Item No.	Specific Process and Amount brought on Base	Description of Material (Include Manufacture, Material Use For, etc.)	For Government Use Only			
			Approved	Disapproved	See Reverse	Initial
EX	Paint - 3 gallons	PROMAR 400 Interior Latex Semi-Gloss Enamel, Extra White, Part Number: B31W4451	EXAMPLE	EXAMPLE	EXAMPLE	EXAMPLE

Item No.	Specific Process and Amount brought on Base	Description of Material (Include Manufacture, Material Use For, etc.)	For Government Use Only			
			Approved	Disapproved	See Reverse	Initial

Contractor HAZMAT Approval Form

Item No.	Specific Process and Amount brought on Base	Description of Material (Include Manufacture, Material Use For, etc.)	For Government Use Only			
			Approved	Disapproved	See Reverse	Initial

	BY COMPLETING THIS FORM, THE UNDERSIGNED CONTRACTOR CERTIFIES THAT THE MATERIAL COMPLIES WITH ALL SPECIFICATIONS OF SUBJECT CONTRACT.		
	Date (YYYYMMDD)	Type or Print Name and Title	Signature
		FOR GOVERNMENT USE ONLY	
TO: (Base Safety Office)		☐ Reviewed	
Date (YYYYMMDD)		Type or Print Name and Grade	Signature
TO: (Base HAZMART Pharmacy)		☐ Reviewed	
Date (YYYYMMDD)		Type or Print Name and Grade	Signature
TO: (Base Bioenvironmental Engineering)		☐ Reviewed	
Date (YYYYMMDD)		Type or Print Name and Grade	Signature
TO: (Base Environmental Engineer)			
RECOMMEND		☐ Approval	☐ Disapproval as indicated above and subject to any applicable comments on the reverse.
Date (YYYYMMDD)		Type or Print Name and Grade	Signature

TO: (Contractor)		
TO: (Base Contracting Office Representative)		
□ Approved	□ Disapproval as indicated above and subject to any applicable comments on the reverse side. Request Resubmittal on Disapproved Items within _____Days of Date shown below.	
Date (YYYYMMDD)	Type or Print Name and Grade	Signature

COMMENTS

(Number to correspond with applicable Item Number on reverse)

INSTRUCTIONS TO CONTRACTORS

1 - This form is to be used by contractors for submitting Hazardous Materials that will be used or consumed on a project by both the GM Contractor and all subcontractors

2 - Adminstrative Data: TO: is the Contracting Office Representative (COR) for the project, FROM: is the name of the company contracted, Date is the date submitted to the COR, Submission number is the number of times this form has been submitted for the contract, Contract Number is the number given to the contract, Previous Submission Number shows the prior submission number, Project Number is a LUXC XXXXX number given to the project, Submittal type is either New/Resubmittal/Closeout

3 - Material data starts with: Item Number this is the number given to each hazardous material either stored on Base or consumed by the project, Specific Process and Amount brought on Base is the contractors estimate of the amount of hazardous materials that will either be stored on base or consumed during the execution of the project, Description of Material this should include the product name and general description as well as how the product is being used.

4 - SDS are required of all materials listed on this form. Item(s) to be approved will be clearly labbed or identified. Data pertaining to item(s) to be approved will be clearly identified or labbed, particularly where documents are voluminous, in order to properly evaluate the materials or articles to be incorporated in the work. Each attachment will be numbered to correspond with the item number shown on the face of this form.

5 - Requests submitted shall be numbered consecutively, by contract, in the space entitled "Submission No.". This number, in addition to the Contract No., will be used to identify each Material Approval Submittal. Resubmissions will be indicated in the appropriate block and the insertion of previous submission number and data in addition to a new submission number. A single submission should be used for all work of a section of the specifications, but in NO instance should the submission include work for more than one (1) contract. Submittals requiring priority handling will be submitted by separate submittal using the form and so marked across the face of the form.

6 - This Contractor HAZMAT Approval Form is not valid unless it is signed by the COR. This approval is required as called for by the contracting officer under the terms of this contract.

Contractor Hazardous Materials Usage Tracking Form (Return this form to Contracting/Project Manager)

Contractor Name_____ Date of Report_____ Reporting Period _____

Contractor Project Manager_____

Contractor POC for obtaining Hazardous Materials information Name: _____ Phone:_____

Email: _____ Contract#_____ Project #_____

Item No:	Material / Manufacturer:	Material Used For:	Initial Amount on Site	Size of Container	Total Additional Brought on Site	Total Quantity Used	Monthly Remainder
EX	Example: Material: SHERWIN WILLIAMS - PROMAR 400 Interior Latex Semi-Gloss Enamel, Extra White	Painting Building 13, Office 102 & 106	3	1 Gal.	2	4 Gal.	1 Gal.

Item No:	Material / Manufacturer:	Material Used For:	Initial Amount on Site	Size of Container	Total Additional Brought on Site	Total Quantity Used	Monthly Remainder

Contractor HAZMAT Usage Tracking Form

This form is a reflection of the Contractor HAZMAT Approval Form

Contractors are responsible for all Sub Contactors utilized for the project number listed on the form

- **Contractor Name**: Name of the contracting company
- **Date of Report**: Date the contractor is submitting this form ex: 5 May 2016
- **Reporting Period**: The month of the project that this form is for ex: 1 May 2016 – 31 May 2016
- **Contractor Project Manager**: The contractor's on site project manager or person responsible for submitting this form
- **Contractor POC for obtaining Hazardous Materials Information Name**: Only need if different than the Contractor Project Manager
- **Phone**: Phone number of the contractor's on site project manager or person responsible for submitting this form
- **Email**: Email of the contractor's on site project manager or person responsible for submitting this form
- **Contract #**: the contract number for this contract
- **Project #**: the project number for this contract
- **Item Number**: will match the Item Number from the Approval Form (If there is no usage on an Item Number that was previously approved on the Contractor HAZMAT Approval Form do not list that item number)
- **Material / Manufacturer**: will match the manufacturer and description of material on the Approval Form
- **Material Used For**: box will describe how that material is being consumed on Base
- **Initial Amount on Site**: will match the estimate on the Approval Form for amount brought on Base
- **Size of Container**: reflects the size of container by a specific unit of measurement that the material is stored in while on Base
- **Total Additional Brought on Site**: this number is the total number of additional container sizes brought on base such as in the example shows that 2 additional 1 gallon containers were brought on Base giving us a total of 5 gallons on Base.
    - If the amount brought on site is labeled with a unit of measurement then it will not be assumed to be the same size as the container
- **Total Quantity Used**: Shows the amount of chemical by a specific unit of measurement used during the reporting period
- **Monthly Remainder**: Shows the amount of chemical remaining on site by a specific unit of measurement

EQUIPMENT/WARRANTY SUMMARY

BUILDING NO:_____ PROJECT MANAGER:_____ _____

PROJECT NO: _____W.O./J.O. NO:_____ PROJECT TITLE: _____ _____

NOMENCLATURE						FREON			MISC		WARRANTY		
ITEM NO.	DESCRIPTION	SPEC SECTION	MODEL NO.	SERIAL NO.	SIZE	TYPE	LBS	OZS	DATE INSTALLED	LOCATION	START DATE	LENGTH OF WARRANTY	END DATE

ACCESS CONTROL LIST AND BACKGROUND CONSENT FORM

PRIVACY ACT STATEMENT

AUTHORITY: Section 3101, Title 44-10 United States Code (U.S.C) 8013 Executive Order 9397, USC 552A.
PRINCIPLE PURPOSE: Criminal History Background Checks on individuals entering on Federal Installations
DISCLOSURE: Voluntary. However, refusal to provide required information or sign this form will prevent the individual from gaining access to Federal Installations
NOTICE: The information on this form is being collected in accordance with federal law permitting the installation commander to limit access to the installation for security reasons (50 U.S.C. Section 797 and DoD Directive 5200.8) This data will be used to screen individuals who have, or are seeking access to, the 114th FW, Sioux Falls, South Dakota. Failure to provide truthful, complete and accurate responses may be used as a basis to deny entry to the installation and is also punishable as a criminal offense.

THE SPONSOR IS RESPONSIBLE FOR ADVISING INDIVIDUALS LISTED ON THIS FORM OF ALL PRIVACY AND CONSENT INFORMATION AND STATEMENTS

INSTRUCTIONS:

The Requester/Sponsor is responsible for the accuracy of this document and content. Organizations or personnel that sponsor groups or individuals onto the installation for an organized function (e.g. retirement, promotion, base function, contract work, etc.), will submit this letter of sponsorship to 114.MSG.BDOC.Org@us.af.mil at the Security Forces Squadron at least seven days prior to the event or project. Last minute changes will not be allowed. This letter must contain full birth names (First, Middle, Last), birth dates, driver's license numbers and driver's license issuing state of each visitor. Birth names listed will match as it appears on their state or government issued identification and will be verified upon arrival. Security Forces will receive these forms by the organization or personnel who is sponsoring the event or project; not the individuals themselves. Visitors and contractors can pre-enroll their information prior to arriving at the installation. Pre-enrollment can be completed at: https://dbids-global-enroll.dmdc.mil/. Pre-enrollment is not required for one time visitor access for base events if the individual is registered on this Access Control List. After pre-enrollment has been completed, DBIDS system will prompt users to print a QR code. This code will be utilized by the entry controller to expedite their processing time before entering the installation. If additions or deletions to this access list occur, it is the responsibility of the Base Sponsor or Requester to resubmit a new updated Access Control List to Security Forces. Additions or deletions will not be permitted to existing Access Control Lists. Requesting organization or personnel have the responsibility to ensure the accuracy and upkeep of this document. Vehicles and personnel requesting base access are subject to search. Vehicle operators must have a valid driver's license and be in possession of the vehicle's registration and proof of insurance to travel on the installation. This form does not take the place of standard mission related JPAS request procedures.

SECTION I: BASE SPONSOR'S/REQUESTER'S INFORMATION

1. NAME:	2. EMAIL:	3. PHONE NUMBER:

SECTION II: PROJECT/EVENT INFORMATION

4. DESCRIPTION:	5. START DATE: *(MM/DD/YEAR)*
6. BASE LOCATION:	7. END DATE: *(MM/DD/YEAR)*

SECTION III: CONTRACTOR INFORMATION

8. COMPANY NAME:	9. PROJECT NUMBER:	
10. COMPANY REPRESENTATIVE NAME:	11. EMAIL:	12. PHONE NUMBER:

SECTION IV: CONSENT AND UNDERSTANDING

13. Sponsor will ensure all individuals understand the United States Air Force has an obligation to require a criminal history background check as a condition prior to allowing access to the installation in order to provide security for personnel and property under it's' control. Sponsor/ Requester will ensure all individuals understand that random criminal history background checks will be conducted on the individuals while they are on Federal Installations.	13a. INITIALS:
14. Sponsor will ensure all individuals understand that the record checks may include the following: A State Criminal History Repository Check in the state where individuals currently reside and in states where they have formerly resided. A National Agency Check with inquires which includes a Federal Bureau of Investigation, fingerprint check as required.	14a. INITIALS:
15. Sponsor will ensure all individuals understand that they hereby authorize any Federal, State, or Local agency or office to release any record relation to them or individuals listed on this document, which is necessary to complete the record checks, described above.	15a. INITIALS:
16. Sponsor will ensure all individuals understand that all personal and company vehicles on base must have current proof of insurance, valid driver's license and vehicle registration.	16a. INITIALS:
17. Sponsor will ensure all individuals understand that if anyone listed on this document are denied access to the installation due to results of the criminal background check, a rebuttal may be made to further review circumstances of denial. It is the responsibility of the individual to submit a written rebuttal explaining the nature of their offenses. Justification is also needed to be granted access to the installation.	17a. INITIALS:

ACCESS CONTROL LIST AND BACKGROUND CONSENT FORM

ALL INFORMATION MUST MATCH GOVERNMENT OR STATE ISSUED IDENTIFICATION.

BASE ACCESS WILL BE DENIED IF INFORMATION IS MISSING, INCOMPLETE OR UNLEGIBLE.

SECTION V: VISITOR INFORMATION				SECTION VI: VETTING
18a. FIRST NAME:	18b. MIDDLE INITIAL:	18c. LAST NAME:		19a. STATUS:
18d. DATE OF BIRTH: *(MM/DD/YEAR)*	18e. DRIVER'S LICENCE/ID NUMBER:		18f. STATE OF ISSUE:	19b. OFFICER INITIAL:
20a. FIRST NAME:	20b. MIDDLE INITIAL:	20c. LAST NAME:		21a. STATUS:
20d. DATE OF BIRTH: *(MM/DD/YEAR)*	20e. DRIVER'S LICENCE/ID NUMBER:		20f. STATE OF ISSUE:	21b. OFFICER INITIAL:
22a. FIRST NAME:	22b. MIDDLE INITIAL:	22c. LAST NAME:		23a. STATUS:
22d. DATE OF BIRTH: *(MM/DD/YEAR)*	22e. DRIVER'S LICENCE/ID NUMBER:		22f. STATE OF ISSUE:	23b. OFFICER INITIAL:
24a. FIRST NAME:	24b. MIDDLE INITIAL:	24c. LAST NAME:		25a. STATUS:
24d. DATE OF BIRTH: *(MM/DD/YEAR)*	24e. DRIVER'S LICENCE/ID NUMBER:		24f. STATE OF ISSUE:	25b. OFFICER INITIAL:
26a. FIRST NAME:	26b. MIDDLE INITIAL:	26c. LAST NAME:		27a. STATUS:
26d. DATE OF BIRTH: *(MM/DD/YEAR)*	26e. DRIVER'S LICENCE/ID NUMBER:		26f. STATE OF ISSUE:	27b. OFFICER INITIAL:
28a. FIRST NAME:	28b. MIDDLE INITIAL:	28c. LAST NAME:		29a. STATUS:
28d. DATE OF BIRTH: *(MM/DD/YEAR)*	28e. DRIVER'S LICENCE/ID NUMBER:		28f. STATE OF ISSUE:	29b. OFFICER INITIAL:
30a. FIRST NAME:	30b. MIDDLE INITIAL:	30c. LAST NAME:		31a. STATUS:
30d. DATE OF BIRTH: *(MM/DD/YEAR)*	30e. DRIVER'S LICENCE/ID NUMBER:		30f. STATE OF ISSUE:	31b. OFFICER INITIAL:
32a. FIRST NAME:	32b. MIDDLE INITIAL:	32c. LAST NAME:		33a. STATUS:
32d. DATE OF BIRTH: *(MM/DD/YEAR)*	32e. DRIVER'S LICENCE/ID NUMBER:		32f. STATE OF ISSUE:	33b. OFFICER INITIAL:
34a. FIRST NAME:	34b. MIDDLE INITIAL:	34c. LAST NAME:		35a. STATUS:
34d. DATE OF BIRTH: *(MM/DD/YEAR)*	34e. DRIVER'S LICENCE/ID NUMBER:		34f. STATE OF ISSUE:	35b. OFFICER INITIAL:
36a. FIRST NAME:	36b. MIDDLE INITIAL:	36c. LAST NAME:		37a. STATUS:
36d. DATE OF BIRTH: *(MM/DD/YEAR)*	36e. DRIVER'S LICENCE/ID NUMBER:		36f. STATE OF ISSUE:	37b. OFFICER INITIAL:
38a. FIRST NAME:	38b. MIDDLE INITIAL:	38c. LAST NAME:		39a. STATUS:
38d. DATE OF BIRTH: *(MM/DD/YEAR)*	38e. DRIVER'S LICENCE/ID NUMBER:		38f. STATE OF ISSUE:	39b. OFFICER INITIAL:
40a. FIRST NAME:	40b. MIDDLE INITIAL:	40c. LAST NAME:		41a. STATUS:
40d. DATE OF BIRTH: *(MM/DD/YEAR)*	40e. DRIVER'S LICENCE/ID NUMBER:		40f. STATE OF ISSUE:	41b. OFFICER INITIAL:

TRANSFER AND ACCEPTANCE OF DoD REAL PROPERTY

Form Approved
OMB No. 0704-0188

PAGE OF PAGES

The public reporting burden for this collection of information is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to the Department of Defense, Washington Headquarters Services, Executive Services Directorate, Information Management Division, 4800 Mark Center Drive, Alexandria,VA 22350-3100 (0704-0188). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if itdoes not display a currently valid OMB control number.

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE ABOVE ORGANIZATION.

1. FROM *(Organization Name)*
TBD
TBD
NJ ANG Base, Atlantic City ANGB, Egg Harbor Township, NJ

2. DATE PREPARED *(YYYYMMDD)*
20240212

3. PROJECT/JOB NUMBER
AQRC 189015

4. SERIAL NUMBER
TBD

5. TO *(Organization - Installation Code and Name)*
USPFO for New Jersey, Contracting
400 Langley Road
Egg Harbor Township, NJ 08234-9500

6. RPSUID/SITENAME/ INSTCODE/INSTNAME
####/AQRC/Atlantic City ANGB, Egg Harbor Township, New Jersey

7. CONTRACT NUMBER(S)

7a. PLACED-IN-SERVICE DATE *(YYYYMMDD)*

8. TRANSACTION DETAILS

a. METHOD *(X all that apply)*
- [6] ACQUISITION BY CONSTRUCTION
- [ ] TRANSFER BETWEEN SERVICES
- [ ] CAPITAL IMPROVEMENT
- [ ] INVENTORY ADJUSTMENT

b. WHEN/EVENT *(X one)*
- [6] TOTAL ASSET PLACED-IN-SERVICE
- [ ] PARTIAL ASSET PLACED-IN-SERVICE

c. TYPE *(X one)*
- [6] DRAFT
- [ ] FINAL
- [ ] INTERIM

9. ITEM NO.	10a. FACILITY NO.	10b. RPUID	11. CATEGORY CODE	12. CATCODE DESCRIPTION		13. TYPE CODE	14. SUST. CODE	15. PRIMARY UM	AREA 16. PRIMARY UM QUANTITY	17. SECONDARY UM	OTHER ARY	18. SECONDARY UM QUANTITY		19. COST	20. FUND SOURCE	21. FUND ORG	22. INTER-EST CODE	23. ITEM REMARKS
TBD																		
TBD																		
TBD																		
TBD																		

24. STATEMENT OF COMPLETION. The facilities listed hereon are in accordance with maps, drawings, and specifications and change orders approved by the authorized representative of the using agency except for the deficiencies listed on the reverse side.

a. TRANSFERRED BY *(Typed Name and Signature)*

b. DATE SIGNED *(YYYYMMDD)*

c. TITLE *(Area Engr./Base Engr./DPW/Construction Agent)*

25a. ACCEPTED BY *(Typed Name and Signature)*

b. DATE SIGNED *(YYYYMMDD)*

c. TITLE *(DPW/RPAO)*

26. PROPERTY VOUCHER NUMBER

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES
11/20, CHG 3: 02/23

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING.Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

SD-03 Product Data

1.2 CONTRACT COST BREAKDOWN

The Contractor must furnish within 30 days after the date of Notice to Proceed, and prior to the submission of its first partial payment estimate, a breakdown of its single job pay item or items which will be reviewed by the Contracting officer as to propriety of distribution of the total cost to the various accounts. Any unbalanced items as between early and late payment items or other discrepancies will be revised by the Contracting Officer to agree with a reasonable cost of the work included in the various items. This Contract cost breakdown will them be utilized as the basis for progress payments to the Contractor.

1.2.1 Submission of Invoices

If DFARS Clause 252.232-7006 Wide Area WorkFlow Payment Instructions is included in the Contract, provide the documents listed in above paragraph CONTENT OF INVOICE in their entirety as attachments in Wide Area Work Flow (WAWF) for each invoice submitted. The maximum size of each WAWF attachment is two megabytes, but there are no limits on the number of attachments. If a document cannot be attached in WAWF due to system or size restriction, provide it as instructed by the Contracting Officer.

Monthly invoices and supporting forms for work performed through the anniversary award date of the Contract must be submitted to the Contracting Officer within 5 calendar days of the date of invoice. For example, if Contract award date is the 7th of the month, the date of each monthly invoice must be the 7th and the invoice must be submitted by the 12th of the month.

1.2.2 Final Invoice

a. A final invoice must be accompanied by the certification required by DFARS 252.247.7023 Transportation of Supplies by Sea, and the Contractor's Final Release. If the Contractor is incorporated, the Final Release must contain the corporate seal. An officer of the corporation must sign and the corporate secretary must certify the Final Release.

b. For final invoices being submitted via WAWF, the original Contractor's Final Release Form and required certification of Transportation of Supplies by Sea must be provided directly to the respective Contracting Officer prior to submission of the final invoice. Once receipt of the original Final Release Form and required certification of Transportation of Supplies by Sea has been confirmed by the Contracting Officer, the Contractor must then submit final invoice and attach a copy of the Final Release Form and required certification of Transportation of Supplies by Sea in WAWF.

c. Final invoices not accompanied by the Contractor's Final Release and required certification of Transportation of Supplies by Sea will be considered incomplete and will be returned to the Contractor.

1.3 SINGLE JOB PAYMENT ITEMS

Payment items for the work of this Contract for which Contract job payments will be made are listed in the BID SCHEDULE and described below. All costs for items of work, which are not specifically mentioned to be included in a associated with the work involved. The job price and payment made for each item listed constitutes full compensation for furnishing all plant, labor, materials and equipment,and performing any associated Contractor quality control, environmental protection, meeting safety, tests and reports, and for performing all work required for which separate payment is not otherwise provided.

1.3.1 Mobilization and Demobilization

1.3.1.1 Payment

Payment will be made for costs associated with mobilization and demobilization, as defined in Special Contract Requirement PAYMENT FOR MOBILIZATION AND DEMOBILIZATION.

1.3.1.2 Unit of Measure

Unit of measure: S.I. (feet and inches)

1.3.2 Structural NO. 1

1.3.3 Payment

Payment will be made for costs associated with operations necessary for construction of structure at Station

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS
11/20, CHG 3: 08/23

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2024) Safety -- Safety and Health Requirements Manual

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

View Location Map

Progress and Completion Pictures

SD-04 Samples

Color Boards; G

1.3 COLOR BOARDS FOR AIR FORCE PROJECTS

Submit five sets of color boards within 90 calendar days after Contract Award. Each set of boards must include samples of colors and finishes of interior surfaces, such as walls, floors, and ceilings. Present the samples on 8 by 10-1/2 inches boards (modules) with a maximum spread of 24 by 31-1/2 inches for foldouts. Design modules to fit in a standard loose-leaf, three-ring binder. Where special finishes such as architectural concrete, carpet, or prefinished textured metal panels are required, submit samples not less than 12 inches square with the board. If more space is needed, more than one board per set may be submitted. Certify that the color samples have been reviewed in detail, and that the color samples are in strict accordance with contract drawings and specifications, except as may be otherwise explicitly stated. Submittal of color samples does not relieve the Contractor of the responsibility to submit samples required elsewhere herein.

1.4 VIEW LOCATION MAP

Submit, prior to or with the first digital photograph submittals, a sketch or drawing indicating the required photographic locations. Update as

required if the locations are moved.

1.5 PROGRESS AND COMPLETION PICTURES

Photographically document site conditions prior to start of construction operations. Include aerial photographs. Provide monthly, and within one month of the completion of work, digital photographs, 1600x1200x24 bit true color minimum resolution in JPEG file format showing the sequence and progress of work. Take a minimum of 20 digital photographs each week throughout the entire project from a minimum of ten different viewpoints selected by the Contractor unless otherwise directed by the Contracting Officer. Submit with the monthly invoice two sets of digital photographs, each set on a separate compact disc (CD) or data versatile disc (DVD), cumulative of all photos to date. Indicate photographs demonstrating environmental procedures. Provide photographs for each month in a separate monthly directory and name each file to indicate its location on the view location sketch. Also provide the view location sketch on the CD or DVD as a digital file. Include a date designator in file names. Photographs provided are for unrestricted use by the Government.

1.5.1 Security Restrictions

Refer to Section 01 14 00 WORK RESTRICTIONS for security requirements for photographs.

1.6 MINIMUM INSURANCE REQUIREMENTS

Provide the minimum insurance coverage required by FAR 28.307-2 Liability, during the entire period of performance under this contract. Provide other insurance coverage as required by New Jersey law.

1.7 SUPERVISION

1.7.1 Superintendent Qualifications

Provide project superintendent with a minimum of 10 years experience in construction with at least 5 of those years as a superintendent on projects similar in size and complexity. The individual must be familiar with the requirements of EM 385-1-1 and have experience in the areas of hazard identification and safety compliance. The individual must be capable of interpreting a critical path schedule and construction drawings. The qualification requirements for the alternate superintendent are the same as for the project superintendent. The Contracting Officer may request proof of the superintendent's qualifications at any point in the project if the performance of the superintendent is in question.

1.7.2 Minimum Communication Requirements

Have at least one qualified superintendent, or competent alternate, capable of reading, writing, and conversing fluently in the English language, on the job-site at all times during the performance of Contract work. In addition, if a Quality Control (QC) representative is required on the Contract, then that individual must also have fluent English communication skills.

1.7.3 Duties

The project superintendent is primarily responsible for managing subcontractors and coordinating day-to-day production and schedule

adherence on the project. The superintendent is required to attend Red Zone meetings, partnering meetings, and quality control meetings. The superintendent or qualified alternative must be on-site at all times during the performance of this contract until the work is completed and accepted.

1.7.4 Non-Compliance Actions

The Project Superintendent is subject to removal by the Contracting Officer for non-compliance with requirements specified in the contract and for failure to manage the project to ensure timely completion. Furthermore, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders is acceptable as the subject of claim for extension of time for excess costs or damages by the Contractor.

1.8 PRECONSTRUCTION MEETING

Immediately after award, prior to commencing any work at the site, coordinate with the Contracting Officer a time and place to meet for the Preconstruction meeting The must take place within 35 calendar days after award of the contract, but prior to commencement of any work at the site. The purpose of this is to discuss and develop a mutual understanding of the administrative requirements of the Contract including but not limited to: daily reporting, invoicing, value engineering, safety, base-access, outage requests, hot work permits, schedule requirements, quality control, schedule of prices or earned value report, shop drawings, submittals, cybersecurity, prosecution of the work, government acceptance, final inspections and contract close-out. Contractor must present and discuss their basic approach to scheduling the construction work and any required phasing.

1.8.1 Attendees

Contractor attendees must include the Project Manager, Superintendent, Site Safety and Health Officer (SSHO), Quality Control Manager and major subcontractors.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

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SECTION 01 31 23.13 20

ELECTRONIC CONSTRUCTION AND FACILITY SUPPORT CONTRACT MANAGEMENT SYSTEM (eCMS)
08/23

PART 1 GENERAL

1.1 CONTRACT ADMINISTRATION

Utilize Contractor provided and Government approved web-based construction management application (hereinafter referred to as the "application) for the transfer, sharing and management of electronic technical submittals and documents. Contractor provided application is subject to Contracting Officer approval and must be compatible with the Air National Guard network. The Government must be able to readily access all hosted project information.

The web-based application is a means of transferring technical documents between the Contractor and the Government. Contact the Contracting Officer's Representative (COR) regarding availability of the application training and reference materials. Software must be compatible with Air National Guard network.

If Contractor application is approved by the Contracting Officer, at minimum, it must have the equivalent functionality of the application. Contractor to provide access rights and training as needed to the Government's construction management staff to successfully operator the Contractor provided application.

Paper media or e-mail submission, including originals or copies, of the documents are not permitted, with the exception to SD-04 Samples as noted in specification 01 33 00 Submittal Procedures, Section 1.6.11 Electronic File Format and except where the web-based application is unavailable, non-functional or specifically requested in addition to electronic submission.

1.2 USER PRIVILEGES

The Contractor's key staff may be provided access to eCMS. Contact the COR for eCMS account access. Project roles and system roles will be established to control each user's menu, application, and software privileges, including the ability to create, edit, or delete objects. Additional project roles may be assigned for workflow. The COR makes the final decision on roles for the project. User's ability to view, edit documents may be lowered at the discretion of the COR.

Only one eCMS user account is required regardless of the number of user's projects. Notify the COR within seven calendar days if a contractor user is no longer associated with company or project so they can remove them from any open record and inactivate them from the project.

1.2.1 eCMS Subcontractor Users

If the contractor's user is a subcontractor, the subcontractor must be registered under the name of their company and email. For example it is common for contractors to contract Quality Control Managers. The QC Manager's account should be under their company's name and email reducing

the number of eCMS accounts required.

1.2.2 Users with Multiple Roles

Users may have multiple roles associated with their account within eCMS. Roles are used in workflow. When a user is added to the project, they will be assigned the default role when the user was created. Contact the COR to change or add roles to the user for the project.

1.2.3 Loss of Privilege

Users may lose privilege to access eCMS at the discretion of the COR and or Contracting Officer. The eCMS is a collaborative system that allows flexibility of use and does not restrict all inappropriate user actions. User activities are logged into eCMS in visible and background data collection. Users found to use eCMS in an inappropriate action may have their eCMS access revoked. Examples include, but not limited to, fraudulent representations, sharing user accounts with others, and changing approved records without the consent of the COR. Depending on the severity of the infraction, the users can lose eCMS access for a period of time, permanently for the project, or lose eCMS access for any project. The contractor may appeal the suspension in writing to the contracting officer within 14 calendar days of notice. The appeal must identify the infraction, supporting information, and steps to ensure the infraction will not happen in the future.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

List of Contractor's Personnel; G

1.4 SYSTEM REQUIREMENTS AND CONNECTIVITY

1.4.1 General

Newforma - Submittal Exchange or the chosen application will requires a web-browser (platform-neutral) and Internet connection. For best results, recommend using browser in InPrivate/Incognito mode; Internet speeds greater than 40mbps when uploading files, computers with high RAM and Solid State Drives, "White List" eCMS website, Zip or Split files for better uploading. Provide and maintain computer hardware and software for the chosen application access throughout the duration of the contract for all Contractor-designated users. Neither upgrading of the Contractor's computer system nor delays associated from the usage of the chosen application will be justification or grounds for a time extension or cost adjustment to the Contract.

1.4.2 Electronic Submittal Website Provider

Subject to compliance with requirements, provide products and/or service under their current licensing agreements by one of the following:

1. "Submittal Exchange" website service designed specifically for transmitting submittals between construction team members. (1-800-714-0024)

2. Pre-approved equal website provider.

1.4.3 Contractor Personnel List

Within 20 calendar days of contract award, provide to the Contracting Officer a list of Contractor's personnel who will have the responsibility for the transfer, sharing and management of electronic submittals, RFIs, daily reports, and other files and will require access to the eCMS. Project personnel roles which must be filled as applicable in the eCMS, include, at a minimum, the Contractor's Project Manager, Superintendent, Quality Control, Manager, Principal, and Site Safety and Health Officer. Notify the COR immediately of any personnel changes to the project. The Contracting Officer reserves the right to perform a security check on all potential users.

Provide the following information:

Company Name

Name (First, Last)

Email Address

Project Role (CQM, SSHO, Superintendent, CM, PM, Principal)

1.4.4 Field Administration

Within 30 days of Contract Award, provide a tablet computer with a Common Access Card (CAC) reader at the job site for Government use only. The tablet computer must have a web-browser, built-in camera, and cellular data connectivity. Provide tablet computer with a rugged case suitable for use in a construction environment. The tablet computer must be fully charged and made available at all times for Government use to facilitate the input of construction data at the job site. After completion of the work, reset the tablet computer to factory default settings. The tablet computer remains the property of the Contractor and must be removed from the site. There are restrictions on use of WIFI on military bases. Cellular data connectivity and availability, and use of WIFI requires coordination with and approval by the Contracting Officer.

1.5 SECURITY CLASSIFICATION

In accordance with current guidance, all military construction contract data are unclassified, unless specified otherwise by a properly designated Original Classification Authority (OCA) and in accordance with an established Security Classification Guide (SCG). Refer to the project's OCA when questions arise about the proper classification of information.

In conformance with the Freedom of Information Act (FOIA), DoD INSTRUCTION 5200.48 CONTROLLED UNCLASSIFIED INFORMATION (CUI), and DoD requirements, any unclassified project documentation uploaded into the eCMS must be designated either "U - UNCLASSIFIED" (U) or "CUI - CONTROLLED UNCLASSIFIED INFORMATION" (CUI). Controlled Unclassified Identification (CUI) documents may be loaded into eCMS with the appropriate markings.

1.5.1 Markings on CUI Documents

Contractor's proprietary information, or documents determined by the originator in accordance with CUI guidance, should be marked CUI. Proprietary information not marked CUI can be released under the Freedom of Information Act (FOIA). Apply the appropriate markings before any document is uploaded into eCMS. Markings are not required on Unclassified U documents.

1.6 APPLICATION UTILIZATION

Establish, maintain, and update data and documentation in the eCMS throughout the duration of the contract. Utilize eCMS or Newforma to transfer all submittals, RFIs, daily reports, and other files required by contract to be forwarded to the government.

Full eCMS use is required. All Submittals/Information to use eCMS Modules including, but not limited to, RFIs, Daily Reports, Meeting Minutes, Communications, Issues, Punch Lists, Checklists, and Flysheets, unless otherwise directed by the COR or Contracting Officer.

The eCMS as an Electronic File Repository is authorized for projects under $1M. Upload all files using the appropriate eCMS module or as directed by the COR. Bulk uploads of RFIs, Submittals, Daily Reports, Issues, Meeting Minutes or Communications records into eCMS modules are allowed. For RFIs, group files by specification number, RFP Part number, or sheet number. For Submittals, group files by specification number. For Daily Reports, group by date range(s), Issues by date range(s), Meeting Minutes by date range(s), and Communications by Type.

1.6.1 Restricted Information

Personally Identifiable Information (PII) transmittal such as credit card, driver's license, passport, social security, and payroll number are not permitted in eCMS. Name, address, and email are permitted. Pre-negotiation information such as cost estimates that require formal negotiations are not allowed. For example, proposed changes over the SAP level of $250k require formal negotiations. Cost estimates for LEAN, ULTRA LEAN, and Design Changes under the SAP level are at the discretion of the COR's or Contract Specialist/Officer's direction. The eCMS must only be used for the transaction of unclassified information associated with construction projects. Controlled Unclassified Identification (CUI) documents may be loaded into eCMS with the appropriate markings. Uploading of files directly into the Documents folder is not allowed. All documents must be uploaded using an eCMS module.

1.6.2 Naming Convention for Files

Titles of files uploaded are to be descriptive of the purpose and content of the file. For example RFI_ROOF_Leak.doc or for submittals, SUB_LIGHT_FIXTURE.pdf. Titles of file to be uploaded must only contain uppercase letters, lowercase letters, numbers, hyphens (-), underscores (_) and periods (.). Use of any other characters is not allowed and may create an error. When practicable, adding the record number to the title is desired. For example RFI_XYZ12345_ROOF_Leak.doc. Uploading files with the same title will create a new revision in eCMS. Original revision is Rev 0, the first revision is Rev 1. Uploaded files are to use the default file location regardless of the module used unless directed by the COR.

1.6.3 ELECTRONIC SUBMITTAL REQUIREMENTS

1.6.4 Submittals and Paperwork

The following submittals and paperwork shall be transmitted to Architect in electronic (PDF) format via a website service designed specifically for transmitting submittals between construction team members. Project website shall include the following functions:

1. Shop drawing submittals
2. Product data submittals
3. Requests for Information
4. Project Directory
5. Project Correspondence
6. Contractor's reports
7. Project Meeting Minutes
8. Contract Modification (Change Orders) Logs
9. Request For Information forms, responses and logs
10. Architectural Supplemental Instructions (ASI's) and logs
11. Owner required Progress Reports
12. Online document collaboration

1.6.5 Electronic Submittal Process

The electronic submittal process is not intended for the following:

1. Color samples, color charts, physical material samples.
2. Applications for Payment, and other submittals not related to shop drawings and product data and not indicated above.

1.6.6 Number of Users

Provide for an unlimited number of users including, but not limited to, the Owner, Architect, Architect's Consultants, major sub-contractors, and suppliers. Provide four hours of software training at Architect's office for Project Web site users.

1.6.7 Project Completion

Upon completion of Project, provide four complete archive copies of Project Website files to Owner and Architect in a digital storage format acceptable to the Owner and Architect.

1.6.8 Project Website

Provide and use project website for purposes hosting and managing project information and documentation noted elsewhere until Final Completion.

1.6.9 Project Website Administration

Project website will be administered by the Architect/Engineer.

1.6.10 SUBMITTAL PROCEDURES

1.6.11 General Submittal Procedure Requirements

Prepare and submit submittals required by individual Specification

Sections as required by Specification Section 01 33 00 SUBMITTAL PROCEDURES.

1.6.12 Electronic Submittals

The intent of electronic submittals is to expedite the construction process by reducing paperwork, improving information flow, and decreasing turnaround time.

1.6.13 Submittal Preparation

Contractor may use any or all of the following options:

1. Subcontractors and Suppliers provide electronic (PDF) submittals to Contractor via email.
2. Subcontractors and Suppliers provide electronic (PDF) submittals to Contractor via the established submittal website.
3. Subcontractors and Suppliers provide paper submittals to General Contractor who electronically scans and converts all submittals to PDF format.

1.6.14 Contractor Review

Contractor shall review and apply electronic stamp certifying that each submittal complies with the requirements of the Contract Documents including verification of manufacturer / product, dimensions and coordination of information with other parts of the work.

1.6.15 Transmitting Submittals

Contractor transmits each submittal to Architect using the established submittal website.

1. Contractor provides e-mail notice to the Base Civil Engineer and Contracting Officer that submittals have been posted to the website and sent to the Architect/Engineer.

1.6.16 Review Comments

Architect / Engineer, Base Civil Engineer and Contracting Officer review comments will be made available on the established submittal website for downloading. Contractor will receive email notice of completed review.

1.6.17 Submittal Distribution

Distribution of reviewed submittals to subcontractors and suppliers is the responsibility of the Contractor.

1. Contractor to submit CD, DVD or USB drive copies of reviewed submittals at project closeout for record purposes in accordance with Section 01 78 00 - Closeout Procedures.

1.6.18 COSTS

1.6.19 Electronic Submittal Website

Contractor shall include the cost of Electronic Submittal Website services in their proposal. This cost is included in the Contract Amount.

1.6.20 Website Intent

The intent is for the Electronic Submittal Website service cost to be used in lieu of postage or shipping costs typically paid for paper submittals.

1.6.21 Training

Contractor shall be responsible for training their employees and/or sub-contractors regarding use of website and PDF submittals

1.6.22 Internet Service and Equipment Requirements

1. Email address and Internet access at Contractor's main office.
2. Adobe Acrobat, Bluebeam or other similar PDF review software for applying electronic stamps and comments.
3. Connectivity requirements:
   a. Broadband modem, router and ISP, equipped with hardware firewall, providing minimum upload and download speeds at each Contractor computer to allow adequate connectivity.

1.6.23 RFIs Module

Create contractor RFIs using eCMS RFIs module. The contractor must confirm the numbering convention with the COR if different than eCMS default.

If the government (GOV) Response has "No" Cost or Schedule Impact, this reply is given with the expressed understanding that it does not constitute a basis for any change in the amount or time of subject contract. Information provided in this response does not authorize work not currently included in the contract. If GOV Response is "Yes" or "Potentially" then this response may require a change to the contract. If the contractor disagrees with the government's No Cost andor No Schedule impact determination, the contractor has 14 calendar days to notify the COR and Contracting Officer in writing.

1.6.24 Submittals Module

Create contractor submittals using eCMS Submittals module. The contractor must confirm the numbering convention with the COR if different than eCMS default.

1.6.25 Submittal Packages Module

Create submittal packages using the eCMS Submittal Packages module in lieu of or in addition to Related Objects. Submittal Packages track completion of the packaged submittals and is used in NAVFAC HQ's KPIs.

1.6.26 Communications Module

Create communications using the eCMS Communications module. The Communications module is used to create or document communications that are not a part of other eCMS modules. Use of Communications module will memorialize information into an eCMS record file. The following are Types of Communications:

Email

Memo to File

Face to Face

Telephone

Web Collaboration

Photos

Other Documents

Other

Unless directed by the COR, upload documents or files that do not have a corresponding eCMS module. Choose "Photos" Type for Photos and "Other Documents" for all other documents.

1.6.27 Issues Module

Create or respond to issues using the eCMS Issues module. Respond to CPARS issues using the Issues module.

1.6.28 Meeting Minutes Module

Create or respond to Meeting Minutes using the eCMS Meetings module.

Document required contractual meetings. Dates of meetings are used in NAVFAC KPIs. Minimum meetings in eCMS include the following:

Post Award Kickoff (PAK)

Pre-construction (Pre Con)

Initial and Preparatory Three Phases of Control

Quality Control (QC)

1.6.29 Potential Change Items Module

Not used.

1.6.30 Daily Report Module

Create Daily Reports using the eCMS Daily Report Module. The contractor must confirm the numbering convention with the COR if different than eCMS default.

1.6.31 Punchlists Testing Logs (Legacy)

Punchlist Testing Logs is a legacy program that is being replaced by the Punch Lists Module. This module is to be used for reference of past projects. Use the Punch Lists Module for all future work.

1.6.32 Punch Lists Module

The eCMS Punch Lists module is useful more than just for Punchlists. The module includes the capability of batch editing, create items from Optical Character Recognition (OCR) plans, assign tasks and track completion of individual items.

Create the following using the Punch Lists module:

Rework Items List

DFOW List

Punch-Out Inspection

Pre-Final Punchlist Inspection

Final Punchlist Inspection

Testing Logs

1.6.33 FWD UltraLean COAR RFP Module

Not Used.

1.6.34 Non-Compliance Notices (NCN) Module

Respond to Non-Compliance Notices listed in the Non-Compliance Notices module.

1.6.35 Checklists

Use Checklist listed in the contractor's eCMS menu and as directed by the COR. Checklists capture data and is used in dashboards and KPIs.

1.6.35.1 Partnering Team Health Survey Checklist

Contractor must use the eCMS checklist to document the partnering team health survey. Partnering Team Health Survey is in accordance with the Partnering Specification of this contract.

1.6.36 Flysheets

Use Flysheets listed in the contractor's eCMS menu, if available, and as directed by the COR. Flysheets allow the contractor to print out information from other systems and upload into eCMS. The eCMS will use OCR to capture the information as data. Flysheets capture data and used in dashboards and KPIs.

1.6.37 eCMS Outage

In the case where eCMS is unavailable for 8 hours or more, paper or email may be used in the interim to maintain project schedule.

Once the system is operational, all final records are required to be recreated using the appropriate module. Subject/title of the record to include the type of record i.e., RFI/Submittal/Daily Report/Communication/Other, the identification number(s), and the statement "Processed Outside of eCMS". Example, "RFI 001 Processed Outside of eCMS".

1.6.38 User Account Activity

eCMS captures user data and activities that are directly related to the user's account. The user agrees through the use of eCMS, their account

activities will be captured and can be displayed on eCMS printed reports.

1.7 QUALITY ASSURANCE

Requested Government response dates on Transmittals and Submittals must be in accordance with the terms and conditions of the Contract unless previously agreed by the COR. Requesting response dates earlier than the required review and response time, without concurrence by the Government COR, may be cause for rejection.

Incomplete submittals will be rejected without further review and must be resubmitted. Required Government response dates for resubmittals must reflect the date of resubmittal, not the original submittal date.

All submittals and associated attachments must be transmitted to the Government via the COR. Transmittals are no longer required when using eCMS since approval status is tracked on the submittal. Transmittal forms can be attached to submittals if approved by the COR. Submittals requiring government approval are "Transmitted For" "Approval". Submittals requiring contractor approved submittals, including those designated for Contractor Quality Control approval or Information Only, are "*Transmitted For" "Information Only" in the Submittal Module. Provide and sign the QC certification or approving statement on the attachment per submittal specification section. When Submittal Packages are required, use eCMS Submittal Packages after creating individual submittals. Importing Submittals from the Submittal Register is optional. Contact the COR for the data conversion requirements.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

-- End of Section --

SECTION 01 32 01.00 10

PROJECT SCHEDULE
08/23

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AACE INTERNATIONAL (AACE)

AACE 29R-03	(2011) Forensic Schedule Analysis
AACE 52R-06	(2006) Time Impact Analysis - As Applied in Construction
AACE 84R-13	(2015) Planning and Accounting for Adverse Weather

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 67-17	(2017) Schedule Delay Analysis

U.S. ARMY CORPS OF ENGINEERS (USACE)

ER 1-1-11	(2017) Administration -- Project Schedules

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Project Scheduler Qualifications; G

Preliminary Project Schedule; G

Initial Project Schedule; G

Periodic Schedule Update; G

1.3 PROJECT SCHEDULER QUALIFICATIONS

Designate an authorized representative to be responsible for the preparation of the schedule and all required updating and production of reports. The Designated Project Scheduler must have prepared and maintained at least three previous construction schedules for projects of similar size and complexity to this contract, using Primavera P6. Representative must have a comprehensive knowledge of CPM scheduling

principles and application.

1.3.1 ANTICIPATED WEATHER LOSS WORK DAYS

use the following schedule of anticipated nonthly non-work days due to adverse weather as the basis for establishing a 'Weather Calendar' showing the number of anticipated non-workdays for each month due to adverse weather, in addition to Saturdays, Sundays and all Federal Holidays as non-work days.

MONTHLY ANTICIPATED ADVERSE WEATHER DELAYS:

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
3	3	4	3	4	4	3	3	3	3	2	3

Assign the Weather Calendar to any activity that could be impacted by adverse weather. Refer to the attached summary of annual climatic factors for Joint Base Andrews, which is provided to the contractor for the purposes of scheduling the required contract work and taking into account usual and customary climatic factors. The Contracting Officer will issue a modification in accordance with the contract clauses, giving the Contractor a time extension for the difference of days between the anticipated and actual adverse weather delay if the number of actual adverse weather delay days exceeds the number of days anticipated for the month in which the delay occurs, if the adverse weather delayed activities are critical to contract completion, and if the activity was scheduled to account for usual and customary climatic factors and noted as being temperature, precipitation and/or wind dependent. A lost workday due to weather conditions is defined as a day in which the Contractor cannot work at least 50 percent of the day on the impacted activity.

1.3.2 ANTICIPATED RESTRICTED DELAYS

Unless otherwise noted or defined in Section 01 14 00 WORK RESTRICTIONS, allow in the schedule one lost workday for every two months of project duration for instances where base access is not permitted or where work areas are temporarily not accessible for security reasons which causes a delay in the work. Use Anticipated Restricted Delays as basis for establishing a 'Security Calendar' showing the number of anticipated non-workdays for each month due to anticipated restrictions, in addition to anticipated adverse weather, Saturdays, Sundays and all Federal Holidays as non-work days. Assign the Security Calendar to any activity that could be impacted by restriction delays. The Contracting Officer will issue a modification in accordance with the contract clauses, giving the Contractor a time extension for the difference of days between the anticipated and actual lost work days if the number of actual restriction delay days exceeds the number of anticipated for the month in which the delay occurs and the restrition delayed activities are critical to contract completion. A lost workday due to restriction delay is defined as a day in which the Contractor cannot work at least 50 percent of the day on teh impacted activity.

PART 2 PRODUCTS

2.1 SOFTWARE

The scheduling software utilized to produce and update the schedules required herein must be capable of meeting all requirements of this specification.

2.1.1 Government Default Software

The Government uses Primavera P6. Ensure exported schedule files are compatible with the version of P6 used by the Government.

2.1.2 Contractor Software

Scheduling software used by the contractor must be commercially available from the software vendor for purchase with vendor software support agreements available. The software routine used to create the required sdef file must be created and supported by the software manufacturer.

2.1.2.1 Primavera

If Primavera P6 is selected for use, provide the "xer" export file in a version of P6 importable by the Government system. Verify at the SEKO meeting which version of P6 is in use by the Government. Export the schedule in a version of P6 no newer than that used by the Government.

2.1.2.2 Other Than Primavera

If the Contractor chooses software other than Primavera P6, that is compliant with this specification, provide for the Government's use two licenses, two computers, and training for two Government employees in the use of the software. These computers will be stand-alone and not connected to Government network. Computers and licenses will be returned at project completion.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Prepare for approval a Project Schedule, as specified herein, pursuant to FAR Clause 52.236-15 Schedules for Construction Contracts. Show in the schedule the proposed sequence to perform the work and dates contemplated for starting and completing all schedule activities. The scheduling of the entire project is required. The scheduling of construction is the responsibility of the Contractor. Contractor management personnel must actively participate in its development. Subcontractors, and suppliers working on the project must also contribute in developing and maintaining an accurate Project Schedule. Provide a schedule that is a forward planning as well as a project monitoring tool. Use the Critical Path Method (CPM) of network calculation to generate all Project Schedules. Prepare each Project Schedule using the Precedence Diagram Method (PDM).

3.1.1 Scheduling Expectations Kickoff Meeting(SEKO)

In conjunction with the post award conference or pre construction conference the Government and the Contractor will hold a separate and distinct Scheduling Expectations Kickoff Meeting(SEKO). The intent of this meeting is for the Government to review with the contractor the

requirements of the scheduling specification, communicate the Government's expectations regarding schedule development and management, and answer any questions the Contractor may have regarding the schedule requirements.

3.2 BASIS FOR PAYMENT AND COST LOADING

The schedule is the basis for determining contract earnings during each update period and therefore the amount of each progress payment. The aggregate value of all activities coded to a contract CLIN must equal the value of the CLIN. Match the progress payment "Pay Period Thru" date in RMS to the schedule data date.

3.2.1 Activity Cost Loading

Activity cost loading must be reasonable and without front-end loading. Activities with a negative cost loading is not allowed. Provide additional documentation to demonstrate reasonableness if requested by the Contracting Officer.

3.2.2 Withholdings / Payment Rejection

Failure to meet the requirements of this specification may result in the disapproval of the preliminary, initial, or periodic schedule updates and subsequent rejection of payment requests until compliance is met.

In the event that the Contracting Officer directs schedule revisions and those revisions have not been included in subsequent Project Schedule revisions or updates, the Contracting Officer may withhold 10 percent of pay request amount from each payment period until such revisions to the project schedule have been made.

3.3 PROJECT SCHEDULE DETAILED REQUIREMENTS

3.3.1 Level of Detail Required

Develop the Project Schedule to the appropriate level of detail to address major milestones and to allow for satisfactory project planning and execution. Failure to develop the Project Schedule to an appropriate level of detail will result in its disapproval. The Contracting Officer will consider, but is not limited to, the following characteristics and requirements to determine appropriate level of detail:

3.3.2 Activity Durations

Reasonable activity durations are those that allow the progress of ongoing activities to be accurately determined between update periods. Non-procurement activities Original Durations (OD) are not to exceed 20 workdays or 30 calendar days.

3.3.3 Procurement Activities

Include in the schedule activities associated with the critical submittals and their approvals, procurement, fabrication, and delivery of long lead materials, equipment, fabricated assemblies, and supplies. Long lead procurement activities are those with an anticipated procurement sequence of over 90 calendar days.

3.3.4 Mandatory Activities

Include the following activities in the initial project schedule and all updates.

a. Submission, review and acceptance of SD-01 Preconstruction Submittals (individual activity for each).

b. Submission, review and acceptance of features requiring design completion

c. Submission of mechanical/electrical/information systems layout drawings.

d. Submission and approval of O & M manuals.

e. Submission and approval of as-built drawings.

f. Submission and approval of DD1354 data and installed equipment lists.

g. Submission and approval of testing and air balance (TAB).

h. Submission of TAB specialist design review report.

i. Submission and approval of fire protection specialist.

j. Submission and approval of Building Commissioning Plan, Controls testing plan, test data, and reports: Develop the schedule logic associated with testing and commissioning of mechanical systems to a level of detail consistent with the contract commissioning requirements. All tasks associated with building testing and commissioning will be completed prior to submission of building commissioning report and subsequent contract completion.

   These activities may include but are not limited to: air and water balancing, building commissioning -functional performance testing, controls testing, and performance verification testing. Include other systems testing, if required. Include additional commissioning requirements noted elsewhere in the Contract as required in the schedule and discuss during the SEKO meeting, noted in paragraph SCHEDULING EXPECTATIONS KICKOFF MEETING (SEKO).

k. Contractor's pre-final inspection.

m. Correction of punch list from Contractor's pre-final inspection.

n. Government's pre-final inspection.

o. Correction of punch list from Government's pre-final inspection.

p. Final inspection.

3.3.5 Government Activities

Show in schedule, Government and other agency activities that could impact progress. These activities include, but are not limited to approvals, environmental permit approvals by State regulators, inspections, utility tie-in, Government Furnished Equipment (GFE) and Notice to Proceed (NTP) for phasing requirements.

3.3.6 Standard Activity Coding Dictionary

Use the activity coding structure defined in the Standard Data Exchange Format (SDEF) in ER 1-1-11. This exact structure is mandatory. Develop and assign all Activity Codes to activities as detailed herein.

The SDEF format is as follows:

Field	Activity Code	Length	Description
1	WRKP	3	Workers per day
2	RESP	4	Responsible party
3	AREA	4	Area of work
4	MODF	6	Modification Number
5	BIDI	6	Bid Item (CLIN)
6	PHAS	2	Phase of work
7	CATW	1	Category of work
8	FOW	20	Feature of work*

*Some systems require that FEATURE OF WORK values be placed in several activity code fields. The notation shown is for Primavera P6. Refer to the specific software guidelines with respect to the FEATURE OF WORK field requirements.

3.3.6.1 Workers Per Day (WRKP)

Assign Workers per Day for all field construction or direct work activities, if directed by the Contracting Officer. Workers per day is based on the average number of workers expected each day to perform a task for the duration of that activity.

3.3.6.2 Responsible Party Coding (RESP)

Assign responsibility code for all activities to the Prime Contractor, Subcontractor(s) or Government agency(ies) responsible for performing the activity.

a. Activities coded with a Government Responsibility code include, but are not limited to: Government approvals, Government design reviews, environmental permit approvals by State regulators, Government Furnished Property/Equipment (GFP) and Notice to Proceed (NTP) for phasing requirements.

b. Activities cannot have more than one Responsibility Code. Examples of acceptable activity code values are: DOR (for the designer of record); ELEC (for the electrical subcontractor); MECH (for the mechanical subcontractor); and GOVT (for USACE).

3.3.6.3 Area of Work Coding (AREA)

Assign Work Area code to activities based upon the work area in which the activity occurs. Define work areas based on resource constraints or space constraints that would preclude a resource, such as a particular trade or craft work crew from working in more than one work area at a time due to restraints on resources or space. Examples of Work Area Coding include different areas within a floor of a building, different floors within a building, and different buildings within a complex of buildings. Activities cannot have more than one Work Area Code.

3.3.6.4 Modification Number (MODF)

Assign a Modification Number Code to any activity or sequence of activities added to the schedule as a result of a Contract Modification, when approved by Contracting Officer. Key all Code values to the Government's modification numbering system. An activity can have only one Modification Number Code.

3.3.6.5 Bid Item Coding (BIDI)

Assign a Bid Item Code to all activities using the Contract Line Item Number (CLIN) to which the activity belongs, even when an activity is not cost loaded. An activity can have only one BIDI Code.

3.3.6.6 Phase of Work Coding (PHAS)

Assign Phase of Work Code to all activities. Examples of phase of work are procurement phase and construction phase. Each activity can have only one Phase of Work code.

a. Code proposed fast track design and construction phases proposed to allow filtering and organizing the schedule by fast track design and construction packages.

b. If the contract specifies phasing with separately defined performance periods, identify a Phase Code to allow filtering and organizing the schedule accordingly.

3.3.6.7 Category of Work Coding (CATW)

Assign a Category of Work Code to all activities. Category of Work Codes include, but are not limited to construction submittal, procurement, fabrication, weather sensitive installation, non-weather sensitive installation, start-up, and testing activities. Each activity can have no more than one Category of Work Code.

3.3.6.8 Feature of Work Coding (FOW)

Assign a Feature of Work Code to appropriate activities based on the Definable Feature of Work to which the activity belongs based on the approved QC plan.

Definable Feature of Work is defined in Section 01 45 00 QUALITY CONTROL. An activity can have only one Feature of Work Code.

3.3.7 Contract Milestones and Constraints

Milestone activities are to be used for significant project events

including, but not limited to, project phasing, project start and end activities, or interim completion dates. The use of artificial float constraints such as "zero free float" or "zero total float" are prohibited.

Mandatory constraints that ignore or effect network logic are prohibited. No constrained dates are allowed in the schedule other than those specified herein. Submit additional constraints to the Contracting Officer for approval on a case by case basis.

3.3.7.1 Project Start Date Milestone and Constraint

The first activity in the project schedule must be a start milestone titled "NTP Acknowledged," which must have a "Start On" constraint date equal to the date that the NTP is acknowledged.

3.3.7.2 End Project Finish Milestone and Constraint

The last activity in the schedule must be a finish milestone titled "End Project."

Constrain the project schedule to the Contract Completion Date in such a way that if the schedule calculates an early finish, then the float calculation for "End Project" milestone reflects positive float on the longest path. If the project schedule calculates a late finish, then the "End Project" milestone float calculation reflects negative float on the longest path.

3.3.7.3 Interim Completion Dates and Constraints

Constrain contractually specified interim completion dates to show negative float when the calculated late finish date of the last activity in that phase is later than the specified interim completion date.

3.3.7.3.1 Start Phase

Use a start milestone as the first activity for a project phase. Call the start milestone "Start Phase X" where "X" refers to the phase of work.

3.3.7.3.2 End Phase

Use a finish milestone as the last activity for a project phase. Call the finish milestone "End Phase X" where "X" refers to the phase of work.

3.3.8 Adverse Weather

Ensure anticipated adverse weather is accounted for in the Project Schedule. AACE 84R-13 provides methodologies for techniques in planning for adverse weather. The preferred methodology is the use of a weather calendar. If a method other than a weather calendar is proposed the discuss the reason during the SEKO meeting.

3.3.9 Calendars

Schedule activities on a Calendar to which the activity logically belongs. Develop calendars to accommodate any contract defined work period such as a 7-day calendar for Government Acceptance activities, concrete cure times, etc. Develop the default Calendar to match the physical work plan with non-work periods identified including weekends and

holidays. Develop Seasonal Calendar(s) and assign to seasonally affected activities as applicable.

If an activity is weather sensitive it should be assigned to a calendar showing non-work days on a monthly basis, with the non-work days selected at random across the weeks of the calendar, using the anticipated adverse weather delay work days provided in the Special Contract Clauses. Assign non-work days over a seven-day week as weather records are compiled on seven-day weeks, which may cause some of the weather related non-work days to fall on weekends

If a weather calendar is used its implementation and execution is to be in accordance with AACE 84R-13

3.3.10 Open Ended Logic

Only two open ended activities are allowed: the first activity "NTP Acknowledged" is to have no predecessor logic, and the last activity -"End Project" is to have no successor logic. Except as noted above all activities are to have at least a start-to-start or finish-to-start relationship with its predecessor(s) and a finish-to-finish or finish-to-start relationship with its successor(s).

Predecessor open ended logic may be allowed in a time impact analyses upon the Contracting Officer's approval.

3.3.11 Default Progress Data Disallowed

Actual Start and Finish dates must not automatically update with default mechanisms included in the scheduling software. Updating of the percent complete and the remaining duration of any activity must be independent functions. Disable program features that calculate one of these parameters from the other. Activity Actual Start (AS) and Actual Finish (AF) dates assigned during the updating process must match those dates provided in the Contractor Quality Control Reports. Failure to document the AS and AF dates in the Daily Quality Control report will result in disapproval of the Contractor's schedule.

3.3.12 Out-of-Sequence Progress

Activities that have progressed before all preceding logic has been satisfied (Out-of-Sequence Progress) will be allowed only on a case-by-case basis subject to approval by the Contracting Officer. Propose logic corrections to eliminate out of sequence progress or justify not changing the sequencing for approval prior to submitting an updated project schedule. Address out of sequence progress or logic changes in the Narrative Report and in the periodic schedule update meetings.

3.3.13 Added and Deleted Activities

Do not delete activities from the project schedule or add new activities to the schedule without approval from the Contracting Officer. Activity ID and description changes are considered new activities and cannot be changed without Contracting Officer approval.

3.3.14 Original Durations

Activity Original Durations (OD) must be reasonable to perform the work item. OD changes are prohibited unless justification is provided

and approved by the Contracting Officer.

3.3.15 Leads, Lags, and Start to Finish Relationships

Lags must be reasonable as determined by the Government and not used in place of realistic original durations, must not be in place to artificially absorb or create float, or to replace proper schedule logic.

a. Leads (negative lags) are prohibited.

b. Start to Finish (SF) relationships are prohibited.

3.3.16 Retained Logic

Schedule calculations must retain the logic between predecessors and successors ("retained logic" mode) even when the successor activity(s) starts and the predecessor activity(s) has not finished (out-of-sequence progress). Software features that in effect sever the tie between predecessor and successor activities when the successor has started and the predecessor logic is not satisfied ("progress override") are not be allowed.

3.3.17 Percent Complete

Update the percent complete for each activity started, based on the realistic assessment of earned value. Activities which are complete but for remaining minor punch list work and which do not restrain the initiation of successor activities may be declared 100 percent complete to allow for proper schedule management. Budgeted cost of activity is to be reduced by the amount needed to correct deficiency. The activity referenced in paragraph COST LOADING of CLOSEOUT ACTIVITIES must have its budgeted cost increased by this amount.

3.3.18 Remaining Duration

Update the remaining duration for each activity based on the number of estimated workdays it will take to complete the activity. Remaining duration may not mathematically correlate with percentage found under paragraph entitled Percent Complete. The remaining duration for unstarted activities are not to be less than its orginal duration.

3.3.19 Cost Loading of Closeout Activities

Cost load the "Correction of punch list from Government pre-final inspection" activity(ies) not less than 1 percent of the present contract value. Activity(ies) may be declared 100 percent complete upon the Government's verification of completion and correction of all punch list work identified during Government pre-final inspection(s).

3.3.19.1 As-Built Drawings

If there is no separate contract line item (CLIN) for as-built drawings, cost load the "Submission and approval of as-built drawings" activity not less than $35,000 or 1 percent of the present contract value, which ever is greater, up to $200,000. Activity will be declared 100 percent complete upon the Government's approval.

3.3.19.2 O & M Manuals

Cost load the "Submission and approval of O & M manuals" activity not less than $20,000. Activity will be declared 100 percent complete upon the Government's approval of all O & M manuals.

3.3.20 Early Completion Schedule and the Right to Finish Early

An Early Completion Schedule is an Initial Project Schedule (IPS) that indicates all scope of the required contract work will be completed before the contractually required completion date.

a. No IPS indicating an Early Completion will be accepted without being fully resource-loaded (including crew sizes and manhours) and the Government agreeing that the schedule is reasonable and achievable.

b. The Government is under no obligation to accelerate work items it is responsible for to ensure that the early completion is met nor is it responsible to modify incremental funding (if applicable) for the project to meet the contractor's accelerated work.

3.4 PROJECT SCHEDULE SUBMISSIONS

Provide the submissions as described below. The data reports and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS. If the Contractor fails or refuses to furnish the information and schedule updates as set forth herein, the Contractor will be deemed not to have provided an estimate upon which a progress payment can be made.

Review comments made by the Government on the schedule(s) do not relieve the Contractor from compliance with requirements of the Contract Documents.

3.4.1 Preliminary Project Schedule Submission

Within 15 calendar days after the NTP is acknowledged, submit the Preliminary Project Schedule defining the planned operations detailed for the first 90 calendar days for approval. The approved Preliminary Project Schedule will be used for payment purposes not to exceed 90 calendar days after NTP. Completely cost load the Preliminary Project Schedule to balance the contract award CLINS shown on the Price Schedule. The Preliminary Project Schedule may be summary in nature for the remaining performance period. It must be early start and late finish constrained and logically tied as specified. The Preliminary Project Schedule forms the basis for the Initial Project Schedule specified herein and must include all of the required plan and program preparations, submissions and approvals identified in the contract (for example, Quality Control Plan, Safety Plan, and Environmental Protection Plan) as well as design activities, planned submissions of all early design packages, permitting activities, design review conference activities, and other non-construction activities intended to occur within the first 90 calendar days. Government acceptance of the associated design package(s) and all other specified Program and Plan approvals must occur prior to any planned construction activities. Activity code any activities that are summary in nature after the first 90 calendar days with Bid Item (CLIN) code (BIDI), Responsibility Code (RESP) and Feature of Work code (FOW).

3.4.2 Initial Project Schedule Submission

Submit the Initial Project Schedule for approval within 42 calendar days after notice to proceed is issued. The schedule must demonstrate a reasonable and realistic sequence of activities which represent all work through the entire contract performance period. No payment will be made for work items not fully detailed in the Project Schedule.

3.4.3 Periodic Schedule Updates

Update the Project Schedule on a regular basis, monthly at a minimum. Provide a draft Periodic Schedule Update for review at the schedule update meetings as prescribed in the paragraph PERIODIC SCHEDULE UPDATE MEETINGS. These updates will enable the Government to assess Contractor's progress.

a. Update information including Actual Start Dates (AS), Actual Finish Dates (AF), Remaining Durations (RD), and Percent Complete. Updated information is subject to the approval of the Government at the meeting.

b. AS and AF dates must match the date(s) reported on the Contractor's Quality Control Report for an activity start or finish.

3.5 SUBMISSION REQUIREMENTS

Submit the following items for the Preliminary Schedule, Initial Schedule, and every Periodic Schedule Update throughout the life of the project:

3.5.1 Electronic Scheduling Data

Provide electronic scheduling data containing the current project schedule and all previously submitted schedules in the format of the scheduling software (e.g. .xer). Also include the Narrative Report and all required Schedule Reports. The electronic file is to identify the type of schedule (Preliminary, Initial, Update), full contract number, Data Date and schedule file name. Each schedule must have a unique file name and use project specific settings. The file naming convention is to be determined at SEKO meeting.

3.5.2 Narrative Report

Provide a Narrative Report with each schedule submission. The Schedule Narrative Report is a "stand alone" report in PDF or Word format. Title the report "Schedule Narrative Report". Show the Report date, schedule name, and contract number on the first page. Indicate who is responsible for the schedule update and narrative report. Provide a brief description of the Project Scope. The Narrative Report is expected to communicate to the Government the thorough analysis of the schedule output and the plans to compensate for problems, either current or potential, which are revealed through that analysis. Include the following information at a minimum in the Narrative Report:

a. Identify and discuss the work scheduled to start in the next update period.

b. Describe activities along the critical path in addition to activities on the next float path after the critical path.

c. Describe current and anticipated problem areas, delaying factors and their impact, and an explanation of corrective actions taken or required to be taken. Identify the party responsible for delay, if applicable.

d. Identify and explain why activities, based on their calculated late dates, should have either started or finished during the update period but did not.

e. Identify and discuss all schedule changes by activity ID and activity name including what specifically was changed and why the change was needed. Include at a minimum new and deleted activities, logic changes, duration changes, calendar changes, lag changes, resource changes, and actual start and finish date changes.

f. Identify and discuss out-of-sequence work.

g. If the longest path changes from a monthly update to the next, provide an explanation of the factors driving the change.

3.5.3 Schedule Reports

The format, filtering, organizing, and sorting for each schedule report will be as directed by the Contracting Officer. Typically, reports contain Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date, Total Float, Actual Start Date, Actual Finish Date, and Percent Complete. Provide the reports electronically in .pdf format. Provide 3 set(s) of hardcopy reports. The following lists typical reports that will be requested:

3.5.3.1 Activity Report

List of all activities sorted according to activity number.

3.5.3.2 Logic Report

List of detailed predecessor and successor activities for every activity in ascending order by activity number.

3.5.3.3 Total Float Report

A list of all incomplete activities sorted in ascending order of total float. List activities which have the same amount of total float in ascending order of Early Start Dates. Do not show completed activities on this report.

3.5.3.4 Earnings Report by CLIN

A compilation of the Total Earnings on the project from the NTP to the data date, which reflects the earnings of activities based on the agreements made in the schedule update meeting defined herein. Provided a complete schedule update has been furnished, this report serves as the basis of determining progress payments. Group activities by CLIN number and sort by activity number. Provide a total CLIN percent earned value, CLIN percent complete, and project percent complete. The printed report must contain the following for each activity: the Activity Number, Activity Description, Original Budgeted Amount, Earnings to Date, Earnings this period, Total Quantity, Quantity to Date, and Percent Complete (based

on cost).

3.5.3.5 Scheduling Report

Provide a Scheduling Report generated from the current project schedule being submitted.

3.5.4 Network Diagram

The Network Diagram is required for the Preliminary, Initial and Periodic Updates. Depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The Contracting Officer will use, but is not limited to, the following conditions to review compliance with this paragraph:

3.5.4.1 Continuous Flow

Show a continuous flow from left to right with no arrows from right to left. Show the activity number, description, duration, and estimated earned value on the diagram.

3.5.4.2 Project Milestone Dates

Show dates on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

3.5.4.3 Critical Path

Show all activities on the critical path. The critical path is defined as the longest path.

3.5.4.4 Grouping and Sorting

Group and sort activities as directed to assist in the understanding of the activity sequence. Typically, this flow will group activities by major elements of work, category of work, work area and/or responsibility.

3.5.4.5 Cash Flow / Schedule Variance Control (SVC) Diagram

With each schedule submission, provide a SVC diagram showing 1) Cash Flow S-Curves indicating planned project cost based on projected early and late activity finish dates, and 2) Earned Value to-date.

3.6 PERIODIC SCHEDULE UPDATE

3.6.1 Periodic Schedule Update Meetings

Conduct periodic schedule update meetings for the purpose of reviewing the proposed Periodic Schedule Update, Narrative Report, Schedule Reports, and progress payment. Conduct meetings at least monthly within five days of the proposed schedule data date. Provide a computer with the scheduling software loaded and a projector which allows all meeting participants to view the proposed schedule during the meeting. The Contractor's authorized scheduler must organize, group, sort, filter, perform schedule revisions as needed and review functions as requested by the Contractor and/or Government. The Contractor scheduler must attend in person unless virtual attendance is approved by Contracting Officer. The meeting is a working interactive exchange which allows the Government and Contractor the opportunity to review the updated schedule on a real time and

interactive basis. The meeting will last no longer than 8 hours. Submit schedule file and narrative to the Government a minimum of two workdays in advance of the meeting. The Contractor's Project Manager must attend the meeting with the authorized representative of the Contracting Officer. Superintendents, foremen and major subcontractors must attend the meeting as required to discuss the project schedule and work. Following the schedule update meeting, make corrections to the schedule and resubmit, following the required schedule naming convention. Include only those changes approved by the Government in the schedule review meeting. Only approved schedules may be used to generate invoices for payment.

3.6.2 Update Submission Following Progress Meeting

Submit the complete Periodic Schedule Update of the Project Schedule containing all approved progress, revisions, and adjustments, pursuant to paragraph SUBMISSION REQUIREMENTS not later than 4 workdays after the periodic schedule update meeting.

3.7 WEEKLY PROGRESS MEETINGS

Conduct a weekly meeting with the Government (or as otherwise mutually agreed to) between the meetings described in paragraph entitled PERIODIC SCHEDULE UPDATE MEETINGS for the purpose of jointly reviewing the actual progress of the project as compared to the as planned progress and to review planned activities for the upcoming two weeks. Use the current approved schedule update for the purposes of this meeting and for the production and review of reports. At the weekly progress meeting, address the status of RFIs, RFPs and Submittals.

3.8 REQUESTS FOR TIME EXTENSIONS

ASCE 67-17 provides delay analysis guidelines. If there is a conflict between the contract and guidance provided in ASCE 67-17, the contract will govern. Provide justification of delay to the Contracting Officer in accordance with the contract provisions and clauses for approval, within 10 days of a delay occuring. Also prepare a time impact analysis for each Government request for proposal (RFP).

3.8.1 Justification of Delay

Provide a description of the event(s) that caused the delay and/or impact to the work. As part of the description, identify all schedule activities impacted. Show that the event that caused the delay/impact was the responsibility of the Government. Provide a time impact analysis that demonstrates the effects of the delay or impact on the project completion date, or interim completion date(s). Evaluate multiple impacts chronologically; each with its own justification of delay. With multiple impacts consider any concurrency of delay. A time extension and the schedule fragnet becomes part of the project schedule and all future schedule updates upon approval by the Contracting Officer.

3.8.2 Changes That Do Not Cause Delay

If it is determined that a change does not constitute a schedule time extension, a fragnet as described in paragraph FRAGMENTARY NETWORK, is to be created and inserted into the Project schedule.

3.8.3 Time Impact Analysis (Prospective Analysis)

Prepare a time impact analysis for approval by the Contracting Officer based on industry standard AACE 52R-06. Utilize a copy of the last approved schedule prior to the first day of the impact or delay for the time impact analysis. If Contracting Officer determines the time frame between the last approved schedule and the first day of impact is too great, prepare an interim updated schedule to perform the time impact analysis. Unless approved by the Contracting Officer, no other changes may be incorporated into the schedule being used to justify the time impact.

3.8.4 Forensic Schedule Analysis (Retrospective Analysis)

Prepare an analysis for approval by the Contracting Officer based on methodologies identified in industry standard AACE 29R-03. Identify which methodology was chosen and explain why it is more appropriate than other methodologies available.

3.8.5 Fragmentary Network (Fragnet)

Prepare a proposed fragnet for time impact analysis consisting of a sequence of new activities that are proposed to be added to the project schedule to demonstrate the influence of the delay or impact to the project's contractual dates. Clearly show how the proposed fragnet is to be tied into the project schedule including all predecessors and successors to the fragnet activities. The proposed fragnet must be approved by the Contracting Officer prior to incorporation into the project schedule.

3.8.6 Time Extension

The Contracting Officer must approve the Justification of Delay including the time impact analysis before a time extension will be granted. No time extension will be granted unless the delay consumes all available Project Float and extends the projected finish date ("End Project" milestone) beyond the Contract Completion Date. The time extension will be in calendar days.

Actual delays that are found to be caused by the Contractor's own actions, which result in a calculated schedule delay, are not a cause for an extension to the performance period, completion date, or any interim milestone date.

3.8.7 Impact to Early Completion Schedule

No extended overhead will be paid for delay prior to the original Contract Completion Date for an Early Completion IPS unless the Contractor actually performed work in accordance with that Early Completion Schedule. The Contractor must show that an early completion was achievable had it not been for the impact.

3.9 FAILURE TO ACHIEVE PROGRESS

Should the progress fall behind the approved project schedule for reasons other than those that are excusable within the terms of the contract, the Contracting Officer may require provision of a written recovery plan for approval. The plan must detail how progress will be made-up to include which activities will be accelerated by adding additional crews, longer

work hours, extra workdays, etc.

3.9.1 Artificially Improving Progress

Artificially improving progress by means such as, but not limited to, revising the schedule logic, modifying, or adding constraints, shortening activity durations, or changing calendars in the project schedule is prohibited. Indicate assumptions made and the basis for any logic, constraint, duration, and calendar changes used in the creation of the recovery plan. Any additional resources, manpower, or daily and weekly work hour changes proposed in the recovery plan must be evident at the work site and documented in the daily report along with the Schedule Narrative Report.

3.9.2 Failure to Perform

Failure to perform work and maintain progress in accordance with the supplemental recovery plan may result in an interim and final unsatisfactory performance rating and may result in corrective action directed by the Contracting Officer pursuant to FAR 52.236-15 Schedules for Construction Contracts, FAR 52.249-10 Default (Fixed-Price Construction), and other contract provisions.

3.9.3 Recovery Schedule

Should the Contracting Officer find it necessary, submit a recovery schedule pursuant to FAR 52.236-15 Schedules for Construction Contracts.

3.10 OWNERSHIP OF FLOAT

Except for the provision given in the paragraph IMPACT TO EARLY COMPLETION SCHEDULE, float available in the schedule, at any time, belongs to the Project and is available for Contractor and Government use. This includes activity and project float. Activity float is the number of workdays that an activity can be delayed without causing a delay to the "End Project" finish milestone. Project float (if applicable) is the number of work days between the projected early finish and the "End Project" finish.

3.11 TRANSFER OF SCHEDULE DATA INTO RESIDENT MANAGEMENT SYSTEM

Ensure schedule data is uploaded to RMS. This data is additional supporting data in a form and detail required by the Contracting Officer pursuant to FAR 52.232-5 Payments under Fixed-Price Construction Contracts. The receipt of a proper payment request pursuant to FAR 52.232-27 Prompt Payment for Construction Contracts is contingent upon the Government receiving both acceptable and approvable hard copies and matching electronic versions of the application for progress payment.

3.12 PRIMAVERA P6 MANDATORY REQUIREMENTS

Ensure Primavera P6 settings provide a schedule capable of fulfilling the requirements of the contract. The following settings are mandatory and required in all schedule submissions to the Government:

a. Activity Codes must be Project Level, not Global or EPS level.

b. Calendars must be Project Level, not Global or Resource level.

c. Activity Duration Types must be set to "Fixed Duration & Units".

d. Percent Complete Types must be set to "Physical".

e. Time Period Admin Preferences must remain the default "8.0 hr/day, 40 hr/week, 172 hr/month, 2000 hr/year". Set Calendar Work Hours/Day to 8.0 Hour days.

f. Set Schedule Option for defining Critical Activities to "Longest Path".

g. Set Schedule Option for defining progressed activities to "Retained Logic".

h. Set up cost loading using a single lump sum non-labor resource. The Price/Unit must be $1/hr, Default Units/Time must be "8h/d", and settings "Auto Compute Actuals" and "Calculate costs from units" un-selected.

i. Activity ID's must not exceed 10 characters.

j. Activity Names must have a verb-noun structure and contain the most defining and detailed description within the first 30 characters.

k. The daily ending hour for all work calendars must be the same.

-- End of Section --

SECTION 01 32 17.00 20

COST-LOADED NETWORK ANALYSIS SCHEDULES (NAS)
11/23

PART 1 GENERAL

1.1 DEFINITIONS

The cost-loaded Network Analysis Schedule (NAS) is a tool to manage the project, both for Contractor and Government activities. The NAS is also used to report progress, evaluate time extensions, and provide the basis for progress payments.

For consistency, when scheduling software terminology is used in this section, the terms in Primavera's scheduling programs are used.

1.2 SCHEDULE REQUIREMENTS PRIOR TO THE START OF WORK

1.2.1 Preliminary Scheduling Meeting

Before preparation of the Project Baseline Schedule, and prior to the start of work, meet with the Contracting Officer to discuss the proposed schedule and the requirements of this section. Propose projected data dates for monthly update schedules for the project and incorporate each monthly update submittal into submittal register. Discuss required forms, terminology, and submittal requirements of this section and other requirements related to schedule management for this contract. Use the NAVFAC-provided Preliminary Scheduling Meeting Guideline in the completion of the intended mutual understanding.

1.2.2 Project Baseline Schedule

Submit the Baseline NAS within 30 calendar days after contract award. Data date must be set to contract award date and no progress recorded for any activity. Only bonds and the required Preliminary Scheduling Meeting may be recorded as complete prior to acceptance of the Baseline NAS. The acceptance of a Baseline NAS is a condition precedent to:

a. The Contractor starting demolition work or construction stage(s) of the contract.

b. Processing Contractor's invoices(s) for any items other than bonds.

c. Review of any schedule updates. The contractor is still required to submit monthly network analysis updates. Without an accepted baseline the Government may return schedule update as received for record.

Submittal of the Baseline NAS is the Contractor's certification that the submitted schedule meets the requirements of the Contract Documents and represents the Contractor's plan on how the work will be accomplished. Provide all items listed in paragraph REQUIRED TABULAR REPORTS AND NATIVE P6 XER FILES with baseline NAS submittal.

1.3 WEEKLY LOOK AHEAD SCHEDULE

1.3.1 Weekly CQC Coordination and Production Meeting

Submit the first look ahead schedule 30 days after contract award and continue to submit weekly until contract completion.

Transmit the Weekly Look Ahead Schedule Submittal to the Contracting Officer on the first day of the current week that the look ahead schedule covers and at least one working day prior to Quality Control meetings or as agreed to by Contracting Officer. Contractor is required to provide all attendees at meetings that require discussion of the schedule.

1.3.2 Weekly Look Ahead Schedule Requirements

Prepare and issue a Four-Week Look Ahead schedule to provide a more detailed day-to-day plan of upcoming work identified on the Project Network Analysis Schedule. Requirements include:

a. For each Look Ahead schedule activity, identify parent NAS activity number(s). The parent NAS activity is the activity in the NAS that would incorporate the Look Ahead schedule activity requirement andor scope of work.

b. Update schedule each week to show the planned work for the current and following two-week period. Also include previous week, as-built work, showing actual start and finish dates.

c. Include upcoming outages, closures, preparatory meetings, and initial meetings, testing and inspections.

d. Clearly identify longest path activities on the Weekly Look Ahead Schedule. Include a key or legend that distinguishes longest path activities. Include all Longest Path activity NAS start/finish dates exceeded andor occurring during this period.

e. Identify responsibility for each activity.

f. The detail work plans are to be bar chart type schedules, derived from but maintained separately from the Project NAS on an electronic spreadsheet program and printed on 11 by 17 inch sheets as directed by the Contracting Officer.

g. Activities must not exceed 5 working days in duration and have sufficient level of detail to assign crews, tools and equipment required to complete the work.

h. Lookahead activities are not limited to only onsite work. Include but not limited to submittal, offsite fabrication, and procurement activities if needed to ensure longest path is maintained. Include design activities and coordination when part of scope.

1.4 MONTHLY NETWORK ANALYSIS

Submittal of Monthly NAS is the Contractor's certification that the submitted schedule meets the requirements of the Contract Documents and represents the Contractor's plan on how the work will be accomplished. Provide all items listed in paragraph REQUIRED TABULAR REPORTS AND NATIVE P6 XER FILES with the monthly NAS submittal.

1.4.1 Monthly Network Analysis Updates

a. Regardless of whether an invoice is being submitted monthly, or no progress in the schedule occurred, an updated schedule (or with new data date) must be submitted monthly to the Government. The Monthly NAS update must be submitted within 10 calendar days of the data date.

b. Regardless of whether a baseline or other schedule is submitted andor accepted, an updated schedule must be submitted monthly to the Government. Monthly updates submitted before the baseline being accepted will be considered as (interim and for information only) submittal.

c. Provide all items listed in paragraph REQUIRED TABULAR REPORTS AND NATIVE P6 XER FILES, with each monthly NAS update submittal.

d. Meet with Government representative(s) at monthly intervals to review and agree on the information presented in the updated project schedule. The submission of an accepted, updated schedule to the Government is a condition precedent to the processing of the Contractor's invoice.

e. Activity progress must incorporate as-built events as they occurred and correspond to records including but not limited to submittals and daily production and quality control reports.

f. Software Settings: Handle schedule calculations and Out-of-Sequence progress (if applicable) through Retained Logic, not Progress Override. Show all activity durations and float values in days. Show activity progress using Remaining Duration. Set default activity type to "Task Dependent".

g. Update schedule must reflect current Contract Completion Date and contract value in accordance with all conformed contract modifications issued prior to data date of NAS update.

1.4.2 As-Built Schedule

As a condition precedent to the release of retention and making final payment, submit an "As-Built Schedule," as the last schedule update showing all activities at 100 percent completion. This schedule must reflect the exact manner in which the project was actually constructed.

1.5 CORRESPONDENCE AND TEST REPORTS

Reference Schedule activity IDs that are being addressed in each correspondence (e.g., letters, Requests for Information (RFIs), e-mails, meeting minute items, Production and QC Daily Reports, material delivery tickets, photographs) and test report (e.g., concrete, soil compaction, weld, pressure).

1.6 ADDITIONAL SCHEDULING REQUIREMENTS

Other specification sections may include additional scheduling requirements, including systems to be inspected, tested and commissioned, and submittal procedures. Those schedule requirements must be incorporated into the NAS schedule.

1.7 SUBMITTALS

Government approval/acceptance is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES: Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Baseline NAS; G

Designated Project Scheduler; G

SD-07 Certificates

Weekly Look Ahead Schedule

Monthly Network Analysis Updates; G

SD-11 Closeout Submittals

As-Built Schedule; G

1.8 SOFTWARE

Prepare and maintain project schedules using Primavera P6 software in a version compatible with Government's current version. Importing data into P6 using data conversion techniques or third party software is cause for rejection of the submitted schedule. Schedules with Performing Organizational Breakdown Structure (POBS) data is cause for rejection.

1.9 DESIGNATED PROJECT SCHEDULER

Within 30 calendar days of contract award, submit to the Contracting Officer for approval an individual who will serve as the Designated Project Scheduler. Include a copy of the candidate's resume with qualifications. The Contracting Officer may remove the Designated Project Scheduler, and require replacement, if the scheduler does not effectively fulfill their duties in accordance with the contract requirements. Payment request will not be processed without an approved Designated Project Scheduler.

1.9.1 Qualifications

The Designated Project Scheduler must have prepared and maintained at least three previous construction schedules, of similar size and complexity to this contract, using Primavera P6.

1.9.2 Duties

Duties of the Designated Project Scheduler include to be actively involved and be responsible for the following::

a. Prepare Baseline NAS.

b. Prepare monthly schedule updates.

c. Prepare tabular reports.

d. Prepare Time Impact Analysis (TIA) as necessary.

e. Provide certification that NAS and TIA submittals conform to the contract requirements.

f. Participate with the Prime Contractor and Government Representative in a monthly meeting at the job site in-person, and scheduled with sufficient time to support the Monthly Network Analysis Updates process, to discuss project status, schedule updates, critical activities, potential delays, and contract modifications impacting the schedule. Have a computer with P6 software available during the meeting.

g. Be present on the project site full-time during working hours.

1.10 NETWORK SYSTEM FORMAT

Prepare the schedule in accordance with the following Primavera P6 settings and parameters. Deviation from these settings and parameters, without prior consent of the Contracting Officer, is cause for rejection of schedule submission.

1.10.1 Schedule Activity Properties and Level of Detail

1.10.1.1 Activity Identification and Organization

a. Identify construction activities planned for the project and other activities that could impact project completion if delayed in the NAS.

b. Each activity must have a unique name.

c. Identify administrative type activity/milestones, including all pre-construction submittal and permit requirements prior to demolition or construction stage.

d. Include times for procurement, Contractor quality control and construction, acceptance testing and training in the schedule.

e. Include the Government approval time required for the submittals that require Government Approval prior to construction, as indicated in Section 01 33 00 SUBMITTAL PROCEDURES.

f. Create separate activities for each Phase, Area, Floor Level and Location the activity is occurring.

g. Do not use construction category activity to represent non-work type reference (e.g., Serial Letter, Request for Information) in NAS. Place Non-work reference within the P6 activity details notebook.

Activity categories included in the schedule are specified below.

1.10.1.2 Activity Logic

a. With the exception of the Contract Award and Contract Completion Date (CCD) milestone activities, activity must not be open-ended; each activity must have at least one predecessor and at least one successor.

b. Activities must not have open start or open finish (dangling) logic.

c. Do not use lead or lag logic without Contracting Officer prior approval.

d. Minimize redundant logic ties.

e. Once an activity exists on the schedule it must not be deleted or renamed to change the scope of the activity and must not be removed from the schedule logic without approval from the Contracting Officer.

(1) While an activity cannot be deleted, where said activity is no longer applicable to the schedule, but must remain within the logic stream for historical record, change the activity original and remaining duration to zero and clearly label "(NO LONGER REQUIRED)" after the activity name. Actual finish date for activity that falls behind the data date. Redistribute accordingly any remaining budget associated with that activity, to other remaining appropriate activity.

(2) Document any such change in the activities' "Notebook," including a date and explanation for the change.

(3) The ID number for a "NO LONGER REQUIRED" activity must not be re-used for another activity.

1.10.1.3 Longest Path Activity Baseline Limitation

For P6 settings, critical activities are defined as being on the Longest Path. Longest Path (Critical) Activities must not make up more than 30 percent of all activity within the Construction Baseline Schedule.

1.10.1.4 Assigned Calendars

All NAS activity must be assigned calendars that reflect required and anticipated non-work days.

1.10.1.5 Activity Categories

1.10.1.5.1 Pre-construction Activities

Examples of pre-construction activities include, but are not limited to, bond approval, permits, pre-construction submittals and approvals. Include pre-construction activities that are required to be completed prior to the Contractor starting the demolition or construction stage of work.

1.10.1.5.2 Procurement Activities

Examples of procurement activities include, but are not limited to: Material/equipment submittal preparation, submittal and approval of material/equipment; material/equipment fabrication and delivery, and material/equipment on-site. As a minimum, separate procurement activities must be provided for critical items, long lead items, items requiring Government approval and material/equipment procurement for which payment will be requested in advance of installation. Show each delivery with relationship tie to the Construction Activity specifically for the delivery.

1.10.1.5.3 Government Activities

Government and other agency activities that could impact progress must be clearly identified. Government activities include, but are not limited to; Government approved submittal reviews, Government conducted inspections/tests, environmental permit approvals by State regulators, utility outages, and delivery of Government Furnished Material/Equipment.

1.10.1.5.4 Construction Quality Management (CQM) Activities

The Preparatory and Initial Phase meetings for each Definable Feature of Work identified in the Contractor's Quality Control Plan must be included in the Three-Week Look Ahead Schedule. Preparatory and Initial phase meetings are not required in the NAS, but can be represented by a start milestone linked to successor parent Construction Activity. The Follow-up Phase must be represented by the Construction Activities themselves in the NAS.

1.10.1.5.5 Construction Activities

On-site construction activities that are the responsibility of the Contractor or Contractor's subcontractors must not have a duration in excess of 20 working days without prior approval by the Contracting Officer. Contractor activities must be driven by calendars that reflect Saturdays, Sundays and all Federal Holidays as non-work days, unless otherwise defined in this contract. Federal Holidays are as defined in 5 USC 6103.

1.10.1.5.6 Turnover and Closeout Activities

Include activities or milestones for items on the NAVFAC Red Zone Checklist/POAM that are applicable to this project. As a minimum, include required Contractor testing, required Government acceptance inspections on equipment, Pre-Final Inspection, Punch List Completion, Final Inspection and Acceptance. Add an unconstrained start milestone for the initial NAVFAC Red Zone - Facility Turnover Planning Meeting at approximately 75 percent construction contract completion or six months prior to Contract Completion Date (CCD), whichever is sooner. Include a separate NAVFAC Red Zone - Facility Turnover Planning Meeting Milestone for each phase if the contract requires construction to be completed in phases.

1.10.1.6 Contract Milestones and Constraints

1.10.1.6.1 Project Start Date Milestones

Include as the first activity on the schedule a start milestone titled, "Contract Award", which must have a Mandatory Start constraint equal to the Contract Award Date.

1.10.1.6.1.1 Post-Award Kickoff (PAK) meeting Milestone

Include an unconstrained finish milestone on the schedule titled, "Post-Award Kickoff Meeting". The Post Award Kickoff Meeting may be a single day, or it may range over several days. The intent is to cover all PAK topics, including Partnering and Concept Design Workshop (if required) in one continuous session.

1.10.1.6.2 Pre-Construction Meeting Milestone

Include an unconstrained finish milestone on the schedule titled, "Pre-Construction Meeting". The Pre-Construction meeting may be a single day, or it may range over several days. The intent to cover all the Pre-Con topics, including Partnering and DD1354.

1.10.1.6.3 Preconstruction Submittals Finish Milestone

Include an unconstrained finish milestone on the schedule titled, "Preconstruction Submittals". This milestone is complete when all required preconstruction submittals have been reviewed and approved by the Government.

1.10.1.6.4 Contractor Mobilization Finish Milestone

Include an unconstrained finish milestone on the schedule titled, "Contractor Mobilization".

1.10.1.6.5 NAVFAC Red Zone - Facility Turnover Planning Meeting Milestones

See paragraph TURNOVER AND CLOSEOUT ACTIVITIES above.

1.10.1.6.6 Substantial Completion Milestone

Include an unconstrained finish milestone on the schedule titled "Substantial Completion." Substantial Completion is defined as the point in time the Government would consider the project ready for beneficial occupancy wherein by mutual agreement of the Government and Contractor, Government use of the facility is allowed while construction access continues in order to complete remaining items (e.g., punch list and other close out submittals). Include a separate Substantial Completion Milestone for each phase if the contract requires construction to be completed in phases.

1.10.1.6.7 DD-1354 Finish Milestone

Add unconstrained finish milestone, titled "DD-1354" and scheduled 30 calendar days prior to Substantial Completion, whenever a Form DD-1354 is required in accordance with Section 01 20 00 PRICE AND PAYMENT PROCEDURES. Include a separate DD-1354 Finish Milestone for each phase if the contract requires construction to be completed in phases.

1.10.1.6.8 Projected Completion Milestone

Include an unconstrained finish milestone on the schedule titled "Projected Completion." Projected Completion is defined as the point in time all contract requirements are complete and verified by the Government with a successful Final Inspection in accordance with Section 01 45 00 QUALITY CONTROL. This milestone must have the Contract Completion Date (CCD) milestone as its only successor.

1.10.1.6.9 Contract Completion Date (CCD) Milestone

Last schedule entry must be an unconstrained finish milestone titled "Contract Completion (CCD: DD-MM-YY)." DD-MM-YYYY is the current contract completion date at data date, day-month-year corresponding to P6 Must Finish By Date. NAS milestone updates of Project Completion finish date for longest path must reflect calculated float as positive or negative

based on CCD. Calculation of schedule updates must be such that if the finish of the "Projected Completion" milestone falls after the contract completion date, then negative float is calculated on the longest path. If the finish of the "Projected Completion" milestone falls before the contract completion date, the float calculation must reflect positive float on the longest path.

1.10.1.6.10 Additional Milestones

Provide up to 5 additional milestones as required by Contracting Officer.

1.10.1.7 Work Breakdown Structure & Activity Code

At a minimum, establish a Work Breakdown Structure (WBS) and provide activity codes identified as follows:

1.10.1.7.1 Work Breakdown Structure (WBS)

Group all activities and milestones within appropriate WBS elements/levels including, at a minimum, the following:

a. Project Milestones:

(1) Management Milestones

(2) Project Administrative Meetings

(3) Permits

b. Pre-Construction Phase:

(1) Submittals and Reviews

(2) Procurement

(3) Mobilization

c. Construction Phase: Create multiple elements/levels in accordance with project specific definable features of work including in WBS descending order as follows:

(1) General Area

(a) Type of Work Item

1. Location

d. Project Closeout: Include activity items such as, but not limited to, Punchlist, Demobilization, O&M, As-built Drawings, Training, and As-built NAS.

e. Modifications: Create Conformed and Non-Conformed elements/levels under Modification WBS. Create multiple elements/levels as the project progresses identified by issue and Fragnet placed in Conformed for modifications issued prior data date, or Non-Conformed for issues not modified to contract prior data date.

f. Removed Activity: Activity is "removed" by remaining within logic sequence, eliminating duration and adding "(NO LONGER REQUIRED)" after

Activity Name in Activity Table.

1.10.1.7.2 Responsibility Code

Use "RESP" for Activity Code Name. All activities in the project schedule must be identified with the resource for completing the task. Activities must not belong to more than one responsible party.

1.10.1.7.3 Activity Category Code

Use "CAT" for Activity Code Name for the following Project Level activity codes:

a. Assign "PROC" value to Procurement type activity

b. Assign "PRE-CON" value to Pre-construction activity

c. Assign "CONS" value to Construction type activity

d. Assign "TEST" value to dedicated testing type activities

e. Assign "CX" value to dedicated Commissioning type activities

f. Assign "CLOS" value to dedicated Close Out type activity

g. Assign "OTHR" to other activity not otherwise designated

1.10.1.7.4 Drawing Code

Identify all activities in the project schedule with its respective Drawing Code. The Drawing Code is the Sheet Number on the primary project drawing which indicates work to be performed. If an activity does not have an applicable Drawing Code (e.g., Mobilize), the code must be "0000".

1.10.1.7.5 Additional Activity Codes

Provide up to an additional five activity codes as required by the Contracting Officer

1.10.1.8 Adverse Weather Lost Work Days

Use the National Oceanic and Atmospheric Administration's (NOAA) Summary of Monthly Normals report to obtain the historical average number of days each month with precipitation, using a nominal 30-year, greater than 0.10 inch precipitation amount parameter, as indicated on the Station Report for the NOAA location closest to the project site as the basis for establishing a "Weather Calendar" showing the number of anticipated non-workdays for each month due to adverse weather, in addition to Saturdays, Sundays and all Federal Holidays as non-work days.

Assign the Weather Calendar to any activity that could be impacted by adverse weather. The Contracting Officer will issue a modification in accordance with the contract clauses, giving the Contractor a time only extension for the difference of days between the anticipated and actual adverse weather delay if the number of actual adverse weather delay days exceeds the number of days anticipated for the month in which the delay occurs and the adverse weather delayed activities are on the longest path to contract completion in the period when delay occurred. A lost workday due to weather conditions is defined as a day in which the Contractor

cannot work at least 50 percent of the day on the impacted activity. Impacts resulting from adverse weather must be documented in Narrative Report for the month that it occurred.

Make changes to P6 project calendars to reflect as-built conditions where work occurred where originally anticipated as non-work days, and where work did not occur (lost work day).

1.10.1.9 Anticipated Restricted Delays

Unless otherwise noted or defined in Section 01 14 00 WORK RESTRICTIONS, allow in the schedule one lost workday for every two months of project duration for instances where base access is not permitted or where work areas are temporarily not accessible for security reasons which causes a delay in the work. Use Anticipated Restricted Delays as basis for establishing a "Security Calendar" showing the number of anticipated non-workdays for each month due to anticipated restrictions, in addition to anticipated adverse weather, Saturdays, Sundays and all Federal Holidays as non-work days. Assign the Security Calendar to any activity that could be impacted by restriction delays. The Contracting Officer will issue a modification in accordance with the contract clauses, giving the Contractor a time extension for the difference of days between the anticipated and actual lost work days if the number of actual restriction delay days exceeds the number of anticipated for the month in which the delay occurs and the restriction delayed activities are critical to contract completion. A lost workday due to restriction delay is defined as a day in which the Contractor cannot work at least 50 percent of the day on the impacted activity.

Impacts resulting from restriction delays must be documented in Narrative Report for the month that it occurred.

Make changes to P6 project calendars to reflect as-built conditions where work occurred where originally anticipated as non-work days, and where work did not occur (lost work day).

1.10.1.10 Cost Loading

The Project Network Analysis Schedule (NAS) must be cost-loaded and will provide the basis for progress payments. Earned Value Reports must be derived from and correspond to cost loaded NAS. Use the Critical Path Method (CPM) and the Precedence Diagram Method (PDM) to satisfy time and cost applications.

Sum of all costs assigned to activities must equal the current contract value as of the data date of the baseline or update schedule.

1.10.1.10.1 Cost Loading Activities

Assign material and equipment costs, including their quantities, for which payment will be requested in advance of installation, to their respective procurement activity only for those material and equipment costs pre-approved by the Government. Assign labor costs, including their quantities, for material and equipment paid for after installation to their respective construction activities. Include all typical mobilization costs dispersed over early construction activities. Costs for mobilization will not be paid as individual pay items with the exception of batch plant set-up, mobilization of dredging equipment or other similar labor-intensive situations. Disperse submittal costs for

activities referenced in paragraph PRE-CONSTRUCTION ACTIVITIES over all construction activities. The value of commissioning, testing and closeout WBS section may not be less than 10 percent of the total costs for procurement and construction activities. ALL activities assigned Government responsibility will have Zero Cost. No contractor cost should be assigned to an activity designated as a Government responsibility. Do not include field overhead positions as individual pay items. Evenly disperse overhead costs and profit to each activity over the duration of the actual construction activities assigned to the Construction Phase WBS level.

1.10.1.10.2 Partial Payment

Breakdown unit of measure and cost must be defined within P6 Activity Detail Expenses for partial payment of any cost loaded activity. Lump sum cost loaded activity will not be partially paid.

1.10.2 Schedule Software Settings and Restrictions

a. Activity Constraints: Date/time constraint(s), other than those required by the contract, are not allowed unless accepted by the Contracting Officer. Identify any constraints proposed and provide an explanation for the purpose of the constraint in the Narrative Report as described in paragraph REQUIRED TABULAR REPORTS.

b. Default Progress Data Disallowed: Actual Start is date work begins on activity with intent to pursue work to substantial completion. Actual Finish is date work is substantially complete to point where successor activity can begin. Actual dates on the CPM schedule must correspond with activity dates reported on the Contractor Quality Control and Production Reports.

c. At a minimum, include the following settings and parameters in P6 Schedule preparation:

(1) General: Define or establish Calendars and Activity Codes at the "Project" level, not the "Global" level.

(2) Admin Drop-Down Menu, Admin Preferences, Time Periods Tab:

(a) Set time periods for P6 to 8.0 Hours/Day, 40.0 Hours/Week, 172.0 Hours/Month and 2000.0 Hours/Year.

(b) Use assigned calendar to specify the number of work hours for each time period: Must be checked.

(3) Admin Drop-Down Menu, Admin Preferences, Earned Value Tab:

(a) Technique for computing performance percent complete: Use "Activity percent Complete"

(b) Technique for computing Estimate to Complete: Use "PF = 1".

(c) Earned Value Calculation: Use "Budgeted values with current dates".

(4) Project Level, Dates Tab:

(a) Set "Must Finish By" date to "Contract Completion Date", and

set "Must Finish By" time to 05:00pm.

(5) Project Level, Defaults Tab:

(a) Duration Type: Set to "Fixed Duration & Units".

(b) Percent Complete Type: Set to "Physical".

(c) Activity Type: Set to "Task Dependent".

(d) Calendar: Set to "Standard 5 Day Workweek". Calendar must reflect Saturday, Sunday and all Federal holidays as non-work days. Alternative calendars may be used with Contracting Officer approval.

(6) Project Level, Calculations Tab:

(a) Default Price/Unit for activities without resource or role Price/Units: Set to "$1/h".

(b) Activity percent complete based on activity steps: Must be Checked.

(c) Link Budget and At Completion for not started activities: Must be Checked.

(d) Reset Remaining Duration and Units to Original: Must be Selected.

(e) Subtract Actual from At Completion: Must be Selected.

(f) Recalculate Actual units and Cost when duration percent complete changes: Must be Checked.

(g) Update units when costs change on resource assignments: Must be Unchecked.

(h) Link Actual to Date and Actual This Period Units and Cost: Must be Checked.

(7) Project Level, Settings Tab:

(a) Define Critical Activities: Check "Longest Path".

(8) Work Breakdown Structure Level, Earned Value Tab:

(a) Technique for Computing Performance Percent Complete: "Activity percent complete" is selected.

(b) Technique for Computing Estimate to Complete (ETC): "PF = 1" is selected.

1.10.3 Required Tabular Reports and Native P6 XER Files

Include the following reports with the Baseline, Monthly Update and any other required schedule submittals:

a. Time Scaled Logic Schedule

Provide formatted 11 by 17-inch Time-scaled Logic Schedule in color and landscape-oriented with each schedule submittal. Clearly show activities on the longest path setting Gantt chart longest path activity bars to red. Group activities by WBS and sort by finish date in ascending order. Include the following information in column form for each activity and include accompanying Gantt chart:

(1) Activity ID

(2) Activity Name

(3) Original Duration

(4) Remaining duration

(5) Physical Percent Complete

(6) Start Date

(7) Finish Date

(8) Total Float

(9) Project-level Calendar

b. Previous Monthly Update Comparison Time Scaled Logic Schedule (Submit with all Monthly Update Schedule Submittals.)

Provide formatted 11 by 17-inch Time-scaled Logic Schedule in color and landscape-oriented with each monthly update schedule submittal. Clearly show activities on the current month longest path setting Gantt chart longest path activities bars to red. Show previous month activities as yellow bars and previous month milestones in yellow within Gantt chart. Sort by finish date in ascending order. Filter activities for longest path. Maintain and assign the accepted previous month update or the accepted baseline schedule for the first update submittal as the baseline and primary baseline in P6 before printing the schedule. Include the following information in column form for each activity and include accompanying Gantt chart:

(1) Activity ID

(2) Activity Name

(3) Original Duration

(4) Current Month Remaining Duration

(5) Current Month Start Date

(6) Previous Month Update Start Date (BL Project Start)

(7) Start Date Delta between Current Month and Previous Month (Variance - BL Project Start Date)

(8) Current Month Finish Date

(9) Previous Month Finish Date (BL Project Finish)

(10) Finish Date Delta between Current Month and Previous Month (Variance - BL Project Start Date)

(11) Current Month Total Float

c. P6 native XER file: Include the back-up native .xer program file compatible with the current Government version of Primavera P6. Each native schedule file must have a unique file name to include project name and data date using (yyyy-mm-dd) convention. Each native schedule must have a unique Project ID and Project Name.

d. Log Report: P6 Scheduling/Leveling Report.

e. Narrative Report: Identify and justify:

(1) Provide Project Summary Data in format below:

(a) Data Date _____

(b) Award Date: _____

(c) Original Project Duration: _____ days post Award Date

(d) Current Project Duration: _____ days post Award Date

(e) Time percent elapsed: _____ percent at data date

(f) Original CCD: _____

(g) Current CCD: _____ (thru MOD _____)

(h) Anticipated CCD: _____ (___ calendar days early/late)

(i) Original Contract Value: $_____

(j) Current Contract Value: $_____

(k) Invoiced Amount: $_____ (____ percent)

(l) Cost Growth: ____ percent

(m) Schedule Growth: ____ percent

(n) There are a total of _____ activities, _____ activities complete (____ percent), ____ activities in progress (____ percent), _____ activities not started (____ percent). Of the in progress and not started activities; ____ (____ percent) are on the longest path. The longest path has duration of _____ calendar days from data-date to anticipated project completion.

(2) Progress made in each area of the project;

(3) Longest Path;

(4) Date/time constraint(s), other than those required by the contract

(5) Listing of all changes made between the previous schedule and current updated schedule include: added or deleted activities, original and remaining durations for activities that have not

started, logic (sequence constraint lag/lead), milestones, planned sequence of operations, longest path, calendars or calendar assignments, and cost loading;

(6) Any decrease in previously reported activity Earned Amount;

(7) Pending items and status thereof, including permits, changes orders, and time extensions;

(8) Status of Contract Completion Date and interim milestones;

(9) Status of Projected Completion Milestone and account of difference in calendar days between previous update Projected Completion Milestone

(10) Current and anticipated delays listing Activity Names and IDs for impacted activities(describe cause of delay and corrective actions(s) and mitigation measures to minimize);

(11) Description of current and potential future schedule problem areas.

(12) Identification of any weather and restricted lost time as compared to anticipated weather for the month and anticipated restricted days for which the update is submitted. Impacts resulting from adverse weather must be documented in tabular form showing the calendar month (or billing period) with the days on which construction activity incurred Lost Work Days due to adverse weather. In narrative form, describe the adverse weather cause such as precipitation measurement, temperature, wind or other influencing factors, and why work was impacted. Describe the construction activity(s) that was (were) scheduled, impacted.

Each entry in the narrative report must cite the respective Activity ID and Activity Name, the date and reason for the change, and description of the change.

f. Earned Value Report: Derive from and correspond to P6 cost loaded schedule. List all activities having a budget amount cost loaded. Compile total earnings on the project from notice to proceed to current progress payment request. Show current budget, previous physical percent complete, to-date physical percent complete, previous earned value, to-date earned value, cost this period and cost to complete on the report for each activity.

g. Schedule Variance Control (SVC) Diagram: With each schedule submission, provide a SVC diagram showing 1) A Cash Flow Curve indicating planned project cost based on each of projected early and projected late activity finish dates and 2) one curve for Earned Value to-date. Revise Cash Flow Curves when the contract is modified, or as directed by the Contracting Officer Include a legend on report clearly indication 3 curves: early finish, late finish, and earned-value to date.

Use the following settings in Activity Usage Profile Options:

(1) In the Data section, under Display, the radio box for Cost must be selected.

(2) In the Data section, under Filter for Bars/Graphs, the checkbox for Total must be checked.

(3) In the Show Bars/Curves section:

(a) Under the By Date column, the checkboxes for Baseline, Actual and Remaining Late must be checked. The checkboxes for Budgeted and Remaining Early must be unchecked.

(b) Under the Cumulative column, the checkboxes for Baseline, Actual and Remaining Late must be checked. The checkboxes for Budgeted and Remaining Early must be unchecked.

(c) Set the color for Baseline to green.

(d) Set the color for Actual to blue.

(e) Set the color for Remaining Late to red.

(4) In the Show Earned Value Curves section, the checkboxes for Planned Value Cost, Earned Value Cost and Estimate at Completion must be unchecked.

h. Logic Diagram showing timescale from data date to 60 days after data date with filter for longest path. Leave Group By selection blank and sort by finish date in ascending order.

i. Baseline or Monthly Update Checklist as applicable completed and certified by Qualified Scheduler. Baseline Project Schedule and Monthly Update Schedule Checklists can be found on the Whole Building Design Guide website at https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-01-32-17-00-20

j. Screen shot PDF of Primavera P6 Time Periods Settings referenced in paragraph SCHEDULE SOFTWARE SETTINGS AND RESTRICTIONS, list item c.(2): ADMIN DROP-DOWN MENU, ADMIN PREFERENCES, TIME PERIODS TAB

k. Screen shot PDF of Primavera P6 Earned Value Settings referenced in paragraph SCHEDULE SOFTWARE SETTINGS AND RESTRICTIONS, list item c.(3): ADMIN DROP-DOWN MENU, ADMIN PREFERENCES, EARNED VALUE TAB

l. Daily Reported Production Activity: Submit on a monthly basis, in electronic spreadsheet (format provided by the Government), summary of daily reported production activity for the reporting month in the update schedule. Use the following columns for reporting:

(1) Date

(2) Activity ID

(3) Work Description

(4) Contractor

(5) Billable Hours

m. HVAC/COMMISSIONING Checklist. See Section 23 09 00 INSTRUMENTATION

AND CONTROL FOR HVAC for checklist requirements. Complete checklist listing all items with baseline submittal. Complete checklist as required to complete project, submitting complete checklist in intermediately following monthly update submittal.

1.11 CONTRACT MODIFICATION

1.11.1 Time Impact Analysis (TIA)

Submit a Time Impact Analysis with each cost and time proposal for a proposed change. TIA must illustrate the influence of each change or delay on the Contract Completion Date or milestones. No time extensions will be granted nor delay damages paid unless a delay occurs which consumes all available Project Float, impacts the longest path, and extends the Projected Completion beyond the Contract Completion Date.

a. Each TIA must be in both narrative and schedule form. The narrative must:

   1. Define the scope and conditions of the change;

   2. Provide start and finish dates of impact;

   3. Successor(s) and predecessor(s) activities to impact period;

   4. Responsible party;

   5. Describe how the impact originated;

   6. How it impacts the schedule's longest path.

b. The schedule submission must consist of three native XER files:

   (1) Fragnet used to define the scope of the changed condition

   (2) Most recent accepted schedule update as of the time of the impact start date. Update this schedule to show all activity progress as of the time of the impact start date. The impact start date is identified as the time when an existing activity is impeded for either starting or finishing.

   (3) The impacted schedule that has the Fragnet inserted in the updated schedule and the schedule "run" so that the new completion date is determined.

c. For claimed as-built project delay, the inserted Fragnet TIA method must be modified to account for as-built events known to occur after the data date of schedule update used. Updated schedules for periods following the impact start date will be used to evaluate how the project progressed (as-built) through the finish of impact. Impact to longest path must be determined for each following update period.

d. All TIAs must include any mitigation, and must determine the apportionment of the overall delay assignable to each individual delay. Apportionment must provide identification of delay type and classification of delay by compensable and non-compensable events. The associated narrative must clearly describe analysis methodology used, and the findings in a chronological listing beginning with the earliest delay event.

(1) Identify and classify types of delay defined as follows:

(a) Force majeure delay (e.g., weather delay): Any delay event caused by something or someone other than the Government or the Contractor, or the risk of which has not been assigned solely to the Government or the Contractor. If the force majeure delay is on the longest path, in absence of other types of concurrent delays, the Contractor is granted an extension of contract time, classified as a non-compensable event.

(b) A Contractor-delay: Any delay event caused by the Contractor, or the risk of which has been assigned solely to the Contractor. If the contractor-delay is on the longest path, in absence of other types of concurrent delays, Contractor is not granted extension of contract time, and classified as a non-compensable event. Where absent other types of delays, and having impact to project completion, Contractor must provide to Contracting Officer a Corrective Action Plan identifying plan to mitigate delay.

(c) A Government-delay: Any delay event caused by the Government, or the risk of which has been assigned solely to the Government. If the Government-delay is on the longest path, in absence of other types of concurrent delays, the Contractor is granted an extension of contract time, and classified as a compensable event.

(2) Functional concurrency must be used to analyze concurrent delays, where: separate delay issues delay project completion, do not necessarily occur at same time, rather occur within same monthly schedule update period at minimum, or within same as-built period under review. If a combination of functionally concurrent delay types occurs, it is considered Concurrent Delay, which is defined in the following combinations:

(a) Government-delay concurrent with contractor-delay: excusable time extension, classified non-compensable event.

(b) Government-delay concurrent with force majeure delay: excusable time extension, classified non-compensable event.

(c) Contractor-delay concurrent with force majeure delay: excusable time extension, classified non-compensable event.

(3) Pacing delay reacting to another delay (parent delay) equally or more critical than paced activity must be identified prior to pacing. Contracting Officer will notify Contractor prior to pacing. Contractor must notify Contracting Officer prior to pacing. Notification must include identification of parent delay issue, estimated parent delay time period, paced activity(s) identity, and pacing reason(s). Pacing Concurrency is defined as follows:

(a) Government-delay concurrent with contractor-pacing: excusable time extension, classified compensable event.

(b) Contractor-delay concurrent with Government-pacing: inexcusable time extension, classified non-compensable event

e. Submit electronic file containing the narrative and the source

schedule files used in the time impact analysis.

1.12 PROJECT FLOAT

Project Float is the length of time between the Contractor's Projected Completion Milestone and the Contract Completion Date. Project Float available in the schedule will not be for the exclusive use of either the Government or the Contractor.

The use of Resource Leveling is prohibited. Techniques used for the purpose of artificially adjusting activity durations to consume float and influence longest path are prohibited.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 01 33 00

SUBMITTAL PROCEDURES
08/18, CHG 4: 02/21

PART 1 GENERAL

1.1 SUMMARY

1.1.1 Submittal Information (SD)

Submittal requirements are specified in the technical sections. Examples and descriptions of submittals identified by the Submittal Description (SD) numbers and titles follow:

SD-01 Preconstruction Submittals

Government approved Division 01 preconstruction submittals that are required prior to or commencing with the start of work must be submitted within 30 calendar days of contract award unless specified elsewhere in the specifications. Contractor approved Division 01 submittals that are required prior to or commencing with the start of work must be submitted within 45 calendar days of contract award unless specified elsewhere in the specifications.

Preconstruction Submittals include schedules and a tabular list of locations, features, and other pertinent information regarding products, materials, equipment, or components to be used in the work.

Certificates Of Insurance

Surety Bonds

List Of Proposed Subcontractors

List Of Proposed Products

Construction progress schedule

Network Analysis Schedule (NAS)

Submittal Register

Schedule Of Prices Or Earned Value Report

Health and safety plan

Work Plan

Quality Control (QC) plan

Environmental Protection Plan

SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.

Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.

Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data

Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials, systems or equipment for some portion of the work.

Samples of warranty language when the contract requires extended product warranties.

SD-04 Samples

Fabricated or unfabricated physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.

Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.

Field samples and mock-ups constructed on the project site establish standards ensuring work can be judged. Includes assemblies or portions of assemblies that are to be incorporated into the project and those that will be removed at conclusion of the work.

SD-05 Design Data

Design calculations, mix designs, analyses or other data pertaining to a part of work.

SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. Unless specified in another section, testing must have been within three years of date of contract award for the project.

Report that includes findings of a test required to be performed on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report that includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Investigation reports

Daily logs and checklists

Final acceptance test and operational test procedure

SD-07 Certificates

Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that the product, system, or material meets specification requirements. Must be dated after award of project contract and clearly name the project.

Document required of Contractor, or of a manufacturer, supplier, installer or Subcontractor through Contractor. The document purpose is to further promote the orderly progression of a portion of the work by documenting procedures, acceptability of methods, or personnel qualifications.

Confined space entry permits

Text of posted operating instructions

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and (SDS)concerning impedances, hazards and safety precautions.

SD-09 Manufacturer's Field Reports

Documentation of the testing and verification actions taken by manufacturer's representative at the job site, in the vicinity of the job site, or on a sample taken from the job site, on a portion of the work, during or after installation, to confirm compliance with manufacturer's standards or instructions. The documentation must be signed by an authorized official of a testing laboratory or agency and state the test results; and indicate whether the material, product, or system has passed or failed the test.

Factory test reports.

SD-10 Operation and Maintenance Data

Data provided by the manufacturer, or the system provider, including manufacturer's help and product line documentation, necessary to maintain and install equipment, for operating and maintenance use by facility personnel.

Data required by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

Data incorporated in an operations and maintenance manual or control system.

SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

Submittals required for Guiding Principle Validation (GPV) or Third Party Certification (TPC).

Special requirements necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

1.1.2 Approving Authority

Office or designated person authorized to approve the submittal.

1.1.3 Work

As used in this section, on-site and off-site construction required by contract documents, including labor necessary to produce submittals, construction, materials, products, equipment, and systems incorporated or to be incorporated in such construction. In exception, excludes work to produce SD-01 submittals.

1.1.4 Or Approved Equal References

The Government no longer allows approved equal references. General Material and finish colors (only) are provided as Basis of Design to be utilized as represented in the Contract Documents or matched to similar colors-pending Government approval. There are items in this contract that have received Justification and Approval (J&A) for other than full and open competition. These are provided in the front end of this spec.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Submittal Register; G

1.3 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.3.1 Government Approved (G)

Within the terms of the Contract Clause SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION, submittals are considered to be "shop drawings."

1.3.2 For Information Only

Submittals not requiring Government approval will be for information only. Within the terms of the Contract Clause SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION, they are not considered to be "shop drawings."

1.3.3 Sustainability Reporting Submittals (S)

Submittals for Guiding Principle Validation (GPV) or Third Party Certification (TPC) are indicated with an "S" designation. These submittals are for information only and for use as specified in Section

01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING.

Schedule submittals for these items throughout the course of construction as provided; do not wait until closeout.

1.4 PREPARATION

1.4.1 Transmittal Form

Transmit each submittal, except sample installations and sample panels to the office of the approving authority using the transmittal form prescribed by the Contracting Officer. Include all information prescribed by the transmittal form and required in paragraph IDENTIFYING SUBMITTALS. Use the submittal transmittal forms to record actions regarding samples.

Use the AF IMT 3000 transmittal form for submitting both Government-approved and information-only submittals. Submit in accordance with the instructions on the reverse side of the form. These forms or similar forms will be furnished to the Contractor. Properly complete this form by filling out all the heading blank spaces and identifying each item submitted. Exercise special care to ensure proper listing of the specification paragraph and sheet number of the contract drawings pertinent to the data submitted for each item.

1.4.2 Submittal Format

1.4.2.1 Format of SD-01 Preconstruction Submittals

When the submittal includes a document that is to be used in the project, or is to become part of the project record, other than as a submittal, do not apply the Contractor's approval stamp to the document itself, but to a separate sheet accompanying the document.

Provide data in the unit of measure used in the contract documents.

1.4.2.2 Format for SD-02 Shop Drawings

Provide shop drawings not less than 8 1/2 by 11 inches nor more than 30 by 42 inches, except for full-size patterns or templates. Prepare drawings to accurate size, with scale indicated, unless another form is required. Ensure drawings are suitable for reproduction and of a quality to produce clear, distinct lines and letters, with dark lines on a white background.

a. Include the nameplate data, size, and capacity on drawings. Also include applicable federal, military, industry, and technical society publication references.

b. Dimension drawings, except diagrams and schematic drawings. Prepare drawings demonstrating interface with other trades to scale. Use the same unit of measure for shop drawings as indicated on the contract drawings. Identify materials and products for work shown.

Present shop drawings sized 8 1/2 by 11 inches as part of the bound volume for submittals. Present larger drawings in sets. Submit an electronic copy of drawings in PDF format and native electronic format.

1.4.2.2.1 Drawing Identification

Include on each drawing the drawing title, number, date, and revision

numbers and dates, in addition to information required in paragraph IDENTIFYING SUBMITTALS.

Number drawings in a logical sequence. Each drawing is to bear the number of the submittal in a uniform location next to the title block. Place the Government contract number in the margin, immediately below the title block, for each drawing.

Reserve a blank space, no smaller than the size recommended by the project on the right-hand side of each sheet for the Government disposition stamp.

1.4.2.3 Format of SD-03 Product Data

Present product data submittals for each section as a complete, bound volume. Include a table of contents, listing the page and catalog item numbers for product data.

Indicate, by prominent notation, each product that is being submitted; indicate the specification section number and paragraph number to which it pertains.

1.4.2.3.1 Product Information

Supplement product data with material prepared for the project to satisfy the submittal requirements where product data does not exist. Identify this material as developed specifically for the project, with information and format as required for submission of SD-07 Certificates.

Provide product data in units used in the Contract documents. Where product data are included in preprinted catalogs with another unit, submit the dimensions in contract document units, on a separate sheet.

1.4.2.3.2 Standards

Where equipment or materials are specified to conform to industry or technical-society reference standards of such organizations as the American National Standards Institute (ANSI), ASTM International (ASTM), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), or Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. State on the certificate that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

1.4.2.3.3 Data Submission

Collect required data submittals for each specific material, product, unit of work, or system into a single submittal that is marked for choices, options, and portions applicable to the submittal. Mark each copy of the product data identically. Partial submittals will not be accepted for expedition of the construction effort.

Submit the manufacturer's instructions before installation.

1.4.2.4 Format of SD-04 Samples

1.4.2.4.1 Sample Characteristics

Furnish samples in the following sizes, unless otherwise specified or unless the manufacturer has prepackaged samples of approximately the same size as specified:

a. Sample of Equipment or Device: Full size.

b. Sample of Materials Less Than 2 by 3 inches: Built up to 8 1/2 by 11 inches.

c. Sample of Materials Exceeding 8 1/2 by 11 inches: Cut down to 8 1/2 by 11 inches and adequate to indicate color, texture, and material variations.

d. Sample of Linear Devices or Materials: 10 inch length or length to be supplied, if less than 10 inches. Examples of linear devices or materials are conduit and handrails.

e. Sample Volume of Nonsolid Materials: Pint. Examples of nonsolid materials are sand and paint.

f. Color Selection Samples: 2 by 4 inches. Where samples are specified for selection of color, finish, pattern, or texture, submit the full set of available choices for the material or product specified. Sizes and quantities of samples are to represent their respective standard unit.

g. Sample Panel: 4 by 4 feet.

h. Sample Installation: 100 square feet.

1.4.2.4.2 Sample Incorporation

Reusable Samples: Incorporate returned samples into work only if so specified or indicated. Incorporated samples are to be in undamaged condition at the time of use.

Recording of Sample Installation: Note and preserve the notation of any area constituting a sample installation, but remove the notation at the final clean-up of the project.

1.4.2.4.3 Comparison Sample

Samples Showing Range of Variation: Where variations in color, finish, pattern, or texture are unavoidable due to nature of the materials, submit sets of samples of not less than three units showing extremes and middle of range. Mark each unit to describe its relation to the range of the variation.

When color, texture, or pattern is specified by naming a particular manufacturer and style, include one sample of that manufacturer and style, for comparison.

1.4.2.5 Format of SD-05 Design Data

Provide design data and certificates on 8 1/2 by 11 inch paper.

1.4.2.6 Format of SD-06 Test Reports

By prominent notation, indicate each report in the submittal. Indicate the specification number and paragraph number to which each report pertains.

1.4.2.7 Format of SD-07 Certificates

Provide design data and certificates on 8 1/2 by 11 inch paper.

1.4.2.8 Format of SD-08 Manufacturer's Instructions

Present manufacturer's instructions submittals for each section. Include the manufacturer's name, trade name, place of manufacture, and catalog model or number on product data. Also include applicable federal, military, industry, and technical-society publication references. If supplemental information is needed to clarify the manufacturer's data, submit it as specified for SD-07 Certificates.

Submit the manufacturer's instructions before installation.

1.4.2.8.1 Standards

Where equipment or materials are specified to conform to industry or technical-society reference standards of such organizations as the American National Standards Institute (ANSI), ASTM International (ASTM), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratories (UL), or Association of Edison Illuminating Companies (AEIC), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Contracting Officer. State on the certificate that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

1.4.2.9 Format of SD-09 Manufacturer's Field Reports

By prominent notation, indicate each report in the submittal. Indicate the specification number and paragraph number to which each report pertains.

1.4.2.10 Format of SD-10 Operation and Maintenance Data (O&M)

Comply with the requirements specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA for O&M Data format.

1.4.2.11 Format of SD-11 Closeout Submittals

When the submittal includes a document that is to be used in the project or is to become part of the project record, other than as a submittal, do not apply the Contractor's approval stamp to the document itself, but to a separate sheet accompanying the document.

Provide data in the unit of measure used in the contract documents.

1.4.3 Source Drawings for Shop Drawings

1.4.3.1 Source Drawings

The entire set of source drawing files (DWG) will not be provided to the Contractor. Request the specific Drawing Number for the preparation of shop drawings. Only those drawings requested to prepare shop drawings will be provided. These drawings are provided only after award.

1.4.3.2 Terms and Conditions

Data contained on these electronic files must not be used for any purpose other than as a convenience in the preparation of construction data for the referenced project. Any other use or reuse is at the sole risk of the Contractor and without liability or legal exposure to the Government. The Contractor must make no claim, and waives to the fullest extent permitted by law any claim or cause of action of any nature against the Government, its agents, or its subconsultants that may arise out of or in connection with the use of these electronic files. The Contractor must, to the fullest extent permitted by law, indemnify and hold the Government harmless against all damages, liabilities, or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from the use of these electronic files.

These electronic source drawing files are not construction documents. Differences may exist between the source drawing files and the corresponding construction documents. The Government makes no representation regarding the accuracy or completeness of the electronic source drawing files, nor does it make representation to the compatibility of these files with the Contractor hardware or software. The Contractor is responsible for determining if any conflict exists. In the event that a conflict arises between the signed and sealed construction documents prepared by the Government and the furnished source drawing files, the signed and sealed construction documents govern. Use of these source drawing files does not relieve the Contractor of the duty to fully comply with the contract documents, including and without limitation the need to check, confirm and coordinate the work of all contractors for the project. If the Contractor uses, duplicates or modifies these electronic source drawing files for use in producing construction data related to this contract, remove all previous indication of ownership (seals, logos, signatures, initials and dates).

1.4.4 Electronic File Format

Provide submittals in electronic format, with the exception of material samples required for SD-04 Samples items. In addition to the electronic submittal, provide three hard copies of the submittals. Compile the submittal file as a single, complete document, to include the Transmittal Form described within, and also separately attach the native files which were used to create PDF. The attached files should include the original digital files used to create the submittal. Name the electronic submittal file specifically according to its contents, and coordinate the file naming convention with the Contracting Officer. Electronic files must be of sufficient quality that all information is legible. Use PDF as the electronic format, unless otherwise specified or directed by the Contracting Officer. Generate PDF files from original documents with bookmarks so that the text included in the PDF file is searchable and can be copied. If documents are scanned, optical character resolution (OCR) routines are required. Index and bookmark files exceeding 30 pages to

allow efficient navigation of the file. When required, the electronic file must include a valid electronic signature or a scan of a signature.

1.5 QUANTITY OF SUBMITTALS

1.5.1 Number of SD-01 Preconstruction Submittal Copies

Unless otherwise specified, submit three sets of administrative submittals.

1.5.2 Number of SD-04 Samples

a. Submit two samples, or two sets of samples showing the range of variation, of each required item. One approved sample or set of samples will be retained by the approving authority and one will be returned to the Contractor.

b. Submit one sample panel or provide one sample installation where directed. Include components listed in the technical section or as directed.

c. Submit one sample installation, where directed.

d. Submit one sample of nonsolid materials.

1.6 INFORMATION ONLY SUBMITTALS

Submittals without a "G" designation must be certified by the QC manager and submitted to the Contracting Officer for information-only. Provide information-only submittals to the Contracting Officer a minimum of 14 calendar days prior to the Preparatory Meeting for the associated Definable Feature of Work (DFOW). Approval of the Contracting Officer is not required on information only submittals. The Contracting Officer will mark "receipt acknowledged" on submittals for information and will return only the transmittal cover sheet to the Contractor. Normally, submittals for information only will not be returned. However, the Government reserves the right to return unsatisfactory submittals and require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

1.7 PROJECT SUBMITTAL REGISTER

A sample Project Submittal Register showing items of equipment and materials for when submittals are required by the specifications is provided as "Appendix A - Submittal Register."

1.7.1 Submittal Management

Prepare and maintain a submittal register, as the work progresses. Do not change data that is output in columns (c), (d), (e), and (f) as delivered by Government; retain data that is output in columns (a), (g), (h), and (i) as approved. As an attachment, provide a submittal register showing items of equipment and materials for which submittals are required by the specifications. This list may not be all-inclusive and additional

submittals may be required.

Column (c): Lists specification section in which submittal is required.

Column (d): Lists each submittal description (SD Number. and type, e.g., SD-02 Shop Drawings) required in each specification section.

Column (e): Lists one principal paragraph in each specification section where a material or product is specified. This listing is only to facilitate locating submitted requirements. Do not consider entries in column (e) as limiting the project requirements.

Thereafter, the Contractor is to track all submittals by maintaining a complete list, including completion of all data columns and all dates on which submittals are received by and returned by the Government.

1.7.2 Preconstruction Use of Submittal Register

Submit the submittal register. Include the QC plan and the project schedule. Verify that all submittals required for the project are listed and add missing submittals. Coordinate and complete the following fields on the register submitted with the QC plan and the project schedule:

Column (a) Activity Number: Activity number from the project schedule.

Column (g) Contractor Submit Date: Scheduled date for the approving authority to receive submittals.

Column (h) Contractor Approval Date: Date that Contractor needs approval of submittal.

Column (i) Contractor Material: Date that Contractor needs material delivered to Contractor control.

1.7.3 Contractor Use of Submittal Register

Update the following fields with each submittal throughout the contract.

Column (b) Transmittal Number: List of consecutive, Contractor-assigned numbers.

Column (j) Action Code (k): Date of action used to record Contractor's review when forwarding submittals to QC.

Column (l) Date submittal transmitted.

Column (q) Date approval was received.

1.7.4 Approving Authority Use of Submittal Register

Update the following fields:

Column (b) Transmittal Number: List of consecutive, Contractor-assigned numbers.

Column (l) Date submittal was received.

Column (m) through (p) Dates of review actions.

Column (q) Date of return to Contractor.

1.8 VARIATIONS

Variations from contract requirements require Contracting Officer approval pursuant to contract Clause FAR 52.236-21 Specifications and Drawings for Construction, and will be considered where advantageous to the Government.

1.8.1 Considering Variations

Discussion of variations with the Contracting Officer before submission will help ensure that functional and quality requirements are met and minimize rejections and resubmittals. For variations that include design changes or some material or product substitutions, the Government may require an evaluation and analysis by a licensed professional engineer hired by the contractor.

Specifically point out variations from contract requirements in a transmittal letter. Failure to point out variations may cause the Government to require rejection and removal of such work at no additional cost to the Government.

1.8.2 Warranting that Variations are Compatible

When delivering a variation for approval, the Contractor warrants that this contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of work.

1.8.3 Review Schedule Extension

In addition to the normal submittal review period, a period of 14 days will be allowed for the Government to consider submittals with variations.

1.9 SCHEDULING

Schedule and submit concurrently product data and shop drawings covering component items forming a system or items that are interrelated. Submit pertinent certifications at the same time. No delay damages or time extensions will be allowed for time lost in late submittals. Allow an additional 5 days for review and approval of submittals for refrigeration and HVAC control systems.

a. Coordinate scheduling, sequencing, preparing, and processing of submittals with performance of work so that work will not be delayed by submittal processing. The Contractor is responsible for additional time required for Government reviews resulting from required resubmittals. The review period for each resubmittal is the same as for the initial submittal.

b. Submittals required by the contract documents are listed on the submittal register. If a submittal is listed in the submittal register but does not pertain to the contract work, the Contractor is to include the submittal in the register and annotate it "N/A" with a brief explanation. Approval by the Contracting Officer does not relieve the Contractor of supplying submittals required by the

contract documents but that have been omitted from the register or marked "N/A."

c. Resubmit the submittal register and annotate it monthly with actual submission and approval dates. When all items on the register have been fully approved, no further resubmittal is required.

Contracting Officer review will be completed within 10 days after the date of submission.

1.10 GOVERNMENT APPROVING AUTHORITY

When the approving authority is the Contracting Officer, the Government will:

a. Note the date on which the submittal was received.

b. Review submittals for approval within the scheduling period specified and only for conformance with project design concepts and compliance with contract documents.

c. Identify returned submittals with one of the actions defined in paragraph REVIEW NOTATIONS and with comments and markings appropriate for the action indicated.

1.10.1 Review Notations

Submittals will be returned to the Contractor with the following notations:

a. Submittals marked "approved" or "accepted" authorize proceeding with the work covered.

b. Submittals marked "approved as noted" or "approved, except as noted, resubmittal not required," authorize proceeding with the work covered provided that the Contractor takes no exception to the corrections.

c. Submittals marked "not approved," "disapproved," or "revise and resubmit" indicate incomplete submittal or noncompliance with the contract requirements or design concept. Resubmit with appropriate changes. Do not proceed with work for this item until the resubmittal is approved.

d. Submittals marked "not reviewed" indicate that the submittal has been previously reviewed and approved, is not required, does not have evidence of being reviewed and approved by Contractor, or is not complete. A submittal marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Resubmit submittals returned for lack of review by Contractor or for being incomplete, with appropriate action, coordination, or change.

e. Submittals marked "receipt acknowledged" indicate that submittals have been received by the Government. This applies only to "information-only submittals" as previously defined.

1.11 DISAPPROVED SUBMITTALS

Make corrections required by the Contracting Officer. If the Contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications, give

notice to the Contracting Officer as required under the FAR clause titled CHANGES. The Contractor is responsible for the dimensions and design of connection details and the construction of work. Failure to point out variations may cause the Government to require rejection and removal of such work at the Contractor's expense.

If changes are necessary to submittals, make such revisions and resubmit in accordance with the procedures above. No item of work requiring a submittal change is to be accomplished until the changed submittals are approved.

1.12 APPROVED SUBMITTALS

The Contracting Officer's approval of submittals is not to be construed as a complete check, and indicates only that the general method of construction, materials, detailing, and other information are satisfactory.

Approval or acceptance by the Government for a submittal does not relieve the Contractor of the responsibility for meeting the contract requirements or for any error that may exist, because under the Quality Control (QC) requirements of this contract, the Contractor is responsible for ensuring information contained with in each submittal accurately conforms with the requirements of the contract documents.

After submittals have been approved or accepted by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.13 APPROVED SAMPLES

Approval of a sample is only for the characteristics or use named in such approval and is not be construed to change or modify any contract requirements. Before submitting samples, provide assurance that the materials or equipment will be available in quantities required in the project. No change or substitution will be permitted after a sample has been approved.

Match the approved samples for materials and equipment incorporated in the work. If requested, approved samples, including those that may be damaged in testing, will be returned to the Contractor, at its expense, upon completion of the contract. Unapproved samples will also be returned to the Contractor at its expense, if so requested.

Failure of any materials to pass the specified tests will be sufficient cause for refusal to consider, under this contract, any further samples of the same brand or make as that material. The Government reserves the right to disapprove any material or equipment that has previously proved unsatisfactory in service.

Samples of various materials or equipment delivered on the site or in place may be taken by the Contracting Officer for testing. Samples failing to meet contract requirements will automatically void previous approvals. Replace such materials or equipment to meet contract requirements.

1.14 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if

required approvals have not been obtained. No payment for materials incorporated in the work will be made unless all required DOR approvals or required Government approvals have been obtained.

1.15 CERTIFICATION OF SUBMITTAL DATA

Certify the submittal data as follows on AF 3000: "I certify that the above submitted items had been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as otherwise stated."

_____NAME OF CONTRACTOR_____SIGNATURE OF CONTRACTOR

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

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SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
New Jersey Air National Guard Mission Training Center

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY					
							SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		01 14 00	SD-01 Preconstruction Submittals															
			Construction Phasing Plan	1.25.2	G													
			Construction Phasing Plan	1.25.2	G													
			Resume for Contractor's Security	1.25.1	G													
			Manager															
			Contractor's Employee	1.19	G													
			Restriction															
			Contractor Vehicle Access	1.9	G													
			Requirements															
			List Of Contact Personnel	1.4.1.1	G													
			Personnel List	1.37	G													
			Contractor Access Passes	1.8	G													
			Activity Regulations	1.4.1														
		01 30 00	SD-01 Preconstruction Submittals															
			View Location Map	1.4														
			Progress and Completion	1.5														
			Pictures															
			SD-04 Samples															
			Color Boards	1.3	G													
		01 31 23.13 20	SD-01 Preconstruction Submittals															
			List of Contractor's Personnel	1.4.3	G													
		01 32 01.00 10	SD-01 Preconstruction Submittals															
			Project Scheduler Qualifications	1.3	G													
			Preliminary Project Schedule	3.4.1	G													
			Initial Project Schedule	3.4.2	G													
			Periodic Schedule Update	3.6.2	G													

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		01 32 17.00 20	SD-01 Preconstruction Submittals															
			Baseline NAS	1.2.2	G													
			Designated Project Scheduler	1.9	G													
			SD-07 Certificates															
			Weekly Look Ahead Schedule	1.3														
			Monthly Network Analysis	1.4.1	G													
			Updates															
			SD-11 Closeout Submittals															
			As-Built Schedule	1.4.2	G													
		01 33 00	SD-01 Preconstruction Submittals															
			Submittal Register	1.7	G													
		01 33 29	SD-01 Preconstruction Submittals															
			Preliminary High Performance	1.5.3.2	G	S												
			and Sustainable Building Checklist															
			Sustainability Action Plan	1.4.1	G	S												
			Preliminary Sustainability	1.5.3.2	G	S												
			eNotebook															
			SD-06 Test Reports															
			Third Party Certification Design	1.5.3.2														
			Compliance Report															
			SD-11 Closeout Submittals															
			Final High Performance and	1.5.3.2														
			Sustainable Building Checklist															
			Final High Performance and	1.5.3.2														
			Sustainable Building Checklist															
			Final Sustainability eNotebook	1.5.3.2	G													

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		01 33 29	Final Sustainability eNotebook	1.5.3.2	G													
			Third Party Certification	3.2	G													
			Certificate, Assessment, or															
			Validation and Compliance Report															
		01 35 26	SD-01 Preconstruction Submittals															
			Accident Prevention Plan (APP)	1.6	G													
			APP - Construction	1.6.1	G													
			Indoor Air Quality (IAQ)	1.13	G													
			Management Plan															
			Final IAQ Management Plan	1.13	S													
			SD-06 Test Reports															
			Notifications and Reports	1.11														
			Accident Reports	1.5.2.1	G													
			Accident Reports	1.11.2	G													
			LHE Inspection Reports	1.11.3														
			SD-07 Certificates															
			Standard Lift Plan	1.6.3.1	G													
			Critical Lift Plan	1.6.3.2	G													
			Activity Hazard Analysis (AHA)	1.7														
			Confined Space Entry Permit	1.8.1														
			Hot Work Permit	1.8.1														
			Certificate of Compliance	1.11.4														
		01 45 00	SD-01 Preconstruction Submittals															
			Contractor Quality Control (CQC)	1.4.2	G													
			Plan															

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		01 45 00	Indoor Air Quality (IAQ)	1.4.1.2.1	G													
			Management Plan															
			Verification Statement	1.11.3														
			SD-07 Certificates															
			Certificate Of Readiness	1.5.4.1	G													
		01 45 35	SD-01 Preconstruction Submittals															
			SIOR Letter of Acceptance	3.1.1	G													
			Project Manual	3.1.1	G													
			Project Manual	3.1.1	G													
			Written NDT Practices	3.1.1														
			Written NDT Practices	3.1.3														
			SD-06 Test Reports															
			Daily Reports	3.1.1														
			Daily Reports	3.1.3														
			Daily Reports	3.1.3														
			Biweekly Reports	3.1.1														
			Biweekly Reports	3.1.2														
			SD-07 Certificates															
			AISC Certified Steel Fabricator	2.1														
			Steel Truss Plant Quality	2.1														
			Assurance Program															
			Wood Truss Plant Quality	2.1														
			Assurance Program															
			AC472 Accreditation	2.1														
			Steel Joist Institute Membership	2.1														
			Certified Plant	2.1														

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		01 45 35	Certificate of Compliance	2.1														
			Special Inspector of Record	1.5.17	G													
			Special Inspector	1.5	G													
			Qualification Records	3.1.1														
			Qualification Records	3.1.3														
			SD-11 Closeout Submittals															
			Interim Report	3.1.1	G													
			Interim Report	3.1.3	G													
			Comprehensive Final Report	3.1.1	G													
			Comprehensive Final Report	3.1.3	G													
		01 50 00	SD-01 Preconstruction Submittals															
			Construction Site Plan	1.3	G													
			Traffic Control Plan	3.3.1	G													
			Haul Road Plan	2.2.1	G													
			Contractor Computer	1.6.1.4	G													
			Cybersecurity Compliance															
			Statements															
			Contractor Temporary Network	1.6.6	G													
			Cybersecurity Compliance															
			Statements															
			SD-03 Product Data															
			Backflow Preventers	1.4	G	AE												
			SD-06 Test Reports															
			Backflow Preventer Tests	3.4														
			SD-07 Certificates															
			Backflow Tester	1.4.1														

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		01 50 00	Backflow Preventers	1.4														
		01 57 19	SD-01 Preconstruction Submittals															
			Hazardous Materials	1.2.7	G													
			Air Permits	3.5.1	G													
			Preconstruction Survey	1.5.1														
			Regulatory Notifications	1.5.2	G													
			Environmental Manager	1.5.3	G													
			Qualifications															
			Employee Training Records	1.5.4	G													
			Environmental Protection Plan	1.6	G													
			Dirt and Dust Control Plan	1.6.9.1														
			Solid Waste Management Permit	1.9														
			Stormwater Pollution Prevention	3.2.1.1	G													
			Plan															
			Stormwater Notice of Intent	3.2.1.2														
			Spill Prevention Control And	3.10.2														
			Countermeasure (SPCC) Plan															
			SD-06 Test Reports															
			Monthly Solid Waste Disposal	1.9.1	G													
			Report															
			Inspection Reports	3.2.1.3														
			SD-07 Certificates															
			Employee Training Records	1.5.4	G													
			Erosion and Sediment Control	1.5.4														
			Inspector															
			SD-11 Closeout Submittals															

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		01 57 19	Regulatory Notifications	1.5.2	G													
			Stormwater Pollution Prevention	3.2.1.4	G													
			Plan Compliance Notebook															
			Stormwater Notice of Termination	3.2.1.5	G													
			Waste Determination	3.7.1	G													
			Documentation															
			Disposal Documentation for	3.7.3.6	G													
			Hazardous and Regulated Waste															
			Assembled Employee Training	1.5.4	G													
			Records															
			Solid Waste Management Permit	1.9	G													
			Regulatory Notification	1.5.2	G													
			Sales Documentation	3.7.2.1	G													
			Contractor Certification	3.7.2.1														
			Hazardous Waste/Debris	3.7.3.1	G													
			Management															
		01 74 19	SD-01 Preconstruction Submittals															
			Construction Waste Management	1.6	G													
			Plan															
			SD-06 Test Reports															
			Quarterly Reports	1.8.4														
			Annual Report	1.8.5														
			SD-11 Closeout Submittals															
			Final Construction Waste	1.9	S													
			Diversion Report															
		01 78 00	SD-03 Product Data															

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		01 78 00	Warranty Management Plan	1.5.1														
			Warranty Tags	1.5.4														
			Spare Parts Data	1.4														
			SD-08 Manufacturer's Instructions															
			Instructions	1.5.1														
			Operation and Maintenance	3.3	G													
			Manuals															
			Operation and Maintenance	3.3	G													
			Manuals															
			SD-11 Closeout Submittals															
			As-Built Drawings	3.1	G													
			Record Drawings	1.1.2	G													
			Record Drawings	3.2	G													
			As-Built Survey of all Buried and	3.4	G													
			Underslab Utilities															
			Warranted Equipment and	1.5.1														
			Materials															
			Certification of EPA Designated	2.1	G													
			Items															
		01 78 23	SD-10 Operation and Maintenance															
			Data															
			Facility Data Workbook	1.4	G													
			Training Plan	3.1.1	G													
			Training Outline	3.1.3	G													
			Training Content	3.1.2	G													

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		01 78 23	Operation And Maintenance	3.2.1	G													
			Manual, Progress Submittal															
			Operation And Maintenance	3.2.2	G													
			Manual, Prefinal Submittal															
			Operation And Maintenance	3.2.3	G													
			Manual, Final Submittal															
			SD-11 Closeout Submittals															
			Training Video Recording	3.1.6	G													
			Validation of Training Completion	3.1.8	G													
			Record Drawings And Utility	1.6.6.7	G													
			Systems															
		01 91 00.15	SD-06 Test Reports															
			Completed Construction	3.6	G													
			Observation Checklists															
			Design Review Report	3.1	G													
			Interim Construction Phase	3.5	G													
			Commissioning Plan															
			Final Construction Phase	3.5	G													
			Commissioning Plan															
			Issues Log	1.12	G													
			SD-07 Certificates															
			Commissioning Firm	1.9	G													
			SD-10 Operation and Maintenance															
			Data															
			Systems Manual	3.9	G													
			SD-11 Closeout Submittals															

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		01 91 00.15	Final Commissioning Report	3.10	G													
			Updated Final Commissioning	3.11	G													
			Report															
		01 91 19	SD-01 Preconstruction Submittals															
			Building Enclosure	1.10.2.1	G													
			Commissioning Specialist															
			Qualifications															
			Building Enclosure Testing Work	1.7	G													
			Plan															
			SD-03 Product Data															
			Thermal Imaging Camera	2.3	G													
			Test Equipment	2.1	G													
			SD-05 Design Data															
			Envelope Surface Area	3.8.2	G													
			Calculations															
			SD-06 Test Reports															
			Completed Building Envelope	3.7	G													
			Inspection Checklists															
			Pressure Test Procedures	3.8.5	G													
			Air Leakage Test Report	1.10.3	G													
			Air Leakage Test Report	3.8.5.7	G													
			Diagnostic Test Report	1.10.3	G													
			Diagnostic Test Report	3.8.6.6	G													
			SD-07 Certificates															
			Pressure Test Agency	1.10.2.2														
			Thermographer Qualifications	1.10.2.3														

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		01 91 19	Certificate of Readiness	1.12														
			SD-10 Operation and Maintenance															
			Data															
			Training	3.9	G													
		02 41 00	SD-01 Preconstruction Submittals															
			Demolition Plan	1.2.2	G													
			Existing Conditions	1.11														
			SD-07 Certificates															
			Notification	1.7	G													
		03 30 00	SD-01 Preconstruction Submittals															
			Concrete Curing Plan	1.6.3.1														
			Quality Control Program	1.6.6	G													
			Quality Control Personnel	1.6.7	G													
			Certifications															
			Quality Control Organizational	1.6.7														
			Chart															
			Laboratory Accreditation	1.6.9	G													
			SD-02 Shop Drawings															
			Formwork	1.7.1														
			Reinforcing Steel	1.6.2.1	G													
			SD-03 Product Data															
			Joint Sealants	2.4.5														
			Joint Filler	2.4.4														
			Formwork Materials	2.1														
			Cementitious Materials	2.3.1														
			Vapor Retarder	2.4.6														

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		03 30 00	Concrete Curing Materials	2.4.1														
			Reinforcement	2.6														
			Liquid Chemical Floor Hardeners	2.4.3.1														
			and Sealers															
			Admixtures	2.3.4														
			Mechanical Reinforcing Bar	2.6.2														
			Connectors															
			Waterstops	2.2.2														
			Local/Regional Materials	1.8.1														
			Biodegradable Form Release	2.2.3														
			Agent															
			Pumping Concrete	1.6.3.2														
			Finishing Plan	1.6.3.3														
			Nonshrink Grout	2.4.2														
			SD-05 Design Data															
			Concrete Mix Design	1.6.1.1	G													
			SD-06 Test Reports															
			Concrete Mix Design	1.6.1.1	G													
			Fly Ash	1.6.4.1														
			Pozzolan	1.6.4.1														
			Slag Cement	1.6.4.2														
			Aggregates	1.6.4.3														
			Tolerance Report	3.10.2.1														
			Compressive Strength Tests	3.14.3.3	G													
			Air Content	3.14.3.4														
			Slump Tests	3.14.3.1														

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		03 30 00	Water	2.3.2														
			SD-07 Certificates															
			Reinforcing Bars	2.6.1														
			Welder Qualifications	1.9														
			VOC Content for Form Release	1.6.3.4														
			Agents, Curing Compounds, and															
			Concrete Penetrating Sealers															
			Safety Data Sheets	1.6.3.5														
			Forest Stewardship Council	1.8.2														
			(FSC) Certification															
			Field Testing Technician and	1.6.7.2														
			Testing Agency															
			SD-08 Manufacturer’s Instructions															
			Liquid Chemical Floor Hardeners	2.4.3.1														
			and Sealers															
			Joint Sealants	2.4.5														
			Curing Compound	2.4.1														
		04 20 00	SD-02 Shop Drawings															
			Cut CMU	3.3.4.1	G													
			Detail Drawings	3.4.1.1	G													
			SD-03 Product Data															
			Hot Weather Procedures	1.5.1	G													
			Cold Weather Procedures	1.5.2	G													
			Cement	2.2.3.2.1	G													
			Cementitious Materials	2.4.1.1	G													
			Insulation	2.6.8	G													

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		04 20 00	Clay Or Shale Brick	2.2.2														
			SD-04 Samples															
			Mock-Up Panel	1.3.1.1	G													
			Concrete Masonry Units (CMU)	2.2.3.2	G													
			Admixtures for Masonry Mortar	2.4.1.3	G													
			Anchors, Ties, and Bar	2.6.2	G													
			Positioners															
			Joint Reinforcement	2.6.3	G													
			Clay Masonry Expansion-Joint	2.6.6	G													
			Materials															
			Insulation	2.6.8	G													
			SD-05 Design Data															
			Masonry Compressive Strength	2.1.2	G													
			Fire-Rated Concrete Masonry	2.2.3.3														
			Units															
			Bracing Calculations	3.2.5	G													
			SD-06 Test Reports															
			Efflorescence Test	2.2.2.1.3														
			Fire-Rated Concrete Masonry	2.2.3.3														
			Units															
			Field Testing of Mortar	3.6.1.1														
			Single-Wythe Masonry Wall	3.6.1.2														
			Water Penetration Test															
			SD-07 Certificates															
			Special Masonry Inspector	1.3.2														
			Qualifications															

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		04 20 00	Concrete Masonry Units (CMU)	2.2.3.2														
			Cementitious Materials	2.4.1.1														
			Admixtures for Masonry Mortar	2.4.1.3														
			Admixtures for Grout	2.4.2.2														
			Anchors, Ties, and Bar	2.6.2														
			Positioners															
			Joint Reinforcement	2.6.3														
			Insulation	2.6.8														
			Insulation	2.6.8														
			SD-08 Manufacturer's Instructions															
			Admixtures for Masonry Mortar	2.4.1.3														
			Admixtures for Grout	2.4.2.2														
			SD-10 Operation and Maintenance															
			Data															
			Take-Back Program	3.8														
			SD-11 Closeout Submittals															
			Recycled Content	2.2.3.2.2	S													
		05 12 00	SD-01 Preconstruction Submittals															
			Erection and Erection Bracing	1.5.1.1	G													
			Drawings															
			SD-02 Shop Drawings															
			Fabrication Drawings	1.5.2	G													
			SD-03 Product Data															
			Shop Primer	2.6.2														
			Welding Electrodes and Rods	2.4.1														
			Direct Tension Indicator Washers	2.3.2.3														

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		05 12 00	Non-Shrink Grout	2.4.2														
			Tension Control Bolts	2.3.3														
			Recycled Content for Structural	2.2.1	S													
			Steel															
			Recycled Content for Structural	2.2.2	S													
			Steel Tubing															
			Recycled Content for Steel Pipe	2.2.3	S													
			SD-06 Test Reports															
			Class B Coating	2.6.2														
			Bolts, Nuts, and Washers	2.3														
			Weld Inspection Reports	3.7.1.2														
			Direct Tension Indicator Washer	3.7.2.1														
			Inspection Reports															
			Bolt Testing Reports	3.7.3.1														
			SD-07 Certificates															
			Steel	2.2														
			Bolts, Nuts, and Washers	2.3														
			Galvanizing	2.5														
			AISC Structural Steel Fabricator	1.3														
			Quality Certification															
			AISC Structural Steel Erector	1.3														
			Quality Certification															
			Welding Procedures and	1.5.3.1														
			Qualifications															
			Welding Electrodes and Rods	2.4.1														
			Certified Welding Inspector	3.7.1.1														

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		05 12 00	NDT Technician	3.7.1.2														
			Welding Procedure Specifications	3.4														
			(WPS)															
		05 21 00	SD-01 Preconstruction Submittals															
			Welder Qualification	1.3.2														
			SD-02 Shop Drawings															
			Steel Joist Framing	1.3.1	G													
			SD-03 Product Data															
			Recycled Content Of Steel	2.3	S													
			Products															
			SD-05 Design Data															
			Design Calculations	2.2	G													
			SD-06 Test Reports															
			Erection Inspection	3.4														
			Welding Inspections	3.4														
			SD-07 Certificates															
			Certification of Compliance	1.3.2														
		05 30 00	SD-02 Shop Drawings															
			Fabrication Drawings	1.3.5	G													
			SD-03 Product Data															
			Accessories	2.2														
			Deck Units	2.1														
			Galvanizing Repair Paint	2.1.4														
			Mechanical Fasteners	2.2.12														
			Touch-Up Paint	2.1.4														
			Welding Equipment	1.3.3														

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		05 30 00	Welding Rods and Accessories	1.3.3														
			Recycled Content of Steel	2.1	S													
			Products															
			SD-04 Samples															
			Metal Roof Deck Units	2.1.1														
			Flexible Closure Strips	2.2.4														
			SD-05 Design Data															
			Deck Units	2.1	G													
			SD-07 Certificates															
			Powder-Actuated Tool Operator	1.3.2														
			Welder Qualifications	1.3.3														
			Welding Procedures	1.3.3														
			Fire Safety	1.3.4.1														
			Wind Storm Resistance	1.3.4.2														
			Manufacturer's Certificate	1.3.1														
		05 40 00	SD-02 Shop Drawings															
			Framing Components	1.6.1	G													
			SD-03 Product Data															
			Studs, Joists	2.1														
			SD-05 Design Data															
			Metal Framing Calculations	1.6.2	G													
			SD-07 Certificates															
			Load-Bearing Cold-Formed Metal	1.4														
			Framing															
			Welds	3.2.1														
		05 50 13	SD-02 Shop Drawings															

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		05 50 13	Expansion Joint Covers	3.8	G													
			Bollards/Pipe Guards	3.10	G													
			Bollards/Pipe Guards	3.10	G													
			Angles and Plates	2.5	G													
			SD-03 Product Data															
			Expansion Joint Covers	3.8	G													
			Roof Hatches	2.6	G													
			Downspout Terminations	3.11	G													
			Downspout Terminations	3.11	G													
			SD-04 Samples															
			Expansion Joint Covers	3.8														
			SD-07 Certificates															
			Certificates of Compliance	2.1	G													
			Recycled Content	2.1	S													
		05 51 33	SD-02 Shop Drawings															
			Ladders	2.4														
			SD-03 Product Data															
			Ladders	2.4														
			Ladder Safety Devices	2.4.1														
			SD-07 Certificates															
			Fabricator Certification for Ladder	1.3														
			Assembly															
			Certificates Of Compliance	2.1														
		06 10 00	SD-02 Shop Drawings															
			Nailing Strips	2.3.2.1	G													
			SD-03 Product Data															

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		06 10 00	Fire-retardant Treatment	1.8	G	S												
			Fire-retardant Treatment	1.8	G	S												
			Adhesives	2.3.3	G	S												
			Adhesives	2.3.3	G	S												
			SD-06 Test Reports															
			Preservative-treated	1.4.3														
			SD-07 Certificates															
			Certificates of Grade	1.9.1	G													
			Certified Sustainably Harvested	2.2.1.1														
			Plywood for Other Uses															
			Preservative Treatment	1.7														
			Indoor Air Quality for Aerosol	2.3.3	S													
			Adhesives															
			Indoor Air Quality for Non-aerosol	2.3.3	S													
			Adhesives															
		06 41 16.00 10	SD-02 Shop Drawings															
			Shop Drawings	2.10														
			Installation	3.1	G	AE												
			SD-03 Product Data															
			Wood Materials	2.1														
			Finish Schedule	1.2														
			Certification	1.5.2	G	AE												
			SD-04 Samples															
			Plastic Laminates	2.3														
			Cabinet Hardware	2.6	S													
			SD-07 Certificates															

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		06 41 16.00 10	Quality Assurance	1.5														
			Laminate Clad Casework	3.1														
			SD-11 Closeout Submittals															
			Sustainability eNotebook															
		06 61 16	SD-02 Shop Drawings															
			Installation	3.1	G													
			SD-03 Product Data															
			Solid Polymer	2.1.1	G													
			Indoor air quality for solid surface	2.2.2	S													
			seam and sealant products															
			SD-04 Samples															
			Material	2.1	G	AE												
			Counter Tops	2.3.5	G	AE												
			SD-07 Certificates															
			Qualifications	1.4.1	G													
			Indoor Air Quality for solid	2.1.1	S													
			surface fabrication products															
		07 05 23	SD-01 Preconstruction Submittals															
			Work Plan	1.4	G													
			SD-03 Product Data															
			Thermal Imaging Camera	2.2	G													
			SD-05 Design Data															
			Envelope Surface Area	3.2	G													
			Calculations															
			SD-07 Certificates															
			Pressure Test Agency	1.6.2.1														

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		07 05 23	Thermographer Qualifications	1.6.2.2														
			Test Instruments	1.6.3														
			Date Of Last Calibration	1.6.3														
			SD-06 Test Reports															
			Pressure Test Procedures	3.5	G													
			Air Leakage Test Report	3.5.7	G													
			Diagnostic Test Report	3.6.5	G													
		07 13 53	SD-03 Product Data															
			Manufacturer's Standard Details	1.3	G													
			Elastomeric Waterproofing Sheet	2.2	G													
			Material															
			Primers, Adhesives, and Mastics	1.4	G													
			Primers, Adhesives, and Mastics	2.2	G													
			Hydrophilic waterstop	2.4	G													
			SD-06 Test Reports															
			Elastomeric Waterproofing Sheet	2.2	G													
			Material															
			Protective Covering	3.7	G													
			SD-07 Certificates															
			Elastomeric Waterproofing Sheet	2.2														
			Material															
			Primers, Adhesives, and Mastics	1.4	G													
			Primers, Adhesives, and Mastics	2.2	G													
			Protective Coverings	1.4	G													
			Special Warranties	1.9	G													
			Special Warranties	1.9	G													

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		07 13 53	Certificates Of Compliance	2.1.1	G													
			Certificates Of Compliance	2.1.2	G													
			SD-08 Manufacturer’s Instructions															
			Primers, Adhesives, and Mastics	1.4	G													
			Primers, Adhesives, and Mastics	2.2	G													
			SD-11 Closeout Submittals															
			Certificates Of Compliance	2.1.1	G													
			Certificates Of Compliance	2.1.2	G													
		07 17 00	SD-03 Product Data															
			Bentonite Materials	2.1	G													
			Bentonite Panels	2.1.3	G													
			Accessories	1.3	G													
			SD-08 Manufacturer’s Instructions															
			Application	3.2														
			Protection	3.3														
			Corrections	3.5	G													
		07 21 13	SD-02 Shop Drawings															
			Manufacturer's Standard Details	1.3	G													
			SD-03 Product Data															
			Environmental Data for Materials	1.4	G													
			Block or Board Insulation	2.1	G													
			Vapor Retarder	2.2	G													
			Pressure Sensitive Tape	2.3	G													
			Protection Board or Coating	2.4	G													
			Accessories	2.5	G													

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		07 21 13	Recycled Content for Block or	2.1.5	S													
			Board Insulation															
			SD-07 Certificates															
			Indoor Air Quality For Block Or	2.1.6	S													
			Board Insulation															
			SD-08 Manufacturer’s Instructions															
			Insulation Installation and	3.3.1														
			Handling															
			Protection Board or Coating	3.4.5														
			Installation															
			Adhesive	2.5.1														
			SD-11 Closeout Submittals															
			Draft Guarantee	1.7.1	G													
			Final Guarantee	1.7.1	G													
			Draft Warranty	1.7.2	G													
			Final Warranty	1.7.2	G													
		07 21 16	SD-03 Product Data															
			Blanket Insulation	2.1	G													
			Recycled Content for Insulation	2.1.1	S													
			Materials															
			Energy Star Label for Insulation	2.1.2	S													
			Materials															
			Vapor Retarder	2.3														
			Accessories	2.4														
			SD-07 Certificates															

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		07 21 16	Indoor Air Quality for Insulation	2.1.4	S													
			Materials															
			Indoor Air Quality for Adhesives	2.4.1	S													
			SD-08 Manufacturer's Instructions															
			Insulation	3.3.1														
		07 22 00	SD-02 Shop Drawings															
			Insulation Board Layout	1.3	G													
			SD-03 Product Data															
			Insulation	2.1	G													
			Cover Board	1.4	G													
			Fasteners	2.3	G													
			Recycled Content For Insulation	2.1.2	S													
			SD-05 Design Data															
			Wind Resistance	1.7	G													
			SD-06 Test Reports															
			Flame Spread Rating	1.8.1	G													
			SD-07 Certificates															
			Installer Qualifications	1.6	G													
			Certificates Of Compliance For	1.6	G													
			Felt Materials															
			Indoor Air Quality For Insulation	2.1.3	S													
			Acceptable Foam Blowing Agents	2.1.4	S													
			SD-08 Manufacturer's Instructions															
			Fasteners	2.3	G													
			Insulation	2.1	G													
		07 27 10	SD-02 Shop Drawings															

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		07 27 10	Air Barrier System Shop	2.1	G													
			Drawings															
			SD-03 Product Data															
			Air Barrier System Product Data	2.1	G													
			SD-04 Samples															
			Mock-Up	3.1.2	G													
			Material Samples For Air Barrier	2.1	G													
			System															
			SD-05 Design Data															
			Design Data And Calculations	1.8	G													
			For The Air Barrier System															
			SD-06 Test Reports															
			Design Review Report	1.8	G													
			Testing and Inspection	3.1.3	G													
			SD-07 Certificates															
			Air Barrier Inspector	1.7	G													
		07 27 26	SD-01 Preconstruction Submittals															
			Qualifications of Manufacturer	1.9.1	G													
			Qualifications of Installer	1.9.2	G													
			SD-02 Shop Drawings															
			Fluid-Applied Membrane Air	1.4.1	G													
			Barrier Shop Drawings															
			SD-03 Product Data															
			Fluid-Applied Membrane Air	1.4	G													
			Barrier															
			Transition Membrane	1.4.1	G													

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		07 27 26	Primers, Adhesives, and Mastics	2.2	G													
			Reinforcement	2.5	G													
			Safety Data Sheets	1.4.2	G													
			SD-04 Samples															
			Mockup	1.4.3	G													
			SD-06 Test Reports															
			Capillary Moisture Test	1.6	G													
			Field Peel Adhesion Test	1.4.4	G													
			Flame Propagation of Wall	1.4.4	G													
			Assemblies															
			Site Inspections	3.4.1	G													
			SD-08 Manufacturer’s Instructions															
			Fluid-Applied Membrane Air	1.4.2	G													
			Barrier Manufacturer's Printed															
			Instructions															
			Primers, Adhesives, and Mastics	1.4.2	G													
			Printed Manufacturer's Instructions															
		07 27 36	SD-01 Preconstruction Submittals															
			Qualification of Manufacturer	1.9.1	G													
			Qualification of Installer	1.9.2	G													
			Quality Control Plan	1.10	G													
			Safety Plan	1.10	G													
			Fire Prevention Plan	1.8.1	G													
			Respiratory Protection Plan	1.8.2	G													
			SD-02 Shop Drawings															

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		07 27 36	Spray Foam Air Barrier System	1.5.1														
			Shop Drawings															
			Fire-Rated Assemblies	1.5.1	G													
			SD-03 Product Data															
			Blowing Agents	2.1.5	G													
			Open Cell	2.1.2	G													
			Primers, Adhesives, and Mastics	2.2	G													
			Sealants	2.3	G													
			Safety Data Sheets	1.5.2	G													
			Thermal Barrier Materials	2.1.1	G													
			Ignition Barrier Coatings	2.1.1	G													
			Recycled Content for Open Cell	2.1.2	S													
			Spray Foam Air Barrier															
			SD-04 Samples															
			Spray Foam Air Barrier Mockup	1.5.3	G													
			SD-06 Test Reports															
			Mockup Peel Adhesion Test	1.5.4	G													
			Thermographic Test	3.4.5.1	G													
			Air Barrier Test	1.7	G													
			Fire-Ratings Of Thermal Barrier	1.5.4	G													
			Materials															
			Flame Spread and Smoke	1.5.4	G													
			Developed Index Ratings of SPF															
			Products															
			Flame Propagation of Wall	1.5.4	G													
			Assemblies															

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		07 27 36	Site Inspections	3.4.1	G													
			SD-07 Certificates															
			Indoor Air Quality for Spray Foam	2.1.5	S													
			Air Barrier															
			SD-08 Manufacturer’s Instructions															
			SPF Handling, Storage, and	1.6.1	G													
			Spray Procedures															
			Substrate Preparation	3.2.1	G													
			Thermal Barrier	1.5.2	G													
			Manufacturer's Printed	1.5.2	G													
			Installation Instructions for															
			Primers, Adhesives, and Mastics															
			SD-09 Manufacturer’s Field															
			Reports															
			Core Samples	1.10														
			Daily Work Record	3.3.2														
			Visual Inspection and Thermal	3.4.5														
			Scanning															
		07 42 63	SD-01 Preconstruction Submittals															
			Qualification of Manufacturer	1.5.3														
			Qualification of Installer	1.5.4														
			Qualifications for Welding Work	1.5.4.1														
			SD-02 Shop Drawings															
			Fabrication and Installation	1.5.1														
			drawings															
			Wall Panel Assemblies	1.5.1														

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		07 42 63	Flashing and Accessories	1.5.1														
			Anchorage Systems	1.5.1														
			SD-03 Product Data															
			sustainable acquisition	1.5.1														
			Manufacturer's catalog data	1.5.1														
			Factory Color Finish	1.5.1														
			Sub-girts and Formed Shapes	1.5.1														
			Closure Materials	1.5.1														
			Insulation	1.5.1														
			Pressure Sensitive Tape	1.5.1														
			Sealants and Caulking	2.4.4.1														
			Rated Wall Assembly	1.5.1														
			Galvanizing Repair Paint	1.5.1														
			Accessories	1.5.1														
			SD-04 Samples															
			Wall Panel Assemblies	1.5.1														
			Fasteners	1.5.1														
			Metal Closure Strips	1.5.1														
			Insulation	1.5.1														
			manufacturer's color charts and	1.5.1														
			chips															
			SD-05 Design Data															
			Wind Design Analysis	1.5.1														
			SD-06 Test Reports															
			Leakage Tests	3.7.2														
			Wind Load Tests	1.3.2														

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		07 42 63	Seismic Tests	1.3.2														
			Factory Color Finish	1.5.1														
			SD-07 Certificates															
			Fasteners	1.5.1														
			Galvanizing Repair Paint	1.5.1														
			wall system assembly wind load	1.5.1														
			and fire rating classification listings															
			SD-08 Manufacturer's Instructions															
			Installation of Wall Panels	1.5.1														
			SD-11 Closeout Submittals															
			Warranty	1.8														
			Warranty	1.8														
			Instructions	1.5.1														
			Safety Data Sheets	1.5.1														
			20 year 'No-Dollar-Limit' Warranty	1.5.1														
		07 60 00	SD-02 Shop Drawings															
			Exposed Sheet Metal	2.2.1	G													
			Gutters	3.1.8	G													
			Downspouts	3.1.9	G													
			Gravel Stops and fascia	2.2.1	G													
			Flashing for Roof Drains	3.1.10	G													
			Copings	3.1.11	G													
			Recycled Content	2.1	S													
			SD-04 Samples															
			Finish Samples	1.4.2	G													
			SD-07 Certificates															

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		07 60 00	Warranty on Finishes	2.2.5.1	G													
			SD-08 Manufacturer's Instructions															
			Instructions for Installation	1.4.3	G													
			Quality Control Plan	3.5	G													
			SD-10 Operation and Maintenance															
			Data															
			Cleaning and Maintenance	1.4.3	G													
		07 61 14.00 20	SD-02 Shop Drawings															
			Roofing	1.2.4	G													
			SD-03 Product Data															
			Roofing Panels	2.1	G													
			Energy Star Label for Steel	2.1	S													
			Roofing Product															
			Recycled Content for Steel	2.1.1	S													
			Roofing Product															
			Attachment Clips	2.3														
			Closures	2.4.1														
			Accessories	2.4														
			Fasteners	2.4.2														
			Sealants	2.4.3														
			Recycled Content	1.3.2.8														
			Recycled Content	1.3.2.8														
			Local/Regional Materials	1.3.2.10														
			Warranty	1.7	G													
			SD-04 Samples															
			Panel	2.1														

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		07 61 14.00 20	Accessories	2.4														
			Sealants	2.4.3														
			Intermediate Support	2.2														
			SD-05 Design Data															
			Design Calculations	1.5														
			SD-06 Test Reports															
			Field Inspection	3.6														
			Structural Performance	1.3.3														
			Finish	1.6.6														
			SD-07 Certificates															
			Manufacturer's Technical	1.6.3														
			Representative															
			Installer's Qualifications	1.6.4														
			Coil Stock	2.1	G													
			SD-08 Manufacturer’s Instructions															
			Installation	3.3	G													
			SD-11 Closeout Submittals															
			Information Card	3.8														
			Warranty	1.7														
		07 84 00	SD-02 Shop Drawings															
			Firestopping System	2.1	G													
			SD-03 Product Data															
			Firestopping Materials	2.2	G													
			SD-06 Test Reports															
			Inspection	3.3	G													
			SD-07 Certificates															

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		07 84 00	Firestopping Materials	2.2														
			Installer Qualifications	1.6.1	G													
		07 92 00	SD-03 Product Data															
			Sealants	2.1	G													
			Primers	2.2	G													
			Bond Breakers	2.3	G													
			Backstops	2.4	G													
			Cleaning Solvents	2.5	G													
			Field Adhesion	3.1	G													
			SD-07 Certificates															
			Indoor Air Quality For Interior	2.1.1	S													
			Sealants															
			Indoor Air Quality For Interior	2.1.3	S													
			Floor Joint Sealants															
		08 11 13	SD-02 Shop Drawings															
			Doors	2.2	G													
			Doors	2.2	G													
			Frames	2.5	G													
			Frames	2.5	G													
			Accessories	2.3														
			SD-03 Product Data															
			Doors	2.2	G													
			Recycled Content for Steel Door	2.2	S													
			Product															
			Frames	2.5	G													

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		08 11 13	Recycled Content for Steel Frame	2.5	S													
			Product															
			Accessories	2.3														
			Weatherstripping	2.6.2														
			SD-04 Samples															
			Volatile Organic Compounds	2.4	S													
			(Voc) Contents															
			Volatile Organic Compounds	2.9	S													
			(Voc) Contents															
			SD-07 Certificates															
			Certificates Of Compliance	2.2	G													
			Certificates Of Compliance	2.4	G													
			Certificates Of Compliance	2.5	G													
			SD-11 Closeout Submittals															
			Recycled Content For Door Cores	2.4	S													
		08 11 16	SD-02 Shop Drawings															
			Door and Frame Assembly	1.5.1	G													
			SD-03 Product Data															
			Door and Frame Assembly	1.5.1	G													
			Recycled Content of Aluminum	2.2.3	S													
			Material															
			SD-04 Samples															
			Finish Samples	1.5.2	G													
			SD-05 Design Data															
			Design Analysis	1.5.3	G													
			Calculations	1.2.1	G													

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		08 11 16	Air Infiltration	1.2.2	G													
			Water Penetration	1.2.3	G													
			NFRC Project Label Certificates	1.2.4	G													
			for Fenestration															
			Certificates Of Compliance	2.1	G													
			SD-08 Manufacturer's Instructions															
			Door and Frame Assembly	1.5.1	G													
			Adjustments, Cleaning, and	1.5.4	G													
			Maintenance															
			NFRC Project Label Certificates	1.2.4	G													
			for Fenestration															
			Recycled Content	2.1	S													
			Recycled Content	2.1	S													
		08 14 00	SD-02 Shop Drawings															
			Doors	2.1	G													
			SD-03 Product Data															
			Doors	2.1	G													
			Recycled Content for Door Cores	2.1.4.1	S													
			Accessories	2.2														
			Water-resistant Sealer	2.3.5														
			Warranty	1.5														
			Volatile Organic Compounds	2.1.4.1	S													
			(Voc) Contents															
			Volatile Organic Compounds	2.3.3	S													
			(Voc) Contents															

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		08 14 00	Volatile Organic Compounds	2.3.4	S													
			(Voc) Contents															
			Volatile Organic Compounds	2.3.5	S													
			(Voc) Contents															
			SD-04 Samples															
			Doors	2.1														
			Door Finish Colors	2.3.4.2	G													
			SD-06 Test Reports															
			Cycle-Slam	2.4														
			Hinge Loading Resistance	2.4														
			SD-07 Certificates															
			Certificates of Grade	1.3.1														
			Certified Sustainably Harvested	2.1.4	S													
			Flush Wood Doors															
			Indoor Air Quality for	2.1.4.1	S													
			Particleboard and Agrifiber Door															
			Cores															
			SD-11 Closeout Submittals															
			Certified Sustainably Harvested	2.1.4	S													
			Flush Wood Doors															
			Recycled Content for Door Cores	2.1.4.1	S													
			Indoor Air Quality for	2.1.4.1	S													
			Particleboard and Agrifiber Door															
			Cores															
			Warranty	1.5														
		08 34 73	SD-02 Shop Drawings															

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		08 34 73	Fabrication Drawings	2.1														
			SD-03 Product Data															
			Steel Sound Retardant Doors	2.1	G													
			Door Frames	2.1	G													
			Door Hardware	2.1	G													
			Door Frame Sound Infill	2.3.2														
			Thresholds	2.1	G													
			SD-06 Test Reports															
			Acoustical Tests	2.4.3	G													
			SD-07 Certificates															
			Steel Sound Retardant Doors	2.1	G													
			Door Frames	2.1	G													
			Door Hardware	2.1	G													
			Thresholds	2.1	G													
			Assembly Test Reports	3.3.1														
		08 41 13	SD-01 Preconstruction Submittals															
			Sample Warranty	1.2.1	G													
			List of Product Installations	1.2.1	G													
			SD-02 Shop Drawings															
			Installation Drawings	3.3	G													
			Fabrication Drawings	2.2	G													
			SD-03 Product Data															
			Manufacturer's Catalog Data	1.2.1	G													
			Finish	2.2.3	G													
			Recycled Content of Aluminum	2.1.1.2	S													
			Material															

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		08 41 13	SD-04 Samples															
			Finish and Color Samples	1.2.1	G													
			SD-06 Test Reports															
			Certified Test Reports	1.2.1	G													
			Deflection	3.4.3														
			Air Infiltration	3.4.1														
			Condensation Resistance and	3.4.4														
			Thermal Transmittance															
			Water Infiltration	3.4.5														
			SD-08 Manufacturer’s Instructions															
			Manufacturer's Instructions	3.3														
			SD-11 Closeout Submittals															
			Manufacturer's Product Warranty	3.6														
		08 71 00	SD-02 Shop Drawings															
			Manufacturer's Detail Drawings	1.3	G													
			Verification of Existing Conditions	1.3	G													
			Hardware Schedule	1.5	G													
			Keying System	2.3.3.4	G													
			Keying System	2.3.3.5	G													
			Keying System	2.3.7	G													
			SD-03 Product Data															
			Hardware Items	2.3	G													
			SD-08 Manufacturer’s Instructions															
			Installation	3.1														
			SD-10 Operation and Maintenance															
			Data															

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		08 71 00	Hardware Schedule	1.5	G													
			SD-11 Closeout Submittals															
			Key Bitting	1.6.1														
		08 81 00	SD-03 Product Data															
			Insulating Glass	2.3														
			Glazing Accessories	1.3														
			Sealants	2.4.3.1														
			SD-04 Samples															
			Insulating Glass	2.3														
			Glazing Compound	2.4.2														
			Tape	2.4.5														
			Sealing Tapes	2.4.5														
			Insulating Glass Units	1.4														
			SD-08 Manufacturer's Instructions															
			Setting and Sealing Materials	2.4														
			Glass Setting	3.2														
			SD-11 Closeout Submittals															
			Insulated Glass Units	1.7.1														
			Warranty for Polycarbonate	1.7.2														
			Sheet															
		08 91 00	SD-02 Shop Drawings															
			Wall Louvers	1.4														
			SD-03 Product Data															
			Metal Wall Louvers	2.2														
			SD-04 Samples															
			Wall Louver Samples	1.5	G													

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		09 22 00	SD-02 Shop Drawings															
			Metal Support Systems	2.1	G													
			SD-03 Product Data															
			Metal Support Systems	2.1														
			SD-07 Certificates															
			Certificates Of Compliance	2.1.1	G													
		09 29 00	SD-03 Product Data															
			Cementitious Backer Units	2.1.6														
			Cementitious Backer Units	3.1.1														
			Water-Resistant Gypsum Backing	2.1.3														
			Board															
			Water-Resistant Gypsum Backing	3.2.5														
			Board															
			Glass Mat Covered or Reinforced	2.1.4														
			Gypsum Sheathing															
			Glass Mat Covered or Reinforced	2.1.4.1														
			Gypsum Sheathing Sealant															
			Accessories	2.1.11														
			Gypsum Board	2.1.1														
			Recycled Content for Gypsum	2.1.1	S													
			Board															
			Recycled Content for Paper	2.1.1	S													
			Facing and Gypsum Cores															
			VOC Content of Joint Compound	2.1.7	S													
			ASTM E90 Factory Test Report	2.1.5.1	G													
			ASTM E90 Factory Test Report	3.7	G													

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		09 29 00	ASTM E336 Field Test Report	3.9	G													
			SD-07 Certificates															
			Asbestos Free Materials	2.1	G													
			Indoor Air Quality for Gypsum	2.1.1	G													
			Board															
			Indoor Air Quality for Non-aerosol	2.1.9	S													
			Adhesives															
			Indoor Air Quality for Aerosol	2.1.9	S													
			Adhesives															
			SD-11 Closeout Submittals															
			Recycled Content for Gypsum	2.1.1	S													
			Board															
			Indoor Air Quality for Gypsum	2.1.1	S													
			Board															
			VOC Content of Joint Compound	2.1.7	S													
		09 30 10	SD-02 Shop Drawings															
			Detail Drawings	3.2	G	AE												
			SD-03 Product Data															
			Porcelain Tile	2.1.1	G	AE												
			Recycled Content for Porcelain	2.1.1	S													
			Tile															
			Transition Strips	2.6.1	G	AE												
			Metal Strips	2.6.2	G													
			Setting-Bed	2.2	G													
			Mortar, Grout, and Adhesive	2.4	G	AE												
			Crack Isolation Membrane	2.7	G													

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		09 30 10	SD-04 Samples															
			Tile	2.1	G													
			Accessories	2.1	G													
			Transition Strips	2.6.1	G													
			Metal Strips	2.6.2	G													
			Grout	1.4	G													
			SD-07 Certificates															
			Indoor Air Quality for Adhesives	2.4	S													
			Indoor Air Quality for Sealants	2.4.3	S													
			Water Absorption Rates	1.3.2														
			SD-08 Manufacturer’s Instructions															
			Manufacturer's Approved	3.8														
			Cleaning Instructions															
			SD-10 Operation and Maintenance															
			Data															
			Porcelain Tile	2.1.1	G													
			Transition Strips	2.6.1	G													
			Metal Strips	2.6.2	G													
		09 51 00	SD-02 Shop Drawings															
			Drawings	2.1	G													
			SD-03 Product Data															
			Recycled Content for Type III	2.2.1.1	S													
			Ceiling Tiles															
			Recycled Content for Suspension	2.3	S													
			Systems															
			Acoustical Performance	2.1.1														

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		09 51 00	Acoustical Ceiling Tiles	2.2.1.1	G													
			SD-04 Samples															
			Acoustical Units	2.2														
			SD-07 Certificates															
			Indoor Air Quality for Type III	2.2.1.1	S													
			Ceiling Tiles															
			Indoor Air Quality for Sealants	2.6	S													
		09 65 00	SD-02 Shop Drawings															
			Resilient Flooring and	2.8	G													
			Accessories															
			SD-03 Product Data															
			Resilient Flooring and	2.8	G													
			Accessories															
			Adhesives	2.4														
			Vinyl Composition Tile	2.1	G													
			Wall Base	2.2	G													
			SD-04 Samples															
			Resilient Flooring and	2.8	G													
			Accessories															
			SD-06 Test Reports															
			Moisture, Alkalinity and Bond	3.3	G													
			Tests															
			SD-07 Certificates															
			Indoor Air Quality for Vinyl	2.1	S													
			Composition Tile															
			Indoor Air Quality for Wall Base	2.2	S													

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		09 65 00	Indoor Air Quality for Adhesives	2.4	S													
			Recycled Content For Vinyl	2.1														
			Composition Tile															
			SD-08 Manufacturer's Instructions															
			Surface Preparation	3.2	G													
			Installation	3.1	G													
			SD-10 Operation and Maintenance															
			Data															
			Resilient Flooring and	2.8	G													
			Accessories															
		09 67 23.15	SD-03 Product Data															
			Joint Sealant	2.1	G	AE												
			Thin Film Flooring System	2.2	G	AE												
			White Aluminum Oxide Non-Skid	2.3	G	AE												
			Grit															
			SD-04 Samples															
			Hardboard Mounted Thin Film	1.3.1														
			Flooring															
			Mockups	1.3.2														
			SD-05 Design Data															
			Environmental Control System	1.4.3.1														
			SD-06 Test Reports															
			Joint Sealant Test Report	1.4.4.1	G													
			Primer Coat	2.2.1	G													
			Urethane Topcoat	2.2.2	G													

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		09 67 23.15	White Aluminum Oxide Non-Skid	2.3	G													
			Grit															
			Patch Test Demonstration	1.8	G													
			Daily Inspection Report	1.4.4.2	G													
			Adhesion Testing	3.10.3	G													
			SD-07 Certificates															
			Coating Work Plan	1.4.2	G													
			Joint Sealant Certificates	1.4.5.5	G													
			Thin Film Flooring System	1.4.5.6	G													
			Certificates															
			Qualifications of Certified	1.4.5.1														
			Industrial Hygienist (CIH)															
			Qualifications of Certified	1.4.1														
			Protective Coatings Specialist															
			(PCS)															
			Qualifications of Coating	1.4.5.2														
			Inspection Company															
			Qualifications of QC Specialist	1.4.5.3														
			Coating Inspector															
			Qualifications of Coating	1.4.5.4	G													
			Contractors															
			Warranty	1.9	G													
			SD-08 Manufacturer’s Instructions															
			Joint Sealant Manufacturer's	1.4.6.1	G													
			Instructions															

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		09 67 23.15	Thin Film Flooring System	1.4.6.2	G													
			Manufacturer's Instructions															
			Water-Based Alkaline Degreaser	1.4.6.3	G													
			SD-11 Closeout Submittals															
			Inspection Logbook	3.10.2.2	G													
		09 68 00	SD-02 Shop Drawings															
			Installation Drawings	3.4	G													
			SD-03 Product Data															
			Carpet	2.1	G													
			Recycled Content for Carpeting	2.1.1	S													
			Moldings	2.4	G													
			Indoor Air Quality for Non-Aerosol	2.3	S													
			Adhesives															
			Indoor Air Quality for Concrete	2.3	S													
			Primer															
			SD-04 Samples															
			Carpet	2.1	G													
			Moldings	2.4	G													
			SD-06 Test Reports															
			Moisture and Alkalinity Tests	3.2	G													
			SD-07 Certificates															
			Indoor Air Quality for Carpet	2.1.2	S													
			SD-08 Manufacturer’s Instructions															
			Surface Preparation	3.1														
			SD-10 Operation and Maintenance															
			Data															

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		09 68 00	Cleaning and Protection	3.5														
			SD-11 Closeout Submittals															
			Warranty	1.6														
		09 69 13	SD-02 Shop Drawings															
			Detailed Installation Drawings	2.2.2	G													
			Fabrication Drawings	2.2.1	G													
			SD-03 Product Data															
			Access Flooring System	2.1	G													
			Recycled Content of Access	2.1.1	S													
			Flooring System															
			Indoor Air Quality For Pedestal	2.1.5	S													
			Adhesive															
			Indoor Air Quality For Adhesives	2.2.5	S													
			SD-04 Samples															
			Floor Panels	2.2														
			Floor Covering	2.2.4	G													
			Panel Support System	2.3														
			Accessories	1.5.1	G													
			Cut Outs	2.5	G													
			SD-05 Design Data															
			Seismic Calculations	2.1.7														
			SD-06 Test Reports															
			Factory Tests	2.4														
			Concentrated Load	2.1.1														
			Uniform Live Load	2.1.1														
			Rolling Load	2.1.1														

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		09 69 13	Rolling Load	2.1.1														
			Impact Load	2.1.1														
			Ultimate Load	2.1.1														
			Stringer Load	2.1.3														
			Pedestal Axial Load	2.1.4														
			Bonding Strength of Pedestal	2.1.5														
			Adhesive															
			Electrical Resistance	3.2.3														
			Field Tests	3.2														
			SD-07 Certificates															
			Compliance with ICC-ES AC300	2.1														
			Compliance with ICC IBC	2.1														
			Certificate of Compliance	2.1														
			Qualification of Manufacturer	1.4.1														
			SD-10 Operation and Maintenance															
			Data															
			Operation and Maintenance	3.5	G													
			Manuals															
			SD-11 Closeout Submittals															
			Lifting Device	2.2.6														
			Warranty	1.6	G													
		09 77 20	SD-02 Shop Drawings															
			Panels	2.1	G													
			SD-03 Product Data															
			Panels	2.1	G													
			SD-04 Samples															

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		09 77 20	Panels	2.1														
		09 90 00	SD-02 Shop Drawings															
			Piping Identification	3.7														
			SD-03 Product Data															
			Coating	2.2	G													
			Product Data Sheets	2.2														
			Volatile Organic Compounds	2.2	S													
			(Voc) Contents															
			SD-04 Samples															
			Color	2.3	G													
			SD-07 Certificates															
			Qualification Testing	1.5.4.2	G													
			Indoor Air Quality for Paints and	1.5.3														
			Primers															
			Indoor Air Quality for Paints and	2.2														
			Primers															
			SD-08 Manufacturer’s Instructions															
			Mixing	2.2														
			Manufacturer's Safety Data	1.7.1														
			Sheets															
			SD-10 Operation and Maintenance															
			Data															
			Coatings	2.2	G													
		10 14 00.20	SD-02 Shop Drawings															
			Detail Drawings	1.4.2	G	AE												
			SD-03 Product Data															

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		10 14 00.20	Room Identification And	2.1	G AE													
			Directional Signage System															
			Exit Door Tactile Sign	2.2	G AE													
			SD-04 Samples															
			Interior Signage	1.4.1	G													
			Software	1.3	G													
			Room Identification And	2.1	G													
			Directional Signage System															
			Exit Door Tactile Sign	2.2	G													
			SD-10 Operation and Maintenance															
			Data															
			Approved Manufacturer's	3.1	G													
			Instructions															
			Protection and Cleaning	3.1.2	G													
		10 14 01	SD-02 Shop Drawings															
			Approved Detail Drawings	3.1	G													
			SD-03 Product Data															
			Modular Exterior Signage System	2.1														
			Installation	3.1														
			Exterior Signage	1.4	G													
			Local/Regional Materials	1.2.1														
			Waste Management	3.2														
			SD-04 Samples															
			Exterior Signage	1.4	G													
			SD-10 Operation and Maintenance															
			Data															

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		10 14 01	Protection and Cleaning	3.1.2														
		10 21 13	SD-02 Shop Drawings															
			Installation Drawings	3.2	G													
			Fabrication Drawings	2.1	G													
			SD-03 Product Data															
			Cleaning and Maintenance	2.1														
			Instructions															
			Anchoring Devices and Fasteners	2.2.2														
			Hardware and Fittings	2.2.4														
			Brackets	2.2.3														
			Door Hardware	2.2.5														
			Pilaster Shoes	2.5														
			Finishes	2.2.4.2	G													
			Finishes	2.7.2	G													
			Recycled content for solid	2.3	S													
			Polyethylene partitions and															
			screens															
			Toilet Enclosures	2.3.1														
			Urinal Screens	2.3.2	G													
			Colors And Finishes	2.7														
			Partition Panels And Doors	2.3	G													
			SD-04 Samples															
			Hardware and Fittings	2.2.4														
			Anchoring Devices and Fasteners	2.2.2														
			SD-07 Certificates															
			Warranty	1.6														

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		10 26 00	SD-02 Shop Drawings															
			Corner Guards	2.2	G													
			SD-03 Product Data															
			Corner Guards	2.2	G													
			Recycled content for steel	2.2.1	S													
			component of corner guards															
			SD-04 Samples															
			Corner Guards	2.2	G													
			SD-07 Certificates															
			Indoor air quality for adhesives	2.4	S													
			SD-10 Operation and Maintenance															
			Data															
			Corner Guards	2.2	G													
		10 28 13	SD-02 Shop Drawings															
			Product Schedule	2.1	G													
			SD-03 Product Data															
			Recycled content for stainless	2.1	S													
			steel toilet accessories															
			Item A5083	2.1.3	G													
			Item A5090	2.1.4	G													
			Item A5109	2.1.5	G													
			Item A5135	2.1.6	G													
			Item A5200	2.1.7	G													
			Mirrors, Glass (MG)	2.1.8	G													
			Paper Towel Dispenser Waste	2.1.9	G													
			Receptacle (Ptdwr)															

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		10 28 13	Soap Dispenser,	2.1.10	G													
			Counter-Mounted															
			Seat Cover Dispenser (Scd)	2.1.11	G													
			Recycling Bins	2.1.12	G													
		10 44 16	SD-02 Shop Drawings															
			Schedule	1.5	G													
			SD-03 Product Data															
			Fire Extinguishers	2.1.1	G													
			Cabinets	Part 2	G													
			Wall Brackets	2.2.2	G													
			Replacement Parts List	3.2.1	G													
			Equipment	2.2	G													
			SD-04 Samples															
			Wall Brackets	2.2.2	G													
			Accessories	Part 2	G													
			Equipment Samples	1.3.1														
			SD-07 Certificates															
			Fire Extinguishers Certifications	2.1.1	G													
			Manufacturer's Warranty with	1.4	G													
			Inspection Tag															
		10 51 16	SD-02 Shop Drawings															
			Materials	2.2	G													
			SD-03 Product Data															
			Manufactured Units	2.3	G													
		10 53 01	SD-02 Shop Drawings															
			Manufactured Canopy	2.1	G													

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		10 53 01	SD-03 Product Data															
			Manufactured Canopy	2.1	G													
		11 01 50	SD-02 Shop Drawings															
			Fall Protection System	1.2.1	G	AE												
			SD-03 Product Data															
			Deceleration Devices	2.1.1.1	G	AE												
			Trolleys	2.1.1.4	G	AE												
			Harness	2.1.1.3	G	AE												
			SD-05 Design Data															
			Engineering Analysis	1.2.1	G	AE												
			SD-07 Certificates															
			Fall Protection System	1.2.1	G													
			SD-09 Manufacturer’s Field															
			Reports															
			Attendee List	3.2.3														
			Operational Test	3.2.2	G													
			SD-10 Operation and Maintenance															
			Data															
			Fall Protection System	1.2.1	G													
		11 94 11	SD-02 Shop Drawings															
			Design Drawings	2.1.1	G													
			Design Drawings	3.2	G													
			Design Drawings	3.2	G													
			SD-03 Product Data															
			Components	2.3	G													
			SD-07 Certificates															

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		11 94 11	insurance	1.3.3.1	G													
			Certification	1.3.3.2	G													
			Material Test Certificates	2.3.2	G													
			SD-10 Operation and Maintenance															
			Data															
			Systems Manuals	3.5.1	G													
		12 24 13	SD-02 Shop Drawings															
			Detailed Drawings	3.3	G													
			Location Schedule	2.1	G													
			SD-03 Product Data															
			Window Shades	2.1	G													
			Recycled Content for various	2.1	S													
			fiber components															
			SD-04 Samples															
			Window Shades	2.1	G													
			SD-06 Test Reports															
			Flammability Requirements	1.4.2	G													
			SD-07 Certificates															
			Indoor Air Quality for roller	2.1	S													
			window shades															
			Qualifications	1.4.1.1														
			SD-10 Operation and Maintenance															
			Data															
			Window Shades	2.1	G													
		21 13 13.00 10	SD-01 Preconstruction Submittals															

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		21 13 13.00 10	Qualified Fire Protection Engineer	1.4.1	G													
			(QFPE);															
			Sprinkler System Designer	1.4.2	G													
			Sprinkler System Installer	1.4.3	G													
			SD-02 Shop Drawings															
			Shop Drawings	1.4.4	G													
			As-Built Drawings	3.12	G													
			Hydrant Flow Test	1.2.1.2	G													
			SD-03 Product Data															
			Materials and Equipment	2.3	G													
			Spare Parts	1.6														
			Onsite Training	3.13														
			SD-05 Design Data															
			Hydraulic Calculations	1.2.1.3	G													
			SD-06 Test Reports															
			Preliminary Test Procedures	3.8	G													
			Preliminary Test Report	3.9	G													
			Final Acceptance Test	3.10	G													
			Procedures															
			Final Acceptance Test Report	3.11	G													
			Final Acceptance Test Report	3.11	G													
			SD-07 Certificates															
			Certification by Qualified Fire	3.3	G													
			Protection Engineer (QFPE)															
			SD-10 Operation and Maintenance															
			Data															

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		21 13 13.00 10	Operating and Maintenance	3.15	G													
			Manuals															
			Posted Operating and	3.14														
			Maintenance Instructions															
			Posted Operating and	3.14														
			Maintenance Instructions															
		21 30 00	SD-01 Preconstruction Submittals															
			Fire Pump Installation Related	1.3	G													
			Submittals															
			Qualifications of Welders	1.7.2	G													
			Qualifications of Installer	1.7.3	G													
			Qualified Fire Protection Engineer	1.7.1	G													
			SD-02 Shop Drawings															
			Installation Drawings	3.3.1	G													
			As-Built Drawings	3.15.2	G													
			Piping Layout	3.3.2	G													
			Pump Room	2.8	G													
			SD-03 Product Data															
			Catalog Data	2.1	G													
			Spare Parts	1.6														
			Manufacturer's Representative	1.7.6	G													
			Field Training	3.15.1	G													
			SD-06 Test Reports															
			Preliminary Test Procedures	3.8	G													
			Preliminary Test Report	3.10	G													
			Final Test Procedures	3.11	G													

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		21 30 00	Final Test Report	3.13	G													
			SD-07 Certificates															
			Preliminary Test Certification	1.7.4	G													
			Final Test Certification	1.7.5	G													
			SD-10 Operation and Maintenance															
			Data															
			Operating and Maintenance	3.15.1	G													
			Instructions															
			Posted Operating and	3.14	G													
			Maintenance Instructions															
			Flow Meter	2.13	G													
		22 00 00	SD-02 Shop Drawings															
			Plumbing System	3.9.1	G													
			SD-03 Product Data															
			Recycled Content for Cast Iron	2.1	S													
			Pipe															
			Backflow Prevention Assemblies	3.9.1.1	G													
			Fixtures	2.4														
			Flush Valve Water Closets	2.4.2														
			WaterSense Label for Flush	2.4.2	S													
			Valve Water Closet															
			Flush Valve Urinals	2.4.3														
			WaterSense Label for Urinal	2.4.3	S													
			Barrier-Type Trap Seal Protection	2.8														
			Device															
			Countertop Lavatories	2.4.5														

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		22 00 00	Kitchen Sinks	2.4.6														
			Drinking-Water Coolers	2.4.7	G													
			Energy Star Label for Electric	2.4.7	S													
			Water Cooler															
			Energy Star Label for Wheelchair	2.4.8	S													
			Electric Water Cooler															
			Water Heaters	2.9	G													
			Pumps	2.10	G													
			Welding	1.5.1														
			Vibration-Absorbing Features	3.4	G													
			Plumbing System	3.9.1														
			SD-06 Test Reports															
			Tests, Flushing and Disinfection	3.9														
			Test of Backflow Prevention	3.9.1.1	G													
			Assemblies															
			SD-07 Certificates															
			Materials and Equipment	1.3														
			Bolts	2.1.1														
			SD-10 Operation and Maintenance															
			Data															
			Plumbing System	3.9.1	G													
		23 05 48.00 40	SD-02 Shop Drawings															
			Installation Drawings	1.2	G													
			Outline Drawings	1.2	G													
			SD-03 Product Data															

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		23 05 48.00 40	Equipment and Performance	1.2	G													
			Data															
			Isolators	2.2.1	G													
			SD-06 Test Reports															
			Type of Isolator	2.4	G													
			Type of Base	2.4	G													
			Allowable Deflection	2.4	G													
			Measured Deflection	2.4	G													
		23 05 93	SD-01 Preconstruction Submittals															
			Records of Existing Conditions	1.3.3	G													
			TAB Firm	1.5.3.1	G													
			TAB Team Assistants	1.2	G													
			TAB Team Engineer	1.2	G													
			TAB Specialist	1.5.3.2	G													
			TAB Team Field Leader	1.2	G													
			SD-02 Shop Drawings															
			TAB Schematic Drawings and	1.3.3	G													
			Report Forms															
			SD-03 Product Data															
			Equipment and Performance	1.3	G													
			Data															
			TAB Related HVAC Submittals	1.5.3.4	G													
			TAB Procedures	1.5.2	G													
			Calibration	1.5.2	G													
			Systems Readiness Check	1.3.3	G													
			TAB Execution	1.5.4	G													

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		23 05 93	TAB Verification	1.5.4.3	G													
			SD-06 Test Reports															
			Completed Pre-Final DALT	3.3.5	G													
			Report															
			Certified Final DALT Report	3.3.8	G													
			TAB Design Review Report	1.6.1.1	G													
			TAB Report for Season 1	1.5.5.2	G													
			TAB Report for Season 2	1.5.5.2	G													
			SD-07 Certificates															
			Independent TAB Agency and	1.5.1	G													
			Personnel Qualifications															
			DALT and TAB Submittal and	1.6.1	G													
			Work Schedule															
			TAB Pre-Field Engineering	1.6.1.3	G													
			Report															
			TAB Firm	1.5.3.1	G													
			Design Review Report	1.3.3	G													
			Pre-field DALT Preliminary	1.6.1.2	G													
			Notification															
			Advanced Notice for Season 1	1.6.1	G													
			TAB Field Work															
			Prerequisite HVAC Work Check	1.6.1	G													
			Out List For Season 1															
			Advanced Notice for Season 2	1.6.1	G													
			TAB Field Work															

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		23 05 93	Prerequisite HVAC Work Check	1.6.1	G													
			Out List For Season 2															
		23 07 00	SD-02 Shop Drawings															
			MICA Plates	3.2.2.4	G													
			Pipe Insulation Systems	2.3														
			Pipe Insulation Systems	3.2														
			Duct Insulation Systems	3.3														
			Equipment Insulation Systems	3.4														
			Recycled content for insulation	2.3.1	S													
			materials															
			SD-03 Product Data															
			Pipe Insulation Systems	2.3	G													
			Pipe Insulation Systems	3.2	G													
			Duct Insulation Systems	3.3	G													
			Equipment Insulation Systems	3.4	G													
			SD-04 Samples															
			Thermal Insulation	2.2.1.3	G													
			Display Samples	3.1.1	G													
			SD-07 Certificates															
			Indoor air quality for adhesives	2.2.1	S													
			SD-08 Manufacturer's Instructions															
			Pipe Insulation Systems	2.3	G													
			Pipe Insulation Systems	3.2	G													
			Duct Insulation Systems	3.3	G													
			Equipment Insulation Systems	3.4	G													
		23 09 00	SD-02 Shop Drawings															

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		23 09 00	DDC Contractor Design Drawings	3.2	G													
			Draft As-Built Drawings	3.2	G													
			Final As-Built Drawings	3.2	G													
			SD-03 Product Data															
			Computer Software	2.5	G													
			Programming Software	1.8.3	G													
			Controller Application Programs	1.8.4	G													
			Configuration Software	1.8.1	G													
			Controller Configuration Settings	1.8.2	G													
			Proprietary Multi-Split	1.1.1.3	G													
			Engineering Tool Software															
			Manufacturer's Product Data	2.2	G													
			SD-05 Design Data															
			Boiler Or Chiller Plant Gateway	1.9														
			Request															
			SD-06 Test Reports															
			Pre-Construction Quality Control	1.10.1	G													
			(QC) Checklist															
			Post-Construction Quality Control	1.10.2	G													
			(QC) Checklist															
			Start-Up Testing Report	3.5.2	G													
			PVT Procedures	3.6.1	G													
			PVT Report	3.6.3	G													
			SD-10 Operation and Maintenance															
			Data															

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		23 09 00	Operation and Maintenance	3.7	G													
			(O&M) Instructions															
			Training Documentation	3.9.1	G													
			SD-11 Closeout Submittals															
			Enclosure Keys	2.7.1	G													
			Enclosure Keys	2.9	G													
			Password Summary Report	3.1.6.1	G													
			Closeout Quality Control (QC)	1.10.3	G													
			Checklist															
		23 11 20	SD-02 Shop Drawings															
			Gas Piping System	1.5.3	G													
			Gas Piping System	2.2	G													
			Gas Piping System	3.3	G													
			SD-03 Product Data															
			Pipe and Fittings	1.6.1	G													
			Gas Equipment Connectors	1.5.3	G													
			Gas Piping System	1.5.3	G													
			Gas Piping System	2.2	G													
			Gas Piping System	3.3	G													
			Pipe Coating Materials	2.1														
			Pressure Regulators	2.6	G													
			Risers	2.4	G													
			Transition Fittings	2.2.8	G													
			Valves	2.3	G													
			Warning and Identification Tape	2.2.4	G													
			SD-06 Test Reports															

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		23 11 20	Testing	3.18	G													
			Pressure Tests	3.18.1	G													
			Test with Gas	3.18.2	G													
			SD-07 Certificates															
			Welders Procedures and	1.5.1	G													
			Qualifications															
			Assigned Number, Letter, or	1.5.1	G													
			Symbol															
			SD-08 Manufacturer's Instructions															
			PE Pipe and Fittings	1.5.2	G													
			Pipe Coating Materials	2.1	G													
			SD-10 Operation and Maintenance															
			Data															
			Gas Facility System and	1.3.1	G													
			Equipment Operation															
			Gas Facility System Maintenance	1.3.2	G													
			Gas Facility Equipment	1.3.3	G													
			Maintenance															
		23 30 00	SD-02 Shop Drawings															
			Detail Drawings	1.4.4	G													
			SD-03 Product Data															
			Metallic Flexible Duct	2.8.1.1														
			Insulated Nonmetallic Flexible	2.8.1.2														
			Duct Runouts															
			Duct Connectors	2.8.1.2														
			Duct Access Doors	2.8.2	G													

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(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		23 30 00	Fire Dampers	2.8.3														
			Manual Balancing Dampers	2.8.4	G													
			Sound Attenuation Equipment	2.8.8														
			Acoustical Duct Liner	2.8.8.3														
			Diffusers	2.8.9.1														
			Registers and Grilles	2.8.9.2														
			Louvers	2.8.10														
			Air Vents, Penthouses, and	2.8.11														
			Goosenecks															
			Centrifugal Fans	2.9.1.1														
			In-Line Centrifugal Fans	2.9.1.2														
			Tube Axial Direct Drive Inline Fan	2.9.1.3														
			Panel Type Power Wall	2.9.1.4														
			Ventilators															
			Air Handling Units	2.10	G													
			Room Fan-Coil Units	2.11.1	G													
			Variable Volume, Single Duct	2.11.2.2	G													
			Terminal Units															
			Test Procedures	1.4.5														
			Diagrams	1.2.1.2	G													
			Indoor Air Quality for Duct	2.8.1	S													
			Sealants															
			SD-06 Test Reports															
			Performance Tests	3.12	G													
			Damper Acceptance Test	3.10	G													
			SD-07 Certificates															

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		23 30 00	Bolts	1.4.1														
			Ozone Depleting Substances	1.4.3														
			Technician Certification															
			SD-08 Manufacturer's Instructions															
			Manufacturer's Installation	3.2														
			Instructions															
			Operation and Maintenance	3.14.2														
			Training															
			SD-10 Operation and Maintenance															
			Data															
			Operation and Maintenance	3.14.1	G													
			Manuals															
			Fire Dampers	2.8.3	G													
			Manual Balancing Dampers	2.8.4	G													
			Centrifugal Fans	2.9.1.1	G													
			In-Line Centrifugal Fans	2.9.1.2	G													
			Tube Axial Direct Drive Inline Fan	2.9.1.3	G													
			Panel Type Power Wall	2.9.1.4	G													
			Ventilators															
			Air Handling Units	2.10	G													
			Room Fan-Coil Units	2.11.1	G													
			Variable Volume, Single Duct	2.11.2.2	G													
			Terminal Units															
			SD-11 Closeout Submittals															
			Indoor Air Quality During	3.13	S													
			Construction															

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		23 52 00	SD-02 Shop Drawings															
			Detail Drawings	1.5	G													
			SD-03 Product Data															
			Materials and Equipment	2.1.1	G													
			Spare Parts	1.5	G													
			Water Treatment System	2.13	G													
			Boiler Water Treatment	2.13														
			Heating System Tests	3.8														
			Unit Heaters	2.7	G													
			Welding	1.3														
			Qualifications	3.8														
			Field Instructions	3.10														
			Tests	3.4	G													
			SD-06 Test Reports															
			Heating System Tests	3.8														
			Water Treatment Testing	3.8.1														
			MakeUp Water Analysis	2.13.1														
			SD-07 Certificates															
			Bolts	2.9.8.3														
			SD-10 Operation and Maintenance															
			Data															
			Operation and Maintenance	3.10	G													
			Instructions															
			Water Treatment System	2.13	G													
			SD-11 Closeout Submittals															

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		23 52 00	Indoor Air Quality During	3.9.2														
			Construction															
		23 64 10	SD-03 Product Data															
			Water Chiller	2.4	G													
			Posted Instructions	3.1.3														
			Verification of Dimensions	1.6.1														
			System Performance Tests	3.5														
			Demonstrations	3.6														
			Refrigerant	2.5.1														
			Water Chiller - Field Acceptance	3.4.1	G													
			Test Plan															
			SD-06 Test Reports															
			Field Acceptance Testing	3.4	G													
			Water Chiller - Field Acceptance	3.4.2	G													
			Test Report															
			System Performance Tests	3.5														
			SD-07 Certificates															
			Refrigeration System	3.1.9	G													
			Ozone Depleting Substances	1.3.1														
			Technician Certification															
			SD-08 Manufacturer's Instructions															
			Water Chiller - Installation	3.1	G													
			Instructions															
			SD-10 Operation and Maintenance															
			Data															

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		23 64 10	Operation and Maintenance	3.6	G													
			Manuals															
			SD-11 Closeout Submittals															
			Indoor Air Quality During	3.3	S													
			Construction															
		23 64 26	SD-03 Product Data															
			Calibrated Balancing Valves	2.4.5	G													
			Automatic Flow Control Valves	2.4.6	G													
			Water Temperature Mixing Valve	2.4.7	G													
			Water Temperature Regulating	2.4.8	G													
			Valves															
			Water Pressure Reducing Valve	2.4.9														
			Pressure Relief Valve	2.4.10														
			Combination Pressure and	2.4.11														
			Temperature Relief Valves															
			Expansion Joints	2.5.8	G													
			Pumps	2.6	G													
			Combination Strainer and Pump	2.5.2														
			Suction Diffuser															
			Expansion Tanks	2.7														
			Air Separator Tanks	2.8														
			Water Treatment Systems	2.9	G													
			SD-06 Test Reports															
			Piping Welds NDE Report	3.1.1.3														
			Pressure Tests Reports	3.4.2	G													
			SD-07 Certificates															

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		23 64 26	Employer's Record Documents	3.1.1.1														
			(For Welding)															
			Welding Procedures and	3.1.1.2														
			Qualifications															
			SD-08 Manufacturer’s Instructions															
			Lesson plan for the Instruction	3.5	G													
			Course															
			SD-10 Operation and Maintenance															
			Data															
			Water Treatment Systems	2.9	G													
			Calibrated Balancing Valves	2.4.5	G													
			Automatic Flow Control Valves	2.4.6	G													
			Water Temperature Mixing Valve	2.4.7	G													
			Water Temperature Regulating	2.4.8	G													
			Valves															
			Water Pressure Reducing Valve	2.4.9	G													
			Pressure Relief Valve	2.4.10	G													
			Combination Pressure and	2.4.11	G													
			Temperature Relief Valves															
			Expansion Joints	2.5.8	G													
			Pumps	2.6	G													
			Combination Strainer and Pump	2.5.2	G													
			Suction Diffuser															
			Expansion Tanks	2.7	G													
			Air Separator Tanks	2.8	G													
		23 81 23	SD-03 Product Data															

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		23 81 23	Computer Room Air Conditioner	2.1	G													
			Space Temperature Control	2.5.2	G													
			System Drawings															
			Filters	2.1.5														
			Refrigerants	1.4														
			SD-06 Test Reports															
			CRAC Production Schedule and	2.7.2	G													
			Factory Test Schedule															
			Manufacturer's Factory Test	2.7.1	G													
			Plans															
			Factory Test Reports	2.7.5	G													
			Field Test Schedule	3.3.2	G													
			Manufacturer's Field Test Plans	3.3.1	G													
			Field Test Reports	3.3.6	G													
			SD-07 Certificates															
			Credentials of the Manufacturer's	3.3.3	G													
			Field Test Representative															
			Ozone Depleting Substances	1.5.1														
			Technician Certification															
			SD-08 Manufacturer’s Instructions															
			Installation Manual for Each Type	3.1.2														
			of CRAC															
			SD-10 Operation and Maintenance															
			Data															
			Computer Room Air Conditioner	3.1.3	G													
			Operation and Maintenance Data															

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		23 81 23	SD-11 Closeout Submittals															
			Indoor Air Quality During	3.2	S													
			Construction															
		23 83 00.00 20	SD-02 Shop Drawings															
			Heater Installation Drawing	3.1														
			SD-03 Product Data															
			Electric Unit Heaters	2.1														
			Electric Baseboard Units	2.2														
			Thermostat	2.1.4														
			Unit Thermostat	2.2.5														
			SD-10 Operation and Maintenance															
			Data															
			Electric Unit Heaters	2.1														
			Electric Baseboard Units	2.2														
		25 05 11.04	SD-01 Preconstruction Submittals															
			Device Account Lock Exception	3.3.2	G													
			Request															
			Multiple Ethernet Connection	3.2.4.2	G													
			Device Request															
			Contractor Computer	1.10.1.6	G													
			Cybersecurity Compliance															
			Statements															
			Contractor Temporary Network	1.10.6	G													
			Cybersecurity Compliance															
			Statements															

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		25 05 11.04	Cybersecurity Interconnection	1.8.2	G													
			Schedule															
			Protection of Information At Rest	3.7.4	G													
			Proposal															
			Proposed STIG and SRG	1.8.1	G													
			Applicability Report															
			SD-02 Shop Drawings															
			Network Communication Report	1.8.3	G													
			Cybersecurity Riser Diagram	1.8.6	G													
			SD-03 Product Data															
			Control System Cybersecurity	1.8.8	G													
			Documentation															
			SD-06 Test Reports															
			Control System Cybersecurity	3.14.1	G													
			Testing Procedures															
			Control System Cybersecurity	3.14.3	G													
			Testing Report															
			SD-07 Certificates															
			Software Licenses	1.9	G													
			SD-11 Closeout Submittals															
			Confidential Password Report	3.4.5.5	G													
			Enclosure Keys	3.3.7	G													
			Software and Configuration	1.8.5	G													
			Backups															
			Auditing Front End Software	3.5.3	G													

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		25 05 11.04	Device Audit Record Upload	3.5.4.2	G													
			Software															
			System Maintenance Tool	3.9	G													
			Software															
			Control System Scanning Tools	3.11.2	G													
			STIG, SRG and Vendor Guide	1.8.7	G													
			Compliance Result Report															
			Control System Inventory Report	1.8.4	G													
			Integrity Verification Software	3.13.2	G													
		25 05 11.25	SD-01 Preconstruction Submittals															
			Device Account Lock Exception	3.3.2	G													
			Request															
			Multiple Ethernet Connection	3.2.3.2	G													
			Device Request															
			Contractor Computer	1.10.1.6	G													
			Cybersecurity Compliance															
			Statements															
			Contractor Temporary Network	1.10.6	G													
			Cybersecurity Compliance															
			Statements															
			Cybersecurity Interconnection	1.8.2	G													
			Schedule															
			Proposed STIG and SRG	1.8.1	G													
			Applicability Report															
			SD-02 Shop Drawings															
			Network Communication Report	1.8.3	G													

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		25 05 11.25	Cybersecurity Riser Diagram	1.8.6	G													
			SD-03 Product Data															
			Control System Cybersecurity	1.8.8	G													
			Documentation															
			SD-06 Test Reports															
			Control System Cybersecurity	3.14.1	G													
			Testing Procedures															
			Control System Cybersecurity	3.14.3	G													
			Testing Report															
			SD-07 Certificates															
			Software Licenses	1.9	G													
			SD-11 Closeout Submittals															
			Confidential Password Report	3.4.4.5	G													
			Enclosure Keys	3.3.5	G													
			Software and Configuration	1.8.5	G													
			Backups															
			Auditing Front End Software	3.5.3	G													
			Device Audit Record Upload	3.5.4.1	G													
			Software															
			System Maintenance Tool	3.9	G													
			Software															
			Control System Scanning Tools	3.11.2	G													
			STIG, SRG and Vendor Guide	1.8.7	G													
			Compliance Result Report															
			Control System Inventory Report	1.8.4	G													
		26 05 13.00 10	SD-01 Preconstruction Submittals															

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		26 05 13.00 10	List of Splices and Terminations	1.3.1	G													
			to be Installed by															
			Splicer/Terminator															
			SD-02 Shop Drawings															
			Pulling Plan	3.2.3	G													
			SD-03 Product Data															
			Multiple-Conductor Shielded		G													
			Cables															
			Multiple-Conductor Nonshielded		G													
			Cables															
			Single-Conductor Shielded	2.2.1	G													
			Cables															
			Single-Conductor Nonshielded		G													
			Cables															
			Portable Cables		G													
			Cable Supports and Fittings	2.2.5	G													
			Polyethylene Cable Tags	2.2.6	G													
			Polyethylene Cable Tags	2.2.6	G													
			Fireproof Tape	2.2.7	G													
			Splices	2.2.3	G													
			Terminations	2.2.4	G													
			SD-06 Test Reports															
			Field Testing	3.3	G													
			Qualification Test Reports	2.4.1	G													
			Radiographic Tests	3.3	G													
			SD-07 Certificates															

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(a)	(b)	(c)	(d)	(e)	(f)		(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		26 05 13.00 10	Splicer/Terminator Certifications	1.5.2	G													
			SD-08 Manufacturer's Instructions															
			Medium-Voltage Power Cables	3.4	G													
			Terminations	2.2.4	G													
			Splices	2.2.3	G													
		26 05 73	SD-01 Preconstruction Submittals															
			Field Examination Plan	3.1	G													
			Arc Flash Label Formats	3.2.9	G													
			SD-06 Test Reports															
			Field Examination	3.1.1														
			SD-07 Certificates															
			System Analyzer	1.4.1	G													
			SD-11 Closeout Submittals															
			Model Files	3.3	G													
			Load Flow Study	3.2.4	G													
			Fault Current Study	3.2.5	G													
			System Coordination Study	3.2.6	G													
			Arc Flash Hazard Study	3.2.7	G													
		26 08 00	SD-06 Test Reports															
			Acceptance Tests and	3.1	G													
			Inspections															
			SD-07 Certificates															
			Qualifications	1.4.1	G													
			Acceptance Test and Inspections	1.4.3	G													
			Procedure															
		26 12 19.10	SD-02 Shop Drawings															

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		26 12 19.10	Pad-mounted Transformer	1.5.1	G													
			Drawings															
			SD-03 Product Data															
			Pad-mounted Transformers	2.2	G													
			SD-06 Test Reports															
			Acceptance Checks and Tests	3.7.1	G													
			SD-07 Certificates															
			Transformer Efficiencies	2.2.2.1	G													
			SD-09 Manufacturer's Field															
			Reports															
			Transformer Test Schedule	2.7.1	G													
			Design Tests	2.7.2	G													
			Routine and Other Tests	2.7.3	G													
			SD-10 Operation and Maintenance															
			Data															
			Transformer(s)	1.6.1	G													
		26 20 00	SD-02 Shop Drawings															
			Panelboards	2.12	G													
			Transformers	2.14	G													
			Wireways	2.25	G													
			SD-03 Product Data															
			Receptacles	2.11	G													
			Circuit Breakers	2.12.3	G													
			Switches	2.9	G													
			Transformers	2.14	G													
			Enclosed Circuit Breakers	2.13	G													

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		26 20 00	Motor Controllers	2.16	G													
			Manual Motor Starters	2.17	G													
			Surge Protective Devices	2.26	G													
			Telecommunications Grounding	3.1.11.5	G													
			Busbar															
			SD-06 Test Reports															
			600-volt Wiring Test	3.5.2	G													
			Grounding System Test	3.5.5	G													
			Transformer Tests	3.5.3	G													
			Ground-fault Receptacle Test	3.5.4	G													
			SD-07 Certificates															
			Fuses	2.10	G													
			SD-09 Manufacturer’s Field															
			Reports															
			Transformer Factory Tests	2.28.1														
		26 24 13	SD-02 Shop Drawings															
			Switchboard Drawings	1.5.2	G													
			SD-03 Product Data															
			Switchboard	2.2	G													
			SD-06 Test Reports															
			Switchboard Design Tests	2.5.2	G													
			Switchboard Production Tests	2.5.3	G													
			Acceptance Checks and Tests	3.5.1	G													
			SD-10 Operation and Maintenance															
			Data															

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		26 24 13	Switchboard Operation and	1.6.1	G													
			Maintenance															
			SD-11 Closeout Submittals															
			Assembled Operation and	1.6.2	G													
			Maintenance Manuals															
			Equipment Test Schedule	2.5.1	G													
			Request for Settings	3.5	G													
			Service Entrance Available Fault	2.7	G													
			Current Label															
		26 29 23	SD-02 Shop Drawings															
			Schematic Diagrams	1.5.1	G													
			Interconnecting Diagrams	1.5.2	G													
			Installation Drawings	1.5.3	G													
			As-Built Drawings	1.5.3	G													
			SD-03 Product Data															
			Adjustable Speed Drives	2.1	G													
			Wires and Cables	2.3														
			Equipment Schedule	1.5.4														
			SD-06 Test Reports															
			ASD Test	3.3.1														
			Performance Verification Tests	3.3.2														
			Endurance Test	3.3.3														
			SD-08 Manufacturer’s Instructions															
			Installation instructions	1.5.5														
			SD-09 Manufacturer’s Field															
			Reports															

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		26 29 23	ASD Test Plan	2.5.1	G													
			Standard Products	1.5.6														
			SD-10 Operation and Maintenance															
			Data															
			Adjustable Speed Drives	2.1														
		26 35 34	SD-03 Product Data															
			Filter Assemblies	2.3.4	G													
			SD-06 Test Reports															
			Factory Tests	2.1.1														
			Impulse Sparkover Voltage	2.4.1.3														
			ESA Extinguishing Test	2.4.1.4														
			ESA Extreme Duty Discharge	2.4.1.5														
			Test															
			SD-10 Operation and Maintenance															
			Data															
			Operating and Maintenance	3.3	G													
			Manuals															
			Service Organization	2.2.1	G													
		26 36 00	SD-02 Shop Drawings															
			Manual Transfer Switch Drawings	1.4.2	G													
			SD-03 Product Data															
			Manual Transfer Switches	2.1	G													
			SD-06 Test Reports															
			Acceptance Checks and Tests	3.2.1	G													
			Functional Acceptance Tests	3.2.2	G													
			SD-07 Certificates															

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		26 36 00	Proof of Listing	1.4.1	G													
			SD-10 Operation and Maintenance															
			Data															
			Operation and Maintenance	1.3	G													
			Manual															
		26 41 00	SD-06 Test Reports															
			Lightning Protection and	1.4.2	G													
			Grounding System Test Plan															
			Grounding Systems Testing	3.5.2	G													
			SD-07 Certificates															
			Component UL Listed and	1.4.1	G													
			Labeled															
			Lightning Protection System	1.4.3	G													
			Inspection Certificate															
			Roof Manufacturer's Warranty	3.1.1.1	G													
		26 42 14.00 10	SD-02 Shop Drawings															
			Drawings	1.3.6	G													
			Contractor's Modifications	2.1.1	G													
			SD-03 Product Data															
			Equipment	2.1	G													
			Spare Parts	1.5														
			SD-06 Test Reports															
			Tests and Measurements	3.5	G													
			Contractor's Modifications	2.1.1	G													
			SD-07 Certificates															
			Cathodic Protection System	2.1														

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		26 42 14.00 10	Services of 'Corrosion Expert'	1.3.1	G													
			SD-10 Operation and Maintenance															
			Data															
			Cathodic Protection System	2.1	G													
			Training Course	3.6	G													
		26 51 00	SD-02 Shop Drawings															
			Luminaire Drawings	1.5.1	G													
			Occupancy/Vacancy Sensor	1.5.8	G													
			Coverage Layout															
			Lighting Control System One-Line	1.7.2	G													
			Diagram															
			Sequence of Operation for	2.5.1	G													
			Lighting Control System															
			SD-03 Product Data															
			Luminaires	2.2	G													
			Light Sources	2.3	G													
			LED Drivers	2.4	G													
			Luminaire Warranty	1.6.1	G													
			Lighting Controls Warranty	1.6.2	G													
			Local Area Controller	2.5.1.1.1	G													
			Lighting Contactor	2.5.1.2	G													
			Switches	2.5.2.1	G													
			Digital Switch Timers	2.5.2.2	G													
			Wall Box Dimmers	2.5.2.3	G													
			Occupancy/Vacancy Sensors	2.5.2.4	G													
			Photosensors	2.5.2.5	G													

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		26 51 00	Power Packs	2.5.2.4.5	G													
			Exit Signs	2.6.1	G													
			Emergency Drivers	2.6.2	G													
			SD-05 Design Data															
			Luminaire Design Data	1.5.2	G													
			Photometric Plan	1.5.7	G													
			SD-06 Test Reports															
			ANSI/IES LM-79 Test Report	1.5.3	G													
			ANSI/IES LM-80 Test Report	1.5.4	G													
			ANSI/IES TM-21 Test Report	1.5.5	G													
			Occupancy/Vacancy Sensor	3.2.1.1	G													
			Verification Test															
			Photosensor Verification Test	3.2.1.1	G													
			SD-07 Certificates															
			LED Driver and Dimming Switch	1.5.6	G													
			Compatibility Certificate															
			SD-10 Operation and Maintenance															
			Data															
			Lighting System	1.7.1	G													
			Lighting Control System	1.7.2	G													
			Maintenance Staff Training Plan	3.3.2.1	G													
			End-User Training Plan	3.3.2.2	G													
		26 56 00	SD-02 Shop Drawings															
			Luminaire Drawings	1.5.1.1	G													
			Pole Drawings	1.5.1.2	G													
			SD-03 Product Data															

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		26 56 00	Luminaires	2.2	G													
			Light Sources	2.3	G													
			LED Drivers	2.4	G													
			Luminaire Warranty	1.7.1	G													
			Lighting Controls Warranty	1.7.2	G													
			Pole Warranty	1.7.3	G													
			Lighting Contactor	2.5.1.1	G													
			Poles	2.6	G													
			Brackets	2.6.2														
			SD-05 Design Data															
			Luminaire Design Data	1.5.2	G													
			Photometric Plan	1.5.3	G													
			SD-10 Operation and Maintenance															
			Data															
			Maintenance Staff Training Plan	3.3.1.1	G													
			End-User Training Plan	3.3.1.2	G													
		27 10 00	SD-02 Shop Drawings															
			Telecommunications Drawings	1.6.1.1	G													
			Telecommunications Space	1.6.1.2	G													
			Drawings															
			SD-03 Product Data															
			Telecommunications Cabling	2.3	G													
			Patch Panels	2.4.4	G													
			Telecommunications	2.5	G													
			Outlet/Connector Assemblies															
			Connector Blocks	2.4.2	G													

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		27 10 00	Spare Parts	1.10.3	G													
			SD-06 Test Reports															
			Telecommunications Cabling	3.5.1	G													
			Testing															
			SD-07 Certificates															
			Telecommunications Contractor	1.6.2.1	G													
			Key Personnel	1.6.2.2	G													
			Manufacturer Qualifications	1.6.2.3	G													
			Test Plan	1.6.3	G													
			SD-09 Manufacturer's Field															
			Reports															
			Factory Reel Tests	2.11.1	G													
			SD-10 Operation and Maintenance															
			Data															
			Telecommunications Cabling and	1.10.1	G													
			Pathway System															
			SD-11 Closeout Submittals															
			Record Documentation	1.10.2	G													
		28 10 05	SD-02 Shop Drawings															
			ESS Components	1.3.3.1	G													
			Overall System Schematic	1.3.3.2	G													
			SD-05 Design Data															
			Backup Battery Capacity	1.5.1	G													
			Calculations															
			CCTV Storage Calculations	1.5.2														
			SD-07 Certificates															

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		28 10 05	Contractor Qualifications	1.3.4.1	G													
			Instructor Qualifications	1.3.4.2	G													
			SD-10 Operation and Maintenance															
			Data															
			Training Plan	3.5.1	G													
			Training Content	3.5	G													
			ESS Components	1.3.3.1	G													
			ESS Software	1.6	G													
			SD-11 Closeout Submittals															
			As-Built Drawings	1.7	G													
		28 31 76	SD-01 Preconstruction Submittals															
			Qualified Fire Protection Engineer	1.3.2	G													
			(QFPE)															
			Fire alarm system designer	1.8.2.1	G													
			Supervisor	1.8.2.2	G													
			Technician	1.8.2.3	G													
			Installer	1.8.2.4	G													
			Test Technician	1.8.2.5	G													
			Fire Alarm System Site-Specific	1.7	G													
			Software Acknowledgement															
			SD-02 Shop Drawings															
			Nameplates	1.8.1.3	G													
			Instructions	2.2.4	G													
			Wiring Diagrams	1.8.1.4	G													
			System Layout	1.8.1.5	G													
			Notification Appliances	1.8.1.6	G													

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		28 31 76	Initiating devices	1.8.1.7	G													
			Amplifiers	1.8.1.8	G													
			Battery Power	1.8.1.9	G													
			Voltage Drop Calculations	1.8.1.10	G													
			SD-03 Product Data															
			Fire Alarm and Mass Notification	2.3	G													
			Control Unit (FACU)															
			Local Operating Console (LOC)	1.4.4	G													
			Amplifiers	1.8.1.8	G													
			Tone Generators	2.5	G													
			Digitalized voice generators	2.5	G													
			Remote Annunciator		G													
			Manual Stations	2.6	G													
			Smoke Detectors	2.7	G													
			Duct Smoke Detectors	2.7.2	G													
			Heat Detectors	2.17.2	G													
			Carbon monoxide detector	2.9	G													
			Addressable Interface Devices	2.10	G													
			Addressable Control Modules	2.11	G													
			Isolation Modules	1.8.1.5	G													
			Notification Appliances	1.8.1.6	G													
			Textual Display Sign Control	2.12.3	G													
			Panel															
			Textual Display Signs	2.12.3	G													
			Batteries	2.14.1	G													
			Battery Chargers	2.14.2	G													

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		28 31 76	Auxiliary Power Supply Panels	2.14.1.1	G													
			Surge Protective Devices	2.15	G													
			Alarm Wiring	2.15	G													
			Back Boxes and Conduit	3.3.4	G													
			Ceiling Bridges	3.2.9	G													
			Terminal Cabinets	3.3.2	G													
			Automatic Fire Alarm		G													
			Transmitters															
			Environmental Enclosures or		G													
			Guards															
			Document Storage Cabinet	3.10.3	G													
			Radio Transmitter And Interface	2.17.1	G													
			Panels															
			SD-06 Test Reports															
			Test Procedures	3.6.1	G													
			SD-07 Certificates															
			Verification of Compliant	3.6.2.1	G													
			Installation															
			Request for Government Final	3.6.2.2	G													
			Test															
			SD-10 Operation and Maintenance															
			Data															
			Operation and Maintenance	1.8.1.12	G													
			(O&M) Instructions															
			Operation and Maintenance	3.8	G													
			(O&M) Instructions															

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		28 31 76	Instruction of Government	3.9	G													
			Employees															
			SD-11 Closeout Submittals															
			As-Built Drawings	1.8.1.13														
			Spare Parts	1.10.1														
		31 00 00	SD-01 Preconstruction Submittals															
			Excavation and Trenching Plan	3.1.3	G													
			Borrow Plan	3.2	G													
			Jacking, Boring, and Tunneling	3.4.3	G													
			Plan															
			Rock Excavation Plan	3.4.7	G													
			Disposition of Surplus Materials	3.9	G													
			Preconstruction Meeting	1.6.3	G													
			SD-03 Product Data															
			Geotextiles	2.4														
			SD-04 Samples															
			Geotextiles	2.4														
			SD-06 Test Reports															
			Material Test Report	3.10	G													
			Pipe Inspection Report	3.6.1.7	G													
		31 11 00	SD-01 Preconstruction Submittals															
			Herbicide Application Plan	3.1.1														
			SD-03 Product Data															
			Herbicides	1.3.2	G													
			SD-07 Certificates															
			Qualifications	1.3.2	G													

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		31 11 00	SD-11 Closeout Submittals															
			Pest Management Report	3.5.1														
		32 01 16.71	SD-01 Preconstruction Submittals															
			Equipment	2.1	G													
			Proposed Techniques	3.2	G													
			Quality Control Plan	3.1.1	G													
			Qualifications	1.5.1	G													
			SD-06 Test Reports															
			QC Monitoring	3.5.1														
			Test Section Results	3.4	G													
		32 11 23	SD-03 Product Data															
			Plant, Equipment, and Tools	2.4	G													
			Waybills and Delivery Tickets	1.1.1														
			SD-06 Test Reports															
			Initial Tests	2.3.1	G													
			In-Place Tests	3.12.1	G													
		32 12 16.16	SD-02 Shop Drawings															
			Placement Plan	2.1	G													
			SD-03 Product Data															
			Diamond Grinding Plan	2.1.5	G													
			Mix Design	2.5	G													
			Contractor Quality Control	3.1	G													
			SD-04 Samples															
			Aggregates	2.2														
			Asphalt Cement Binder	2.3														
			Warm-mix Additive	2.5.1														

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		32 12 16.16	SD-06 Test Reports															
			Aggregates	2.2	G													
			QC Monitoring	3.1.3.9														
			SD-07 Certificates															
			Asphalt Cement Binder	2.3	G													
			Laboratory Accreditation and	1.3.11														
			Validation															
			Warm-mix Additive	2.5.1														
		32 15 00	SD-03 Product Data															
			Plant, Equipment, and Tools	1.4	G													
			SD-06 Test Reports															
			Initial Tests	2.3.1	G													
			In-Place Tests	3.10.1	G													
		32 16 19	SD-03 Product Data															
			Concrete	2.1														
			SD-06 Test Reports															
			Field Quality Control	3.8														
		32 17 23	SD-03 Product Data															
			Surface Preparation Equipment	2.1.1.1	G													
			List															
			Application Equipment List	2.1.2	G													
			Exterior Surface Preparation	3.2														
			Safety Data Sheets	1.3.1	G													
			Reflective media for roads	2.2.2.1	G													
			Waterborne Paint	2.2.1	G													
			SD-06 Test Reports															

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		32 17 23	Reflective Media for Roads	2.2.2.1	G													
			Waterborne Paint	2.2.1	G													
			SD-07 Certificates															
			Qualifications	1.3.2	G													
			Reflective Media for Roads	2.2.2.1														
			Waterborne Paint	2.2.1														
			Volatile Organic Compound	1.3.1	G													
			SD-08 Manufacturer's Instructions															
			Waterborne Paint	2.2.1	G													
		32 31 13	SD-02 Shop Drawings															
			Fence Assembly	2.1	G													
			Location of Corner, End, and Pull	3.2.1.1	G													
			Posts															
			Erection/Installation Drawings	Part 3	G													
			SD-03 Product Data															
			Fence Assembly	2.1	G													
			Zinc Coating	2.3.1	G													
			Fabric	2.2.1	G													
			Stretcher Bars	2.2.6	G													
			Concrete	2.3.2	G													
			SD-04 Samples															
			Fabric	2.2.1	G													
			Posts	2.2.2	G													
			Braces	2.2.3	G													
			Line Posts	2.2.2.1.1	G													
			Sleeves	2.2.5	G													

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		32 31 13	Top Rail	2.2.3.1	G													
			Tension Wire	2.2.8	G													
			Stretcher Bars	2.2.6	G													
			Wire Ties	2.2.4	G													
			SD-07 Certificates															
			Certificates of Compliance	1.3.1														
			SD-08 Manufacturer's Instructions															
			Fence Assembly	2.1														
			Hardware Assembly	2.1														
			Accessories	2.1														
			SD-11 Closeout Submittals															
			Recycled Material Content	3.3														
		32 92 19	SD-03 Product Data															
			Wood Cellulose Fiber Mulch	2.5.3														
			Fertilizer	2.4														
			SD-06 Test Reports															
			Topsoil Composition Tests	2.2.3														
			SD-07 Certificates															
			Seed	2.1														
		33 11 00	SD-01 Preconstruction Submittals															
			Connections	3.1.1	G													
			SD-03 Product Data															
			Pipe, Fittings, Joints and	2.1.1	G													
			Couplings															
			Valves	2.1.2	G													
			Valve Boxes	2.1.2.4	G													

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		33 11 00	Corporation Stops	2.2.3.1	G													
			Backflow Preventer	1.4.2.1.1	G													
			SD-06 Test Reports															
			Backflow Preventer Tests	3.3.1.3	G													
			Bacteriological Samples	3.3.1.2	G													
			Hydrostatic Test	3.3.1.1														
			SD-07 Certificates															
			Pipe, Fittings, Joints and	2.1.1														
			Couplings															
			Lining for Fittings	2.1.1.1.1.2														
			Valves	2.1.2														
			Backflow Prevention Training	1.4.2.1.1.2														
			Certificate															
			Backflow Tester	1.4.2.1.1.1														
			Displacement Type Meters	2.1.3.1														
			NFPA 20 and NFPA 24	3.2.1.4														
			Contractor's Material and Test															
			Certificates for Underground															
			Piping															
			SD-08 Manufacturer’s Instructions															
			PVC Piping	2.1.1.1.1.1														
			PVC Piping For Service Lines	2.1.1.1.2														
		33 11 23	SD-03 Product Data															
			Valve Box	2.7														
			Pressure Regulator	2.4.3														
			Gas Equipment Connectors	2.6														

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		33 11 23	Valves	2.4														
			Warning and Identification Tape	2.9														
			Risers	2.2.3														
			Transition Fittings	2.2.4														
			Gas meter	2.5														
			SD-07 Certificates															
			Welder's Qualifications	1.4.1														
			PE Welder's Qualifications	1.4.2														
			Welder's Identification Symbols	1.4.1														
			SD-08 Manufacturer’s Instructions															
			PE Pipe and Fittings	2.2.2														
		33 30 00	SD-01 Preconstruction Submittals															
			Contractor's License	1.3.1	G													
			SD-02 Shop Drawings															
			Installation Drawings	3.1.1	G													
			SD-03 Product Data															
			Precast Concrete Manholes	2.2.5														
			Frames, Covers, and Gratings	2.2.9														
			Gravity Pipe	2.2.1														
			SD-06 Test Reports															
			Precast Concrete Sewer Manhole	3.3.1.1.2	G													
			Test															
			Infiltration Tests And Exfiltration	3.3.1.1.1	G													
			Tests															
			Negative Air Pressure Test	3.3.1.1.2	G													
			SD-07 Certificates															

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		33 30 00	Portland Cement	2.2.3														
		33 40 00	SD-06 Test Reports															
			Leakage Test	3.8.1.1	G													
			SD-07 Certificates															
			Hydrostatic Test on Watertight	2.4.1	G													
			Joints															
			Frame and Cover or Gratings	2.3.6	G													
			SD-08 Manufacturer's Instructions															
			Placing Pipe and Box Culvert	3.3	G													
			SD-11 Closeout Submittals															
			Post-Installation Inspection	3.8.2.1.2	G													
			Report															
			LID Verification Report	3.8.2.2	G													
		33 71 02	SD-02 Shop Drawings															
			Precast Underground Structures	1.5.1	G													
			SD-03 Product Data															
			Precast Concrete Structures	2.6.1.1	G													
			Sealing Material	2.6.1.4														
			Pulling-In Irons	3.2.2														
			Manhole Frames and Covers	2.6.2	G													
			Handhole Frames and Covers	2.6.3	G													
			Composite/Fiberglass Handholes	2.6.5	G													
			Cable Supports	2.7	G													
			SD-06 Test Reports															
			Field Acceptance Checks and	3.9.1	G													
			Tests															

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		33 71 02	Arc-proofing Test	2.9.1	G													
			SD-07 Certificates															
			Cable Installer Qualifications		G													

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SECTION 01 33 29

SUSTAINABILITY REQUIREMENTS AND REPORTING
02/21

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 189.1	(2014) Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings

COUNCIL ON ENVIRONMENTAL QUALITY (CEQ) (WHITE HOUSE)

HPSB Guiding Principles	(2020) Guiding Principles for Sustainable Federal Buildings and Determining Compliance with the Guiding Principles for Sustainable Federal Buildings

INTERNATIONAL CODE COUNCIL (ICC)

ICC IgCC	(2018) International Green Construction Code

U.S. DEPARTMENT OF AGRICULTURE (USDA)

FSRIA 9002	Farm Security and Rural Investment Act Section 9002 (USDA BioPreferred Program)

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 1-200-02	(2020; with Change 1, 2020; Change 2, 2022) High Performance and Sustainable Building Requirements
UFC 3-600-01	(2016; with Change 6, 2021) Fire Protection Engineering for Facilities

U.S. DEPARTMENT OF ENERGY (DOE)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 247	Comprehensive Procurement Guideline for Products Containing Recovered Materials

1.2 SUMMARY

This section includes requirements for Sustainability documentation and reporting submittals per the federally mandated High Performance and Sustainable Building (HPSB) or HPSB "Guiding Principles" (GP), and Third Party Certification (TPC) requirements, in accordance with UFC 1-200-02 High Performance and Sustainable Building Requirements, and other identified requirements. Reference the GBCI TECHNICAL GUIDE - New Construction and Renovations Guiding Principles Implemented by UFC 1-200-02, Jun 2022 for Third Party Construction Phase compliance goals.

The Construction Contractor shall familiarize itself with the relevant requirements and provide the necessary information and instruction to all subcontractors and installers.

Free standing furniture and furnishings are not included in the construction contract.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval.Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Preliminary High Performance and Sustainable Building Checklist; G, S

Sustainability Action Plan; G, S

Preliminary Sustainability eNotebook; G, S

SD-06 Test Reports

Third Party Certification Design Compliance Report;

SD-11 Closeout Submittals

Final High Performance and Sustainable Building Checklist;

Final Sustainability eNotebook; G

Third Party Certification Certificate, Assessment, or Validation and Compliance Report; G

1.4 GUIDING PRINCIPLES VALIDATION (GPV)

Provide the following sustainability activities and documentation to verify achievement of HPSB Guiding Principles Validation (GPV):

Refer to attachment 1, HPSB Checklist at the end of this specification section.

a. Analysis of each Guiding Principle Requirement and how project complies. Include final government approved narrative(s) in the HPSB

Checklist submittal. Multiple checklists indicate multiple buildings that require individual HPSB Checklist tracking.

b. No changes to the HPSB Checklist are allowed without approval from the Contracting Officer, in accordance with Section 01 33 00 SUBMITTAL REQUIREMENTS. Immediately bring to the attention of the Contracting Officer any project changes that impact meeting the approved HPSB Guiding Principles Requirements for this project. Demonstrate the change will not increase the life-cycle cost and maintains or improves the building performance.

c. Documentation of all work required to incorporate the applicable HPSB Guiding Principles requirements indicated on the HPSB Checklist and in this contract, including all "S" submittals.

d. Sustainability Action Plan.

e. Construction related documentation for the project Sustainability eNotebook and keep updated with regularly-scheduled Construction Quality Control Meetings. Include construction related documentation containing the following components:

(1) HPSB Checklist(s)

(2) Sustainability Action Plan

(3) Documentation illustrating HPSB Guiding Principles Requirements compliance, including "S" submittals

1.4.1 Sustainability Action Plan

Include the following information in the Sustainability Action Plan:

a. Analysis of each HPSB Guiding Principles Requirement and how project will comply. Final government approved narrative(s) must be included in the HPSB Checklist submittal.

b. Name and contact information for: Contractor's Point of Contact (POC) ensuring sustainability goals are accomplished and documentation is assembled. For TPC that include on-site visit by third party representative, provide list of required attendees.

c. Indoor Air Quality plan.

1.5 SUSTAINABILITY SUBMITTALS

Provide HPSB Checklist and other documentation in the Sustainability eNotebook to indicate compliance with the sustainability requirements of the project.

1.5.1 High Performance Sustainable Building (HPSB) Checklist

Provide construction documentation that provides proof of, and supports compliance with, the completed HPSB Checklist.

1.5.1.1 HPSB Checklist Submittals

Submit updated HPSB Checklist with each Sustainability eNotebook submittal. Include the final HPSB Checklist(s) with the interim DD1354

Real Property Record Submittal.

1.5.2 "S" Submittals for Sustainability Documentation

"S" submittals are the sustainability documentation requirements cited in the various sections of this contract. Submit the GPV and TPC sustainability documentation required in this section as "S" submittals in all affected UFGS Sections.

a. Highlight GPV and TPC compliance data in "S" submittal.

b. Add "S" submittals to the Sustainability eNotebook only after submittal approval, and bookmark them as required in paragraph SUSTAINABILITY ENOTEBOOK below.

c. Ensure all approved "S" submittals are included in each Sustainability eNotebook submittal.

1.5.3 Sustainability eNotebook

The Sustainability eNotebook is an electronic organizational file that serves as a repository for all required sustainability submittals. To support documentation of compliance with an approved HPSB and TPC checklist, provide and maintain a comprehensive and current Sustainability eNotebook. Include all required data in Sustainability eNotebook, to support full compliance with the HPSB Guiding Principles Requirements, including:

a. HPSB checklist

b. Sustainability Action Plan

c. Calculations

d. Labels

e. "S" submittals

f. Certifications, assessments, or validations and compliance report

g. TPC documentation required in paragraph THIRD PARTY CERTIFICATION (TPC).

1.5.3.1 Sustainability eNotebook Format

Provide Sustainability eNotebook in the form of an Adobe PDF file; bookmark each HPSB Guiding Principles Requirement, TPC requirement, and sub-bookmark at each document. Match format to HPSB Guiding Principles numbering system indicated herein. Maintain up-to-date information, such as spreadsheets, templates, with each current submittals. For TPC projects, provide a second Table of Contents using TPC numbering system, for maintaining documentation unique to TPC.

Contracting Officer may deduct from the monthly progress payment accordingly if Sustainability eNotebook information is not current and on track per project goals.

1.5.3.2 Sustainability eNotebook Submittal Schedule

Provide Sustainability eNotebook Submittals at the following milestones of the project:

a. Preliminary Sustainability eNotebook

Submit preliminary Sustainability eNotebook with updated Preliminary High Performance and Sustainable Building Checklist and TPC checklist at the first post award meeting in accordance with Section 01 30 00 ADMINISTRATIVE REQUIREMENTS.

b. Final Sustainability eNotebook

Submit updated Sustainability eNotebook at the Beneficial Occupancy Date (BOD). Final progress payment retainage may be held by Contracting Officer until final sustainability documentation is complete. Submit three electronic copies of the Final Sustainability eNotebook on DVDs to the Government. Include Final High Performance and Sustainable Building Checklist.

c. Third Party Certification Design Compliance Report

Obtain Third Party Certification Design Compliance Report after final design submittal is approved. Submittal must indicate 100 percent compliance with applicable design requirements. File approved submittal in the Sustainability eNotebook.

d. Construction Quality Control Meetings.

Provide up-to-date GP and TPC documentation in the Sustainability eNotebook and TPC Online tool for each meeting.

e. Final Sustainability eNotebook

Submit updated Sustainability eNotebook with updated Final High Performance and Sustainable Building Checklist with TPC Checklist. Final progress payment retainage may be held by Contracting Officer until Final Sustainability construction phase documentation is complete.

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1.6 DOCUMENTATION REQUIREMENTS

a. Incorporate each of the following HPSB Guiding Principles requirements into project and provide documentation that proves compliance with each listed requirement. Items below are organized by HPSB Guiding Principles. For life-cycle cost analysis requirements, one document with all analyses is acceptable, with Contracting Officer approval.

b. For each of the following paragraphs that require the use of products listed on Government-required websites, provide documentation of the process used to select products, or process used to determine why listed products do not meet project performance requirements.

1.6.1 Commissioning (Cx)

Develop and incorporate Commissioning requirements into the documents, in

accordance with Section 01 91 00.15 BUILDING COMMISSIONING.

1.6.2 Energy Efficient Products

Provide only energy-using products that are Energy Star rated or have Federal Energy Management Program (FEMP) recommended efficiency. Where Energy Star or FEMP recommendations have not been established, provide most efficient products that are life-cycle cost-effective. Provide only energy using products that meet FEMP requirements for low standby power consumption. Energy efficient products can be found at: https://www.energy.gov/eere/femp/federal-energy-management-program and http://www.energystar.gov/.

For construction submittal documentation, provide proof that product is labeled energy efficient and complies with the cited requirements.

1.6.3 Building-level Power Metering

Provide building-level meters for electricity, natural gas, and steam where applicable.

1.6.3.1 Construction Submittal Documentation

Provide manufacturer's data validating compatibility with base-wide system and component advanced meter requirements.

1.6.4 Indoor Water Use

Provide Construction Documentation proof that fixtures are labeled EPA WaterSense, for products available with EPA WaterSense labeling; for all other fixtures, proof they comply with EPA WaterSense efficiency requirements.

1.6.5 Indoor Water Metering

Provide building-level meters for potable water use. Provide the requirements cited in the following paragraphs:

1.6.5.1 Construction Submittal Documentation

Provide manufacturer's data validating compatibility with base-wide system and component advanced meter requirements.

1.6.6 Outdoor Water Use

Where new irrigation is required, provide only non-potable sources. Provide the requirements cited in the following paragraphs:

1.6.6.1 Construction Submittal Documentation

Provide manufacturer's data validating compatibility with base-wide system and component advanced meter requirements.

1.6.7 Outdoor Water Meters

Provide meters for outdoor systems that use potable water. Provide the requirements cited in the following paragraphs:

1.6.7.1 Construction Submittal Documentation

Provide manufacturer's data validating compatibility with base-wide system and component advanced meter requirements.

1.6.8 Moisture Control

Provide the following:

1.6.8.1 Construction Submittal Documentation

Ensure construction materials are separated and protected in accordance with other sections in this contract document, with adequate humidity controls during construction. In accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA, includes plan for ongoing building moisture control.

Coordinate with the moisture control requirements of Section 01 45 00 QUALITY CONTROL.

1.6.9 Reduce Volatile Organic Compounds (VOC) (Low-Emitting Materials)

Meet the requirements of Table 3-1 at the end of this specification.

For Construction submittal documentation, provide certifications or labels that demonstrate compliance with cited requirements, based on the attached TABLE 3-1.

1.6.10 Indoor Air Quality During Construction

Prior to construction, create indoor air quality plan. Develop and implement an IAQ construction management plan during construction and flush building air before occupancy.

For new construction indoor air quality plan must meet the requirements of ASHRAE 189.1 and ICC IgCC 1001.3.1.5 (10.3.1.4) Indoor Air Quality (IAQ) Construction Management with maximum outdoor air consistent with achieving relative humidity no greater than 60 percent.

Provide documentation showing that after construction ends and prior to occupancy, HVAC filters were replaced and building air was flushed out in accordance with the cited standard.

1.6.11 Recycled Content

Comply with 40 CFR 247. Refer to: https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program for assistance identifying products cited in 40 CFR 247. Selected products must comply with non-proprietary requirements of the Federal Acquisition Regulation and must meet performance requirements.

1.6.11.1 Construction Submittal Documentation

a. Provide manufacturers' documents stating the recycled content by material, or written justification for claiming one of the exceptions allowed on the cited website.

b. Substitutions: Submit for Government approval for proposed alternative products or systems that provide equivalent performance and appearance

and have greater contribution to project recycled content requirements. For all such proposed substitutions, submit with the Sustainability Action Plan accompanied by product data demonstrating equivalence.

c. In order to complete compliance with FAR 52.223-9 Estimate of Percentage of Recovered Material Content for EPA Designated Items, refer to submittal requirement for recycled/recovered material content in Section 01 78 00 CLOSEOUT SUBMITTALS.

1.6.12 Bio-Based Products

Provide products and materials composed of the highest percentage of bio-based materials (including rapidly renewable resources and certified sustainability harvested products), consistent with FSRIA 9002 USDA BioPreferred Program, to the maximum extent possible without jeopardizing the intended end use or detracting from the overall quality delivered to the end user and when available at a reasonable cost. Use only supplies and materials of a type and quality that conform to applicable specifications and standards.

Comply with FSRIA 9002 USDA BioPreferred Program. Refer to www.biopreferred.gov for the product categories and BioPreferred Catalog. Selected products must comply with non-proprietary requirements of the Federal Acquisition Regulation and must meet performance requirements. Provide the following documentation:

a. USDA BioPreferred label for each product; for bio-based products used on project but not listed with BioPreferred program, provide bio-based content and percentage.

b. In order to complete compliance with FAR 52.223-1 Biobased Product Certification, refer to submittal requirement for biobased products in Section 01 78 00 CLOSEOUT SUBMITTALS, paragraphs CERTIFICATION OF EPA DESIGNATED ITEMS and CERTIFICATION OF USDA DESIGNATED ITEMS.

1.6.13 Waste Material Management (Recycling – Construction)

Divert demolition and construction debris from landfill disposal where markets or on site recycling exist, provide documentationin accordance with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

1.6.14 Additional Sustainability Requirements

Provide the additional sustainability requirements cited in this paragraph.

1.6.14.1 Third Party Certification (TPC) Documentation

Third Party Certification certificate, assessment, or validation, and compliance report requirements are in addition to all requirements under header above GUIDING PRINCIPLES VALIDATION (GPV).

1.6.14.1.1 TPC Management and Certification

Execute the following TPC Certification, assessment, or validation requirements:

a. Refer to TPC Checklist at the end of this specification section. (Multiple checklists indicate multiple buildings that require TPC.)

b. Immediately bring to the attention of the Contracting Officer any project changes that impact meeting the approved TPC Requirements for this project. Demonstrate the change will not increase the life-cycle cost and maintains or improves the building performance.

c. Complete all work required to incorporate the applicable TPC Requirements.

d. Maintain the construction related information in the Sustainability eNotebook pertaining to additions and changes to the approved sustainability requirements. When construction changes are made that affect design sustainability requirements, provide all required updates to affected design requirements and update in the Sustainability eNotebook. Maintain the Sustainability eNotebook in electronic format. For more explanation, refer to paragraph SUSTAINABILITY eNOTEBOOK. Provide the following components in the Sustainability eNotebook, in addition to the GPV components above:

(1) TPC Checklist

(2) Completed TPC forms. Transmit by the method required by the TPC organization.

(3) Copy of all correspondence with the TPC organization including proof of TPC registration

(4) Documentation illustrating compliance with TPC requirements and additional documentation as requested by the TPC

(5) TPC Award Certificate, assessment, or validation and compliance report.

e. Provide the following information in the Sustainability Action Plan. Provide this TPC information in addition to the Sustainability Action Plan items above:

(1) Planned method to achieve each TPC requirement.

(2) For each TPC requirement that is attempted but not achieved, provide narrative explaining how mission or activity precludes achieving specific sustainability requirement or goal. Provide analysis of particular requirement and level to which project is able to comply.

(3) Provide name and contact information for: Sustainability point of contact (POC) and other names of sustainability professionals responsible for ensuring TPC sustainability goals are accomplished and documentation is assembled. Sustainability POCs are also responsible for ensuring GPV required in paragraph GUIDING PRINCIPLES VALIDATION (GPV) above.

f. Bear all costs associated with construction changes that affect sustainability requirements, constructing, demonstrating, and documenting that project complies with approved TPC requirements, including but not limited to:

(1) All Construction Phase Review, certification, or validation fees.

(2) Online (or offline with secure facilities) TPC management and documentation.

(3) Obtaining TPC certification or validation based on Government-approved sustainability goals.

(4) Construction work required to incorporate TPC requirements.

(5) Submittals required to demonstrate compliance with Government approved TPC checklists.

g. Provide all calculations, product data, and certifications, assessments, or validations required in this specification to demonstrate compliance with the TPC Requirements.

h. Provide all TPC management and documentation. Transmit TPC requirements by the method required by TPC organization.

i. Provide all required responses to third party organization.

j. Facilitate and participate in required TPC site visit. Coordinate with the Contract Officer to determine participating team members. Include Commissioning provider on applicable projects.

k. Provide TPC Certificate, assessment, or validation. Provide TPC compliance report that includes level achieved and reasons for non-compliance or not applicable elements. Use format below to create the Certificate, assessment or validation, compliance report, and Letter of Congratulations (when provided). Forward to parties designated by Contracting Officer:

(1) Certificate, Assessment or Validation:

Project Title, first line: P-(X); Form DD1391 Project Name).

Project Title, second line: UIC (Installation code)

(2) Letter Congratulations (when provided):

Address letter to Facility's Installation Commander Name. Address the letter to an individual person.

(3) Compliance Report:

Title page must cite Project title: P-(X); (1391 Project Name); Final Building Name if known; UIC (installation code); Owner Service; User organization if known; date of compliance.

Include TPC scoresheet if applicable.

l. Once Final Certification is achieved, turn over Administrative rights to online TPC to the Base Civil Engineer or designee, contact information provided by the Contracting Officer.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 SUSTAINABILITY COORDINATION

Provide sustainability focus and coordination at all meetings to achieve sustainability goals. Coordinate meeting requirements with other UFGS Sections meeting requirements in this project. Ensure the designated TPC accredited sustainability professional responsible for GP and TPC documentation participates in these meetings to coordinate documentation completion. Review GP and TPC sustainability requirements, HPSB Checklist and TPC documentation, Sustainability Action Plan, and completeness status of Sustainability eNotebook, and TPC status at the following meetings:

a. Pre-Construction Conference

b. Construction Quality Control Meetings

f. TPC On-site Visit

Execute, coordinate, and facilitate on-site visit by third party representative no later than 60 days before final turnover, or as required by TPC organization, whichever is greater.

g. Facility Turnover Meetings

Conduct review no later than 60 days before final turnover and identify any outstanding issues that affect correct completion of all documentation and final TPC certification, assessment or validation, and actions that will achieve requirements. Conduct corrective actions prior to turnover, to ensure all requirements are achieved.

3.2 THIRD PARTY CERTIFICATION CERTIFICATE, ASSESSMENT, OR VALIDATION AND COMPLIANCE REPORT

Finalize the process requirements and obtain the TPC Certificate, assessment, or validation, and compliance report, indicating completion of the project's sustainability goals. Include TPC compliance report with final TPC scoresheet as applicable.

Deliver one original certificate, assessment, or validation, and compliance report to Contractor Officer, unless otherwise instructed.

3.3 TABLE 3-1 VOLATILE ORGANIC COMPOUNDS (VOC) (LOW EMITTING MATERIALS) REQUIREMENTS

TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements

Source: ICC IgCC Chapter 8 (Materials) (Interior Applications Only)

MATERIAL CATEGORY	EMISSIONS REQUIREMENT		MATERIALS WITH ADDED VOC REQUIREMENT	EMISSIONS REQUIREMENTS
Adhesives and Sealants	**CDPH/EHLB/Standard method V1.1 (California Section 01350)** (Use "office" or "classroom" space limits for all applications)	or	Adhesives (carpet, resilient, wood flooring; base cove; ceramic tile; drywall and panel; primers) Sealants (acoustical; firestop; HVAC Air duct; primers) Caulks	**SCAQMD Rule 1168** (Use "other" category for HVAC duct sealant) (for firestop adhesive, UFC 3-600-01 overrides conflicting requirements)
			Aerosol adhesives	**Section 3 of Green Seal Standard GS-36** (except: cleaners, solvent cements, and primers used with plastic piping and conduit in plumbing, fire suppression, and electrical systems; HVAC air duct sealants when the application space air temp is less than 40 F (4.5 C).

TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements

Source: ICC IgCC Chapter 8 (Materials) (Interior Applications Only)

MATERIAL CATEGORY	EMISSIONS REQUIREMENT		MATERIALS WITH ADDED VOC REQUIREMENT	EMISSIONS REQUIREMENTS
Paints and Coatings	**CDPH/EHLB/Standard method V1.1 (California Section 01350)** (Use "office" or "classroom" space limits for all applications)	or	Flat and nonflat, nonflat high-gloss, specialty, basement specialty, fire-resistive, floor, low-solids, rust preventative, wood, reflective wall coatings; concrete/masonry sealers; primers; sealers; undercoaters; shellacs (clear and opaque); stains; varnishes; conjugated oil varnish; lacquer; clear brushing lacquer	**Green Seal Standard GS-11**

TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements

Source: ICC IgCC Chapter 8 (Materials) (Interior Applications Only)

MATERIAL CATEGORY	EMISSIONS REQUIREMENT		MATERIALS WITH ADDED VOC REQUIREMENT	EMISSIONS REQUIREMENTS
Paints and Coatings	**CDPH/EHLB/Standard method V1.1 (California Section 01350)** (Use "office" or "classroom" space limits for all applications)	or	Concrete curing compounds; dry fog, faux finishing, graphic arts (sign paints), industrial maintenance, mastic texture, metallic pigmented, multicolor, recycled coatings; pretreatment wash primers, reactive penetrating sealers; specialty primers, wood preservatives, and zinc primers	**California Air Resources Board (CARB) Suggested Control Measure for Architectural Coatings** or **SCAQMD Rule 1113r**
Paints and Coatings	**CDPH/EHLB/Standard method V1.1 (California Section 01350)** (Use "office" or "classroom" space limits for all applications)	or	High-temperature coatings; stone consolidants; swimming-pool coatings; tub- and tile-refining coatings; and waterproofing membranes	**California Air Resources Board (CARB) Suggested Control Measure for Architectural Coatings**

TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements Source: ICC IgCC Chapter 8 (Materials) (Interior Applications Only)				
MATERIAL CATEGORY	**EMISSIONS REQUIREMENT**		**MATERIALS WITH ADDED VOC REQUIREMENT**	**EMISSIONS REQUIREMENTS**
Floor Covering Materials	For carpet, all locations: **CDPH/EHLB/Standard Method V1.1 (California Section 01350)** or label for **Section 9** of **CDPH/EHLB/Standard Method V1.1 (California Section 01350)**		none	none
Insulation	**CDPH/EHLB/Standard method V1.1** (California Section 01350) (Use "office" or "classroom" space limits for all applications)		none	none
Composite Wood, Wood Structural Panel, and Agrifiber Products, no added urea-formaldehyde resins including laminating adhesives for composite wood and agrifiber assemblies - particleboard, medium density fiberboard (MDF), wheatboard, strawboard, panel substrates, door cores		or	none	**CDPH/EHLB/Standard method V1.1** (California Section 01350) (Use "office" or "classroom" space limits for all applications) (except: Structural panel components such as plywood, particle board, wafer board, and oriented strand board identified as "EXPOSURE 1," "EXTERIOR," or "HUD-APPROVED" are considered acceptable for interior use.)

TABLE 3-1 Volatile Organic Compounds (VOC) (Low Emitting Materials) Requirements

Source: ICC IgCC Chapter 8 (Materials) (Interior Applications Only)

MATERIAL CATEGORY	EMISSIONS REQUIREMENT		MATERIALS WITH ADDED VOC REQUIREMENT	EMISSIONS REQUIREMENTS
Office Furniture Systems and Seating installed prior to occupancy	**ANSI/BIFMA X7.1 ANSI/BIFMA X7.1:** (95-percent of installed office furniture system workstations and seating units) **Section 7.6.2 of ANSI/BIFMA e3** (50-percent of office furniture system workstations and seating units)		none	none
Ceiling and Wall assemblies and systems including: acoustical treatments; ceiling panels and tiles; tackable wall panels and coverings; wall coverings; wall and ceiling paneling and planking	**CDPH/EHLB/Standard method V1.1 (California Section 01350)** (Use "office" or "classroom" space limits for all applications)		none	none

-- End of Section --

SECTION 01 33 39.00 10

ADVANCED MODELING (BIM/CIM/GIS/CAD) REQUIREMENTS
07/24

PART 1 GENERAL

This project requires delivery of intellectual materials which may include BIM, CIM, GIS, and CAD. This specification adresses the intended use by the construction contractor for these deliverables.

1.1 REFERENCES

The publications listed below form a part of this section to the extent referenced. The publications are referred to within the text by the basic designation only.

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 19005-3	(2012) Document Management -- Electronic Document File Format for Long-Term Preservation -- Part 3: Use of ISO 32000-1 with Support for Embedded Files (PDF/A-3)
ISO 32000-1	(2008) Document Management -- Portable Document Format -- Part 1: PDF 1.7

1.2 Protection of GIS Data

If provided by the client GIS source data and product data remain the property of the US Government. The contractor may be required to explain and demonstrate the company's process for protecting all geospatial data, including but not limited to geometry, attributes, metadata, topologies, and relational database schemas and operations used in association with this contract. The contractor may be required to sign a non-disclosure agreement attesting to the same before source data are released. Further information about security and nondisclosure requirements should be obtained from the COR. Some installation map data, source and/or product, may be considered by the government to be "Controlled Unclassified Information" (CUI) also known as "Sensitive but Unclassified" (SBU). The contractor is not authorized to release this information to any third party without the explicit consent of the COR. All source information must be returned to the Government or destroyed upon completion of this contract.

PART 2 PRODUCTS

2.1 GOVERNMENT FURNISHED MATERIALS

The Government may provide advanced modeling files as Government Furnished Material (GFM) for the Contractor's use in developing Record Drawings and/or As-Builts. The information and level of detail contained in the GFM shall be maintained in the Record Models and Record CAD files. The record CAD files are to be derived from the record models.

The Contractor has the option of preparing their own BIM/CIM models and

CAD drawings in lieu of utilizing GFM. Such drawings and models will also be held to the deliverable and quality requirements described herein.

2.1.1 GFM Handover

The Government may provide the GFM, upon request, after contract award. Proposing contractors may request access to the GFM (without amendments) during solicitation, for evaluation and assessment. If issued prior to award, files are for information only, and do not serve as contract documents.

The Contractor is responsible for reviewing the GFM and, if the Contractor chooses to use the GFM, maintaining the files in compliance with the this specification.

2.1.2 GFM File Formats

GFM File Formats

2.1.3 Variation with Contract Drawings and contractor use

Neither the Government nor the Designer of Record (Architects and Engineers)make any claim or warranty that any of the GFM are complete or fully consistent with the contract drawings. The digital files provided are not part of the contract documents. If there is any discrepancy between the BIM/CIM models, the CAD drawings, and the contract drawings, the contract drawings shall govern. The Government has no responsibility to modify any GFMs due to changes in the design that occur after award, and the Government shall assume no liability for the contents of the files provided.

Evaluate the content and quality of the GFM upon receipt. If major discrepancies or omissions occur in the GFM, notify the Contracting Officer and indicate the nature of such variation(s).

CONTRACTOR accepts all risk of incomplete, inaccurate, defective and variant information contained in the ELECTRONIC MEDIA, and waives, quits, and forever discharges and releases the Government, A/E, A/E's consultants and their officers, directors, employees and successors from every claim arising out of or related to any error, omission, conflict, discrepancy, inaccuracy, variation or other defect in the ELECTRONIC MEDIA, whether or not resulting in whole or in part from an act, error or omission of the A/E and whether or not such claim is known or unknown as of the date of this waiver and release.

REUSE: The ELECTRONIC MEDIA shall not be reused in any way. Use of ELECTRONIC MEDIA is limited specifically to the PROJECT according to the terms and conditions within this agreement.

TRANSMISSION AND OWNERSHIP OF ELECTRONIC DATA: The CONTRACTOR may disclose the ELECTRONIC MEDIA to its employees, consultants, or subcontractors in order to perform services or work solely and exclusively for the PROJECT, provided those employees, consultants, and subcontractors are subject to the restrictions on the disclosure and use of the ELECTRONIC MEDIA as set forth in this agreement. By transmitting ELECTRONIC MEDIA, the CONTRACTOR does not convey any ownership right in the ELECTRONIC MEDIA or in the software used to generate the ELECTRONIC MEDIA. Unless otherwise granted in a separate license, the CONTRACTOR'S right to use, modify, or further transmit the ELECTRONIC MEDIA is specifically limited to constructing the

PROJECT consistent with the terms of the CONTRACT and this agreement, and nothing contained in this agreement conveys any other right to use the ELECTRONIC MEDIA.

REPUBLICATION: CONTRACTOR agrees that republication or duplication resulting from distribution of the ELECTRONIC MEDIA is not authorized by the Government, A/E or A/E's consultants. In the event any republication or duplication of the ELECTRONIC MEDIA occurs in any form to any person including any part of shop drawings and submittals CONTRACTOR is obligated to furnish for the PROJECT, then, such republication or distribution shall be without legal liability to the A/E and A/E's consultants, and CONTRACTOR and its successors waive all claims, forever discharge, release and covenant they will assert no claim against the A/E or A/E's consultants and interpose no defense against any of them based on or arising out of the ELECTRONIC MEDIA or any defect, error, conflict, variance or omission therein.

DESTRUCTION OF ELECTRONIC MEDIA: No later than the OWNER'S final acceptance of the PROJECT, the CONTRACTOR shall provide the Government and A/E with a letter certifying that the ELECTRONIC MEDIA has been deleted and removed from all locations.

INDEMNIFICATION: CONTRACTOR shall, to the fullest extent permitted by law, defend, indemnify and hold the Government, A/E, A/E's consultants and their officers, directors, employees and successors harmless from all claims, damages, including bodily injury or death, losses and expenses, including attorney's fees, arising out of or resulting in whole or in part from the use, reuse, republication or distribution of the ELECTRONIC MEDIA. Unless otherwise agreed in writing, any use of, transmission of, or reliance on the ELECTRONIC MEDIA is at the CONTRACTOR'S sole risk.

NOT A SALE: Whether or not CONTRACTOR has paid the A/E or A/E's consultants any compensation or expenses for release of the ELECTRONIC MEDIA, the release shall not be deemed a sale of the ELECTRONIC MEDIA, the data therein, or drawings and specifications that may be printed therefrom. The A/E and A/E's consultants make no representations or warranties, either express or implied, respecting the ELECTRONIC MEDIA, including without limitation warranties of merchantability or suitability for a particular purpose.

DISPUTES: Due to the risk of damage, anomalies in transcription or copying and modification during use by CONTRACTOR whether intended or otherwise, it is agreed that the Government, and A/E's archived copy of the ELECTRONIC MEDIA if A/E chooses to maintain same shall be conclusive, unrebuttable proof in all disputes over the content of the ELECTRONIC MEDIA furnished to CONTRACTOR by this specification. In the event of discrepancies between the ELECTRONIC MEDIA and the INSTRUMENTS of the A/E's services, the INSTRUMENTS shall take precedence. ELECTRONIC MEDIA shall not be admissible in any form of dispute regardless of the information, errors, conflicts, omissions, or variances in the ELECTRONIC MEDIA or between the ELECTRONIC MEDIA and the INSTRUMENTS.

2.1.4 Model Completion and Quality for Record Drawings and/or As-Builts

The Government makes no guarantee that the Record Drawings and/or As-Builts GFM files are developed to the level of completeness or quality required for submittals described herein. It is the Contractor's responsibility to maintain the provided files in compliance with requirements described herein, but shall not be held responsible for

bringing baseline GFM into full compliance.

2.1.5 Data Loss, Corruption, and Error

Transfer of GFM files to the Contractor may result in corrupted files resulting in data loss and/or errors. Use of GFM files is at the Contractor's risk. Verify data integrity upon receipt and request a replacement if necessary.

Any adjustment of file structure, format, or software version required to make GFM compatible with the Contractor's computer systems and/or software is the responsibility of the Contractor.

2.2 SYSTEM PLATFORM AND FILE FORMATS

The Contractor shall use the BIM, GFM data in a like manner as it has been provided and if used, delivered back to the Government in a similar format (software version)

2.3 Other Formats

2.4 PDF

Utilize PDF file format in accordance with ISO 32000-1 and ISO 19005-3. Provide files from original sources, text-searchable, and saved in "Standard" (uncompressed) resolution whenever possible.

PART 3 EXECUTION (NOT USED)

-- End of Section --

SECTION 01 35 26

GOVERNMENTAL SAFETY REQUIREMENTS
11/20, CHG 4: 08/23

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 52.2	(2012) Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B30.3	(2020) Tower Cranes
ASME B30.5	(2021) Mobile and Locomotive Cranes

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP A10.34	(2021) Protection of the Public on or Adjacent to Construction Sites
ASSP Z359.0	(2018) Definitions and Nomenclature Used for Fall Protection and Fall Arrest
ASSP Z359.1	(2020) The Fall Protection Code
ASSP Z359.2	(2017) Minimum Requirements for a Comprehensive Managed Fall Protection Program

ASTM INTERNATIONAL (ASTM)

ASTM D6245	(2012) Using Indoor Carbon Dioxide Concentrations to Evaluate Indoor Air Quality and Ventilation
ASTM D6345	(2010) Standard Guide for Selection of Methods for Active, Integrative Sampling of Volatile Organic Compounds in Air
ASTM F855	(2019) Standard Specifications for Temporary Protective Grounds to Be Used on De-energized Electric Power Lines and Equipment

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 1048	(2016) Guide for Protective Grounding of

	Power Lines
IEEE C2	(2023) National Electrical Safety Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10	(2022; ERTA 1 2021) Standard for Portable Fire Extinguishers
NFPA 51B	(2024) Standard for Fire Prevention During Welding, Cutting, and Other Hot Work
NFPA 70	(2023; ERTA 7 2023; TIA 23-15) National Electrical Code
NFPA 70E	(2024) Standard for Electrical Safety in the Workplace
NFPA 241	(2022) Standard for Safeguarding Construction, Alteration, and Demolition Operations

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

OSHA 1926.502	(Current) Fall Prevention Systems Criteria and Practices

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

ANSI/SMACNA 008	(2007) IAQ Guidelines for Occupied Buildings Under Construction, 2nd Edition

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2024) Safety -- Safety and Health Requirements Manual

U.S DEPARTMENT OF DEFENSE (DOD)

AFI 91-203	Air Force Consolidated Occupational Safety Instruction

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1910.146	Permit-required Confined Spaces
29 CFR 1910.147	The Control of Hazardous Energy (Lock Out/Tag Out)
29 CFR 1926	Safety and Health Regulations for Construction
29 CFR 1926.16	Rules of Construction
29 CFR 1926.500	Fall Protection

1.2 DEFINITIONS

1.2.1 Competent Person (CP)

The CP is a person designated in writing, who, through training, knowledge and experience, is capable of identifying, evaluating, and addressing existing and predictable hazards in the working environment or working conditions that are dangerous to personnel, and who has authorization to take prompt corrective measures with regards to such hazards.

1.2.2 Competent Person, Confined Space

The CP, Confined Space, is a person meeting the competent person requirements as defined EM 385-1-1 Appendix Q, with thorough knowledge of OSHA’s Confined Space Standard, 29 CFR 1910.146, and designated in writing to be responsible for the immediate supervision, implementation and monitoring of the confined space program, who through training, knowledge and experience in confined space entry is capable of identifying, evaluating and addressing existing and potential confined space hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

1.2.3 Competent Person, Cranes and Rigging

The CP, Cranes and Rigging, as defined in EM 385-1-1 Appendix Q, is a person meeting the competent person requirements, who has been designated in writing to be responsible for the immediate supervision, implementation and monitoring of the Crane and Rigging Program, who through training, knowledge and experience in crane and rigging is capable of identifying, evaluating and addressing existing and potential hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

1.2.4 Competent Person, Excavation/Trenching

A CP, Excavation/Trenching, is a person meeting the competent person requirements as defined in EM 385-1-1 Appendix Q and 29 CFR 1926, who has been designated in writing to be responsible for the immediate supervision, implementation and monitoring of the excavation/trenching program, who through training, knowledge and experience in excavation/trenching is capable of identifying, evaluating and addressing existing and potential hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

1.2.5 Competent Person, Fall Protection

The CP, Fall Protection, is a person meeting the competent person requirements as defined in EM 385-1-1 Appendix Q and in accordance with ASSP Z359.0, who has been designated in writing by the employer to be responsible for immediate supervising, implementing and monitoring of the fall protection program, who through training, knowledge and experience in fall protection and rescue systems and equipment, is capable of identifying, evaluating and addressing existing and potential fall hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

1.2.6 Competent Person, Scaffolding

The CP, Scaffolding is a person meeting the competent person requirements in EM 385-1-1 Appendix Q, and designated in writing by the employer to be

responsible for immediate supervising, implementing and monitoring of the scaffolding program. The CP for Scaffolding has enough training, knowledge and experience in scaffolding to correctly identify, evaluate and address existing and potential hazards and also has the authority to take prompt corrective measures with regard to these hazards. CP qualifications must be documented including experience on the specific scaffolding systems/types being used, assessment of the base material that the scaffold will be erected upon, load calculations for materials and personnel, and erection and dismantling. The CP for scaffolding must have a documented minimum of 8-hours of scaffold training to include training on the specific type of scaffold being used (e.g. mast-climbing, adjustable, tubular frame), in accordance with EM 385-1-1 Section 22.B.02.

1.2.7 Competent Person (CP) Trainer

A competent person trainer as defined in EM 385-1-1 Appendix Q, who is qualified in the training material presented, and who possesses a working knowledge of applicable technical regulations, standards, equipment and systems related to the subject matter on which they are training Competent Persons. A competent person trainer must be familiar with the typical hazards and the equipment used in the industry they are instructing. The training provided by the competent person trainer must be appropriate to that specific industry. The competent person trainer must evaluate the knowledge and skills of the competent persons as part of the training process.

1.2.8 High Risk Activities

High Risk Activities are activities that involve work at heights, crane and rigging, excavations and trenching, scaffolding, electrical work, and confined space entry.

1.2.9 High Visibility Accident

A High Visibility Accident is any mishap which may generate publicity or high visibility.

1.2.10 Load Handling Equipment (LHE)

LHE is a term used to describe cranes, hoists and all other hoisting equipment (hoisting equipment means equipment, including crane, derricks, hoists and power operated equipment used with rigging to raise, lower or horizontally move a load).

1.2.11 Medical Treatment

Medical Treatment is treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even when provided by a physician or registered personnel.

1.2.12 Near Miss

A Near Miss is a mishap resulting in no personal injury and zero property damage, but given a shift in time or position, damage or injury may have occurred (e.g., a worker falls off a scaffold and is not injured; a crane swings around to move the load and narrowly misses a parked vehicle).

1.2.13 Operating Envelope

The Operating Envelope is the area surrounding any crane or load handling equipment. Inside this "envelope" is the crane, the operator, riggers and crane walkers, other personnel involved in the operation, rigging gear between the hook, the load, the crane's supporting structure (i.e. ground or rail), the load's rigging path, the lift and rigging procedure.

1.2.14 Qualified Person (QP)

The QP is a person designated in writing, who, by possession of a recognized degree, certificate, or professional standing, or extensive knowledge, training, and experience, has successfully demonstrated their ability to solve or resolve problems related to the subject matter, the work, or the project.

1.2.15 Qualified Person, Fall Protection (QP for FP)

A QP for FP is a person meeting the definition requirements of EM 385-1-1 Appendix Q, and ASSP Z359.2 standard, having a recognized degree or professional certificate and with extensive knowledge, training and experience in the fall protection and rescue field who is capable of designing, analyzing, and evaluating and specifying fall protection and rescue systems.

1.2.16 Load Handling Equipment(LHE)Accident or Load Handling Equipment Mishap

A LHE accident occurs when any one or more of the eight elements in the operating envelope fails to perform correctly during operation, including operation during maintenance or testing resulting in personnel injury or death; material or equipment damage; dropped load; derailment; two-blocking; overload; or collision, including unplanned contact between the load, crane, or other objects. A dropped load, derailment, two-blocking, overload and collision are considered accidents, even though no material damage or injury occurs. A component failure (e.g., motor burnout, gear tooth failure, bearing failure) is not considered an accident solely due to material or equipment damage unless the component failure results in damage to other components (e.g., dropped boom, dropped load, or roll over).

1.3 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Accident Prevention Plan (APP); G

APP - Construction; G

Indoor Air Quality (IAQ) Management Plan; G

Final IAQ Management Plan; S

SD-06 Test Reports

Notifications and Reports

Accident Reports; G

LHE Inspection Reports

SD-07 Certificates

Standard Lift Plan; G

Critical Lift Plan; G

Activity Hazard Analysis (AHA)

Confined Space Entry Permit

Hot Work Permit

Certificate of Compliance

1.4 REGULATORY REQUIREMENTS

In addition to the detailed requirements included in the provisions of this Contract, comply with the most recent edition of USACE EM 385-1-1, and the following federal, state, and local laws, ordinances, criteria, rules and regulations. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements govern.

1.5 SITE QUALIFICATIONS, DUTIES, AND MEETINGS

1.5.1 Personnel Qualifications

1.5.1.1 Site Safety and Health Officer (SSHO)

Provide an SSHO that meets the requirements of EM 385-1-1 Section 1. The SSHO must ensure that the requirements of 29 CFR 1926.16 are met for the project. Provide a Safety oversight team that includes a minimum of one person at each project site to function as the Site Safety and Health Officer (SSHO). The SSHO or an equally-qualified Alternate SSHO must be at the work site at all times to implement and administer the Contractor's safety program and Government-accepted Accident Prevention Plan. The SSHO and Alternate SSHO must have the required training, experience, and qualifications in accordance with EM 385-1-1 Section 01.A.17, and all associated sub-paragraphs.

If the SSHO is off-site an equally-qualified alternate SSHO must be provided and must fulfill the same roles and responsibilities as the primary SSHO.

1.5.2 Personnel Duties

1.5.2.1 Duties of the Site Safety and Health Officer (SSHO)

The SSHO must:

a. Conduct on-site visits daily safety and health inspections and maintain a written log which includes area/operation inspected, date of inspection, identified hazards, recommended corrective actions, estimated and actual dates of corrections. Attach safety inspection logs to the Contractors' daily production report.

b. Conduct mishap investigations and complete required accident reports. Report mishaps and near misses.

c. Use and maintain OSHA's Form 300 to log work-related injuries and illnesses occurring on the project site for Prime Contractors and subcontractors, and make available to the Contracting Officer upon request. Post and maintain the Form 300A on the site Safety Bulletin Board.

d. Maintain applicable safety reference material on the job site.

e. Attend the pre-construction, pre-work meetings including preparatory meetings, and periodic in-progress meetings.

f. Review the APP and AHAs for compliance with EM 385-1-1, and approve, sign, implement and enforce them.

g. Establish a Safety and Occupational Health (SOH) Deficiency Tracking System that lists and monitors outstanding deficiencies until resolution.

h. Ensure subcontractor compliance with safety and health requirements.

i. Maintain a list of hazardous chemicals on site and their material Safety Data Sheets (SDS).

j. Maintain a weekly list of high hazard activities involving energy, equipment, excavation, entry into confined space, and elevation, and be prepared to discuss details during QC Meetings.

k. Provide and keep a record of site safety orientation and indoctrination for Contractor employees, subcontractor employees, and site visitors.

Superintendent, QC Manager, and SSHO are subject to dismissal if the above or any other required duties are not being effectively carried out. If either the Superintendent, QC Manager, or SSHO are dismissed, project work will be stopped and will not be allowed to resume until a suitable replacement is approved and the above duties are again being effectively carried out.

1.5.3 Meetings

1.5.3.1 Preconstruction Conference

a. Contractor representatives who have a responsibility or significant role in accident prevention on the project must attend the

preconstruction. This includes the project superintendent, Site Safety and Occupational Health Officer, quality control manager, or any other assigned safety and health professionals who participated in the development of the APP (including the Activity Hazard Analyses (AHAs) and special plans, program and procedures associated with it).

b. Discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated AHAs that will be developed and implemented during the performance of the Contract. This list of proposed AHAs will be reviewed and an agreement will be reached between the Contractor and the Contracting Officer as to which phases will require an analysis. In addition, establish a schedule for the preparation, submittal, and Government review of AHAs to preclude project delays.

c. Deficiencies in the submitted APP, identified during the Contracting Officer's review, must be corrected, and the APP re-submitted for review prior to the start of construction. Work is not permitted to begin until an APP is established that is acceptable to the Contracting Officer.

1.5.3.2 Safety Meetings

Conduct safety meetings to review past activities, plan for new or changed operations, review pertinent aspects of appropriate AHA (by trade), establish safe working procedures for anticipated hazards, and provide pertinent Safety and Occupational Health (SOH) training and motivation. Conduct meetings at least once a month for all supervisors at the project location. The SSHO, supervisors, foremen, or CDSOs must conduct meetings at least once a week for the trade workers. Document meeting minutes to include the date, persons in attendance, subjects discussed, and names of individual(s) who conducted the meeting. Maintain documentation on-site and furnish copies to the Contracting Officer on request. Notify the Contracting Officer of all scheduled meetings 7 calendar days in advance.

1.6 ACCIDENT PREVENTION PLAN (APP)

1.6.1 APP - Construction

A qualified person must prepare the written site-specific APP. Prepare the APP in accordance with the format and requirements of EM 385-1-1, Appendix A, AFI 91-203and as supplemented herein. Cover all paragraph and subparagraph elements in EM 385-1-1, Appendix A. The APP must be job-specific and address any unusual or unique aspects of the project or activity for which it is written. The APP must interface with the Contractor's overall safety and health program referenced in the APP in the applicable APP element, and made site-specific. Describe the methods to evaluate past safety performance of potential subcontractors in the selection process. Also, describe innovative methods used to ensure and monitor safe work practices of subcontractors. The Government considers the Prime Contractor to be the "controlling authority" for all work site safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the Contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out. The APP must be signed by an officer of the firm (Prime Contractor senior person), the individual preparing the APP, the on-site superintendent, the

designated SSHO, the Contractor Quality Control Manager, and any designated Certified Safety Professional (CSP) or Certified Health Physicist (CIH). The SSHO must provide and maintain the APP and a log of signatures by each subcontractor foreman, attesting that they have read and understand the APP, and make the APP and log available on-site to the Contracting Officer. If English is not the foreman's primary language, the Prime Contractor must provide an interpreter.

Submit the APP to the Contracting Officer 15 calendar days prior to the date of the preconstruction for acceptance. Work cannot proceed without an accepted APP. Once reviewed and accepted by the Contracting Officer, the APP and attachments will be enforced as part of the Contract. Disregarding the provisions of this Contract or the accepted APP is cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified. Continuously review and amend the APP, as necessary, throughout the life of the Contract. Changes to the accepted APP must be made with the knowledge and concurrence of the Contracting Officer, project superintendent, SSHO and Quality Control Manager. Incorporate unusual or high-hazard activities not identified in the original APP as they are discovered. Should any severe hazard exposure (i.e. imminent danger) become evident, stop work in the area, secure the area, and develop a plan to remove the exposure and control the hazard. Notify the Contracting Officer within 24 hours of discovery. Eliminate and remove the hazard. In the interim, take all necessary action to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public (as defined by ASSP A10.34), and the environment.

1.6.2 Names and Qualifications

Provide plans in accordance with the requirements outlined in Appendix A of EM 385-1-1, including the following:

a. Names and qualifications (resumes including education, training, experience and certifications) of site safety and health personnel designated to perform work on this project to include the designated Site Safety and Health Officer and other competent and qualified personnel to be used. Specify the duties of each position.

b. Qualifications of competent and of qualified persons. As a minimum, designate and submit qualifications of competent persons for each of the following major areas: excavation; scaffolding; fall protection; hazardous energy; confined space; health hazard recognition, evaluation and control of chemical, physical and biological agents; and personal protective equipment and clothing to include selection, use and maintenance.

1.6.3 Plans

Provide plans in the APP in accordance with the requirements outlined in Appendix A of EM 385-1-1, including the following:

1.6.3.1 Standard Lift Plan (SLP)

Plan lifts to avoid situations where the operator cannot maintain safe control of the lift. Prepare a written SLP in accordance with EM 385-1-1, Section 16.A.03, using Form 16-2 for every lift or series of lifts (if duty cycle or routine lifts are being performed). The SLP must be developed, reviewed and accepted by all personnel involved in the lift in

conjunction with the associated AHA. Signature on the AHA constitutes acceptance of the plan. Maintain the SLP on the LHE for the current lift(s) being made. Maintain historical SLPs for a minimum of three months.

1.6.3.2 Critical Lift Plan - Crane or Load Handling Equipment

Provide a Critical Lift Plan as required by EM 385-1-1, Section 16.H.01, using Form 16-3. In addition, Critical Lift Plans are required for the following:

a. Lifts over 50 percent of the capacity of barge mounted mobile crane's hoist.

b. When working around energized power lines where the work will get closer than the minimum clearance distance in EM 385-1-1 Table 16-1.

c. For lifts with anticipated binding conditions.

d. When erecting cranes.

1.6.3.2.1 Critical Lift Plan Planning and Schedule

Critical lifts require detailed planning and additional or unusual safety precautions. Develop and submit a critical lift plan to the Contracting Officer 30 calendar days prior to critical lift. Comply with load testing requirements in accordance with EM 385-1-1, Section 16.F.03.

1.6.3.2.2 Lifts of Personnel

In addition to the requirements of EM 385-1-1, Section 16.H.02, for lifts of personnel, demonstrate compliance with the requirements of EM 385-1-1, Section 16.T.

1.6.3.3 Fall Protection and Prevention (FP&P) Plan

The plan must be in accordance with the requirements of OSHA 1926.502 EM 385-1-1, Section 21.D and ASSP Z359.2, be site specific, and address all fall hazards in the work place and during different phases of construction. Address how to protect and prevent workers from falling to lower levels when they are exposed to fall hazards above 6 feet. A competent person or qualified person for fall protection must prepare and sign the plan documentation. Include fall protection and prevention systems, equipment and methods employed for every phase of work, roles and responsibilities, assisted rescue, self-rescue and evacuation procedures, training requirements, and monitoring methods. Review and revise, as necessary, the Fall Protection and Prevention Plan documentation as conditions change, but at a minimum every six months, for lengthy projects, reflecting any changes during the course of construction due to changes in personnel, equipment, systems or work habits. Keep and maintain the accepted Fall Protection and Prevention Plan documentation at the job site for the duration of the project. Include the Fall Protection and Prevention Plan documentation in the Accident Prevention Plan (APP).

1.6.3.4 Excavation Plan

Identify the safety and health aspects of excavation, and provide and prepare the plan in accordance with EM 385-1-1, Section 25.A and Section 31 00 00 EARTHWORK.

1.6.3.5 Site Demolition Plan

Identify the safety and health aspects, and prepare in accordance with Section 02 41 00 DEMOLITION and referenced sources.

1.7 ACTIVITY HAZARD ANALYSIS (AHA)

Before beginning each activity, task or Definable Feature of Work (DFOW) involving a type of work presenting hazards not experienced in previous project operations, or where a new work crew or subcontractor is to perform the work, the Contractor(s) performing that work activity must prepare an AHA. AHAs must be developed by the Prime Contractor, subcontractor, or supplier performing the work, and provided for Prime Contractor review and approval before submitting to the Contracting Officer. AHAs must be signed by the SSHO, Superintendent, QC Manager and the subcontractor Foreman performing the work. Format the AHA in accordance with EM 385-1-1, Section 1 or as directed by the Contracting Officer. Submit the AHA for review at least 15 working days prior to the start of each activity task, or DFOW. The Government reserves the right to require the Contractor to revise and resubmit the AHA if it fails to effectively identify the work sequences, specific anticipated hazards, site conditions, equipment, materials, personnel and the control measures to be implemented.

AHAs must identify competent persons required for phases involving high risk activities, including confined entry, crane and rigging, excavations, trenching, electrical work, fall protection, and scaffolding.

1.7.1 AHA Management

Review the AHA list periodically (at least monthly) at the Contractor supervisory safety meeting, and update as necessary when procedures, scheduling, or hazards change. Use the AHA during daily inspections by the SSHO to ensure the implementation and effectiveness of the required safety and health controls for that work activity.

1.7.2 AHA Signature Log

Each employee performing work as part of an activity, task or DFOW must review the AHA for that work and sign a signature log specifically maintained for that AHA prior to starting work on that activity. The SSHO must maintain a signature log on site for every AHA. Provide employees whose primary language is other than English, with an interpreter to ensure a clear understanding of the AHA and its contents.

1.8 DISPLAY OF SAFETY INFORMATION

1.8.1 Safety Bulletin Board

Prior to commencement of work, erect a safety bulletin board at the job site. Where size, duration, or logistics of project do not facilitate a bulletin board, an alternative method, acceptable to the Contracting Officer, that is accessible and includes all mandatory information for employee and visitor review, may be deemed as meeting the requirement for a bulletin board. Include and maintain information on safety bulletin board as required by EM 385-1-1, Section 01.A.07. Additional items required to be posted include:

a. Confined space entry permit.

b. Hot work permit.

1.8.2 Safety and Occupational Health (SOH) Deficiency Tracking System

Establish a SOH deficiency tracking system that lists and monitors the status of SOH deficiencies in chronological order. Use the tracking system to evaluate the effectiveness of the APP. A monthly evaluation of the data must be discussed in the QC or SOH meeting with everyone on the project. The list must be posted on the project bulletin board and updated daily, and provide the following information:

a. Date deficiency identified;

b. Description of deficiency;

c. Name of person responsible for correcting deficiency;

d. Projected resolution date;

e. Date actually resolved.

1.9 SITE SAFETY REFERENCE MATERIALS

Maintain safety-related references applicable to the project, including those listed in paragraph REFERENCES. Maintain applicable equipment manufacturer's manuals.

1.10 EMERGENCY MEDICAL TREATMENT

Contractors must arrange for their own emergency medical treatment in accordance with EM 385-1-1. Government has no responsibility to provide emergency medical treatment.

1.11 NOTIFICATIONS and REPORTS

1.11.1 Mishap Notifications

Notify the Contracting Officer as soon as practical, but no more than twenty-four hours, after any mishaps, including recordable accidents, incidents, and near misses, as defined in EM 385-1-1 Appendix Q, any report of injury, illness, or any property damage. For LHE or rigging mishaps, notify the Contracting Officer as soon as practical but not more than 4 hours after mishap. The Contractor is responsible for obtaining appropriate medical and emergency assistance and for notifying fire, law enforcement, and regulatory agencies. Immediate reporting is required for electrical mishaps, to include Arc Flash; shock; uncontrolled release of hazardous energy (includes electrical and non-electrical); load handling equipment or rigging; fall from height (any level other than same surface); and underwater diving. These mishaps must be investigated in depth to identify all causes and to recommend hazard control measures.

Within notification include Contractor name; contract title; type of contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (for example, type of construction equipment used and PPE used). Preserve the conditions and evidence on the accident site until

the Government investigation team arrives on-site and Government investigation is conducted. Assist and cooperate fully with the Government's investigation(s) of any mishap.

1.11.2 Accident Reports

a. Conduct an accident investigation for recordable injuries and illnesses, property damage, and near misses as defined in EM 385-1-1, to establish the root cause(s) of the accident. The Contracting Officer will provide copies of any required or special forms.

b. Near Misses: Near miss reports are considered positive and proactive Contractor safety management actions.

c. Conduct an accident investigation for any load handling equipment accident (including rigging accidents) to establish the root cause(s) of the accident. Complete the LHE Accident Report (Crane and Rigging Accident Report) form and provide the report to the Contracting Officer within 30 calendar days of the accident. Do not proceed with crane operations until cause is determined and corrective actions have been implemented to the satisfaction of the Contracting Officer. The Contracting Officer will provide a blank copy of the accident report form.

1.11.3 LHE Inspection Reports

Submit LHE inspection reports required in accordance with EM 385-1-1 and as specified herein with Daily Reports of Inspections.

1.11.4 Certificate of Compliance and Pre-lift Plan/Checklist for LHE and Rigging

Provide a FORM 16-1 Certificate of Compliance for LHE entering an activity under this Contract and in accordance with EM 385-1-1. Post certifications on the crane.

Develop a Standard Lift Plan (SLP) in accordance with EM 385-1-1, Section 16.H.03 using Form 16-2 Standard Pre-Lift Crane Plan/Checklist for each lift planned. Submit SLP to the Contracting Officer for approval within 15 calendar days in advance of planned lift.

1.12 HOT WORK

1.12.1 Permit and Personnel Requirements

Submit and obtain a written permit prior to performing "Hot Work" (i.e. welding or cutting) or operating other flame-producing/spark producing devices, from the Fire Division. A permit is required from the Explosives Safety Office for work in and around where explosives are processed, stored, or handled. CONTRACTORS ARE REQUIRED TO MEET ALL CRITERIA BEFORE A PERMIT IS ISSUED. Provide at least two 20 pound 4A:20 BC rated extinguishers for normal "Hot Work". The extinguishers must be current inspection tagged, and contain an approved safety pin and tamper resistant seal. It is also mandatory to have a designated FIRE WATCH for any "Hot Work" done at this activity. The Fire Watch must be trained in accordance with NFPA 51B and remain on-site for a minimum of one hour after completion of the task or as specified on the hot work permit.

When starting work in the facility, require personnel to familiarize

themselves with the location of the nearest fire alarm boxes and place in memory the emergency Fire Division phone number. REPORT ANY FIRE, NO MATTER HOW SMALL, TO THE RESPONSIBLE FIRE DIVISION IMMEDIATELY.

1.12.2 Work Around Flammable Materials

Obtain permit approval from a Certified Industrial Hygienist for "HOT WORK" within or around flammable materials (such as fuel systems or welding/cutting on fuel pipes) or confined spaces (such as sewer wet wells, manholes, or vaults) that have the potential for flammable or explosive atmospheres.

Whenever these materials, except beryllium and chromium (VI), are encountered in indoor operations, local mechanical exhaust ventilation systems that are sufficient to reduce and maintain personal exposures to within acceptable limits must be used and maintained in accordance with manufacturer's instruction and supplemented by exceptions noted in EM 385-1-1, Section 06.H

1.13 CONSTRUCTION INDOOR AIR QUALITY (IAQ) MANAGEMENT PLAN

Submit an IAQ Management Plan within 15 calendar days after notice to proceed and not less than 10 calendar days before the preconstruction meeting.not less than 10 calendar days before the preconstruction meeting. Revise and resubmit Plan as required by the Contracting Officer. Make copies of the final plan available to all workers on site. Include provisions in the Plan to meet the requirements specified below and to ensure safe, healthy air for construction workers and building occupants. Submit Final IAQ Management Plan for inclusion in the Sustainability eNotebook, in accordance with Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING.

1.13.1 Requirements During Construction

Provide for evaluation of indoor Carbon Dioxide concentrations in accordance with ASTM D6245. Provide for evaluation of volatile organic compounds (VOCs) in indoor air in accordance with ASTM D6345. Use filters with a Minimum Efficiency Reporting Value (MERV) of 8 in permanently installed air handlers during construction.

1.13.1.1 Control Measures

Meet or exceed the requirements of ANSI/SMACNA 008, Chapter 3, to help minimize contamination of the building from construction activities. The five requirements of this manual which must be adhered to are described below:

a. HVAC protection: Isolate return side of HVAC system from surrounding environment to prevent construction dust and debris from entering the duct work and spaces.

b. Source control: Use low emitting paints and other finishes, sealants, adhesives, and other materials as specified. When available, cleaning products must have a low VOC content and be non-toxic to minimize building contamination. Utilize cleaning techniques that minimize dust generation. Cycle equipment off when not needed. Prohibit idling motor vehicles where emissions could be drawn into building. Designate receiving/storage areas for incoming material that minimize IAQ impacts.

c. Pathway interruption: When pollutants are generated use strategies such as 100 percent outside air ventilation or erection of physical barriers between work and non-work areas to prevent contamination.

d. Housekeeping: Clean frequently to remove construction dust and debris. Promptly clean up spills. Remove accumulated water and keep work areas dry to discourage the growth of mold and bacteria. Take extra measures when hazardous materials are involved.

e. Scheduling: Control the sequence of construction to minimize the absorption of VOCs by other building materials.

1.13.1.2 Moisture Contamination

a. Remove accumulated water and keep work dry.

b. Use dehumidification to remove moist, humid air from a work area.

c. Do not use combustion heaters or generators inside the building.

d. Protect porous materials from exposure to moisture.

e. Remove and replace items which remain damp for more than a few hours.

1.13.2 Requirements After Construction

After construction ends and prior to occupancy, conduct a building flush-out or test the indoor air contaminant levels. Flush-out must be a minimum two-weeks with MERV-13 filtration media as determined by ASHRAE 52.2 at 100 percent outside air. Air contamination testing must be consistent with EPA's current Compendium of Methods for the Determination of Air Pollutants in Indoor Air. After building flush-out or testing and prior to occupancy, replace filtration media. Filtration media must have a MERV of 13 as determined by ASHRAE 52.2.

1.14 SEVERE STORM PLAN

In the event of a severe storm warning, the Contractor must comply with the applicable Storm Plan and:

a. Secure outside equipment and materials and place materials that could be damaged in protected areas.

b. Check surrounding area, including roof, for loose material, equipment, debris, and other objects that could be blown away or against existing facilities.

c. Ensure that temporary erosion controls are adequate.

1.15 Public Health Emergencies

In the event of a declared public health emergency, follow safety precautions as required by the Occupational Safety and Health Administration (OSHA) and the Centers for Disease Control and Prevention (CDC). Information can be found at www.osha.gov and www.cdc.gov respectively.

PART 2 PRODUCTS

PART 3 EXECUTION

3.1 CONSTRUCTION AND OTHER WORK

Comply with EM 385-1-1, NFPA 70, NFPA 70E, NFPA 241, the APP, the AHA, Federal and State OSHA regulations, and other related submittals and activity fire and safety regulations. The most stringent standard prevails.

PPE is governed in all areas by the nature of the work the employee is performing. Use personal hearing protection at all times in designated noise hazardous areas or when performing noise hazardous tasks. Safety glasses must be worn or carried/available on each person. Mandatory PPE includes:

a. Hard Hat

b. Long Pants

c. Appropriate Safety Shoes

d. Appropriate Class Reflective Vests

3.1.1 Worksite Communication

Employees working alone in a remote location or away from other workers must be provided an effective means of emergency communications (i.e., cellular phone, two-way radios, land-line telephones or other acceptable means). The selected communication must be readily available (easily within the immediate reach) of the employee and must be tested prior to the start of work to verify that it effectively operates in the area/environment. Develop an employee check-in/check-out communication procedure to ensure employee safety.

3.1.2 Hazardous Material Exclusions

Notwithstanding any other hazardous material used in this Contract, radioactive materials or instruments capable of producing ionizing/non-ionizing radiation (with the exception of radioactive material and devices used in accordance with EM 385-1-1 such as nuclear density meters for compaction testing and laboratory equipment with radioactive sources.) as well as materials which contain asbestos, mercury or polychlorinated biphenyls, di-isocyanates, lead-based paint, and hexavalent chromium, are prohibited. The Contracting Officer, upon written request by the Contractor, may consider exceptions to the use of any of the above excluded materials. Low mercury lamps used within fluorescent lighting fixtures are allowed as an exception without further Contracting Officer approval. Notify the Radiation Safety Officer (RSO) prior to excepted items of radioactive material and devices being brought on base.

3.1.3 Unforeseen Hazardous Material

Contract documents identify materials such as PCB, lead paint, and friable and non-friable asbestos and other OSHA regulated chemicals (i.e. 29 CFR Part 1910.1000). If material(s) that may be hazardous to human health upon disturbance are encountered during construction operations, stop that

portion of work and notify the Contracting Officer immediately. Within 14 calendar days the Government will determine if the material is hazardous. If material is not hazardous or poses no danger, the Government will direct the Contractor to proceed without change. If material is hazardous and handling of the material is necessary to accomplish the work, the Government will issue a modification pursuant to FAR 52.243-4 Changes and FAR 52.236-2 Differing Site Conditions.

3.2 UTILITY OUTAGE REQUIREMENTS

Apply for utility outages at least 21 days in advance. At a minimum, the written request must include the location of the outage, utilities being affected, duration of outage, any necessary sketches, and a description of the means to fulfill energy isolation requirements in accordance with EM 385-1-1, Section 11.A.02 (Isolation). Some examples of energy isolation devices and procedures are highlighted in EM 385-1-1, Section 12.D. In accordance with EM 385-1-1, Section 12.A.01, where outages involve Government or Utility personnel, coordinate with the Government on all activities involving the control of hazardous energy.

These activities include, but are not limited to, a review of HECP and HEC procedures, as well as applicable Activity Hazard Analyses (AHAs). In accordance with EM 385-1-1, Section 11.A.02 and NFPA 70E, work on energized electrical circuits must not be performed without prior Government authorization. Government permission is considered through the permit process and submission of a detailed AHA. Energized work permits are considered only when de-energizing introduces additional or increased hazard or when de-energizing is infeasible.

3.3 OUTAGE COORDINATION MEETING

After the utility outage request is approved and prior to beginning work on the utility system requiring shut-down, conduct a pre-outage coordination meeting in accordance with EM 385-1-1, Section 12.A. This meeting must include the Prime Contractor, the Prime and subcontractors performing the work, the Contracting Officer, and the Installation representative. All parties must fully coordinate HEC activities with one another. During the coordination meeting, all parties must discuss and coordinate on the scope of work, HEC procedures (specifically, the lock-out/tag-out procedures for worker and utility protection), the AHA, assurance of trade personnel qualifications, identification of competent persons, and compliance with HECP training in accordance with EM 385-1-1, Section 12.C. Clarify when personal protective equipment is required during switching operations, inspection, and verification.

3.4 FALL PROTECTION PROGRAM

Establish a fall protection program, for the protection of all employees exposed to fall hazards. Within the program include company policy, identify roles and responsibilities, education and training requirements, fall hazard identification, prevention and control measures, inspection, storage, care and maintenance of fall protection equipment and rescue and evacuation procedures in accordance with OSHA 1926.502, ASSP Z359.2 and EM 385-1-1, Sections 21.A and 21.D.

3.4.1 Training

Institute a fall protection training program. As part of the Fall Protection Program, provide training for each employee who might be

exposed to fall hazards and using personal fall protection equipment. Provide training by a competent person for fall protection in accordance with OSHA 1926.502, EM 385-1-1, Section 21.C. Document training and practical application of the competent person in accordance with OSHA 1926.502, EM 385-1-1, Section 21.C.04 and ASSP Z359.2 in the AHA.

3.4.2 Fall Protection Equipment and Systems

Enforce use of personal fall protection equipment and systems designated (to include fall arrest, restraint, and positioning) for each specific work activity in the Site Specific Fall Protection and Prevention Plan and AHA at all times when an employee is exposed to a fall hazard. Protect employees from fall hazards as specified in EM 385-1-1, Section 21.

Provide personal fall protection equipment, systems, subsystems, and components that comply with EM 385-1-1 Section 21.I, 29 CFR 1926.500 Subpart M,ASSP Z359.0, ASSP Z359.1, and ASSP Z359.2.

3.4.3 Fall Protection for Roofing Work

Implement fall protection controls based on the type of roof being constructed and work being performed. Evaluate the roof area to be accessed for its structural integrity including weight-bearing capabilities for the projected loading.

a. Low Sloped Roofs:

(1) For work within 6 feet from unprotected edge of a roof having a slope less than or equal to 4:12 (vertical to horizontal), protect personnel from falling by the use of conventional fall protection systems (personal fall arrest/restraint systems, guardrails, or safety nets) in accordance with EM 385-1-1, Section 21 and 29 CFR 1926.500. A safety monitoring system is not adequate fall protection and is not authorized.

(2) For work greater than 6 feet from the unprotected roof edge, addition to the use of conventional fall protection systems the use of a warning line system is also permitted, in accordance with 29 CFR 1926.500 and EM 385-1-1, Section 21.L.

b. Steep-Sloped Roofs: Work on a roof having a slope greater than 4:12 (vertical to horizontal) requires a personal fall arrest system, guardrails with toe-boards, or safety nets. This requirement also applies to residential or housing type construction.

3.4.4 Guardrails and Safety Nets

Design, install and use guardrails and safety nets in accordance with EM 385-1-1, Section 21.F.01 and 29 CFR 1926 Subpart M.

3.4.5 Rescue and Evacuation Plan and Procedures

When personal fall arrest systems are used, ensure that the mishap victim can self-rescue or can be rescued promptly should a fall occur. Prepare a Rescue and Evacuation Plan and include a detailed discussion of the following: methods of rescue; methods of self-rescue or assisted-rescue; equipment used; training requirement; specialized training for the rescuers; procedures for requesting rescue and medical assistance; and transportation routes to a medical facility. Include the Rescue and

Evacuation Plan within the Activity Hazard Analysis (AHA) for the phase of work, in the Fall Protection and Prevention (FP&P) Plan, and the Accident Prevention Plan (APP). The plan must be in accordance with the requirements of EM 385-1-1, and ASSP Z359.2.

3.5 WORK PLATFORMS

3.5.1 Scaffolding

Provide employees with a safe means of access to the work area on the scaffold. Climbing of any scaffold braces or supports not specifically designed for access is prohibited. Comply with the following requirements:

a. Scaffold platforms greater than 20 feet in height must be accessed by use of a scaffold stair system.

b. Ladders commonly provided by scaffold system manufacturers are prohibited for accessing scaffold platforms greater than 20 feet maximum in height.

c. An adequate gate is required.

d. Employees performing scaffold erection and dismantling must be qualified.

e. Scaffold must be capable of supporting at least four times the maximum intended load, and provide appropriate fall protection as delineated in the accepted fall protection and prevention plan.

f. Stationary scaffolds must be attached to structural building components to safeguard against tipping forward or backward.

g. Special care must be given to ensure scaffold systems are not overloaded.

h. Side brackets used to extend scaffold platforms on self-supported scaffold systems for the storage of material are prohibited. The first tie-in must be at the height equal to 4 times the width of the smallest dimension of the scaffold base.

i. Scaffolding other than suspended types must bear on base plates upon wood mudsills (2 in x 10 in x 8 in minimum) or other adequate firm foundation.

j. Scaffold or work platform erectors must have fall protection during the erection and dismantling of scaffolding or work platforms that are more than 6 feet.

k. Delineate fall protection requirements when working above 6 feet or above dangerous operations in the Fall Protection and Prevention (FP&P) Plan and Activity Hazard Analysis (AHA) for the phase of work.

3.5.2 Elevated Aerial Work Platforms (AWPs)

Workers must be anchored to the basket or bucket in accordance with manufacturer's specifications and instructions (anchoring to the boom may only be used when allowed by the manufacturer and permitted by the CP). Lanyards used must be sufficiently short to prohibit worker from climbing out of basket. The climbing of rails is prohibited. Lanyards with

built-in shock absorbers are acceptable. Self-retracting devices are not acceptable. Tying off to an adjacent pole or structure is not permitted unless a safe device for 100 percent tie-off is used for the transfer.

Use of AWPs must be operated, inspected, and maintained as specified in the operating manual for the equipment and delineated in the AHA. Operators of AWPs must be designated as qualified operators by the Prime Contractor. Maintain proof of qualifications on site for review and include in the AHA.

3.6 EQUIPMENT

3.6.1 Material Handling Equipment (MHE)

a. Material handling equipment such as forklifts must not be modified with work platform attachments for supporting employees unless specifically delineated in the manufacturer's printed operating instructions. Material handling equipment fitted with personnel work platform attachments are prohibited from traveling or positioning while personnel are working on the platform.

b. The use of hooks on equipment for lifting of material must be in accordance with manufacturer's printed instructions. Material Handling Equipment Operators must be trained in accordance with OSHA 29 CFR 1910, Subpart N.

c. Operators of forklifts or power industrial trucks must be licensed in accordance with OSHA.

3.6.2 Load Handling Equipment (LHE)

The following requirements apply. In exception, these requirements do not apply to commercial truck mounted and articulating boom cranes used solely to deliver material and supplies (not prefabricated components, structural steel, or components of a systems-engineered metal building) where the lift consists of moving materials and supplies from a truck or trailer to the ground; to cranes installed on mechanics trucks that are used solely in the repair of shore-based equipment; to crane that enter the activity but are not used for lifting; nor to other machines not used to lift loads suspended by rigging equipment. However, LHE accidents occurring during such operations must be reported.

a. Equip cranes and derricks as specified in EM 385-1-1, Section 16.

b. Notify the Contracting Officer 15 working days in advance of any LHE entering the activity, in accordance with EM 385-1-1, Section 16.A.02, so that necessary quality assurance spot checks can be coordinated. Contractor's operator must remain with the crane during the spot check. Rigging gear must be in accordance with OSHA, Standards and safety standards.

c. Comply with the LHE manufacturer's specifications and limitations for erection and operation of cranes and hoists used in support of the work. Perform erection under the supervision of a designated person (as defined in ASME B30.5). Perform all testing in accordance with the manufacturer's recommended procedures.

d. Comply with ASME B30.5 for mobile and locomotive cranes, ASME B30.3 for construction tower cranes, and floating derricks.

e. When operating in the vicinity of overhead transmission lines, operators and riggers must be alert to this special hazard and follow the requirements of EM 385-1-1 Section 11, and ASME B30.5 as applicable.

f. Do not use crane suspended personnel work platforms (baskets) unless the Contractor proves that using any other access to the work location would provide a greater hazard to the workers or is impossible. Do not lift personnel with a line hoist or friction crane. Additionally, submit a specific AHA for this work to the Contracting Officer. Ensure the activity and AHA are thoroughly reviewed by all involved personnel.

g. Inspect, maintain, and recharge portable fire extinguishers as specified in NFPA 10, Standard for Portable Fire Extinguishers.

h. All employees must keep clear of loads about to be lifted and of suspended loads, except for employees required to handle the load.

i. Use cribbing when performing lifts on outriggers.

j. The crane hook/block must be positioned directly over the load. Side loading of the crane is prohibited.

k. A physical barricade must be positioned to prevent personnel access where accessible areas of the LHE's rotating superstructure poses a risk of striking, pinching or crushing personnel.

l. Maintain inspection records in accordance by EM 385-1-1, Section 16.D, including shift, monthly, and annual inspections, the signature of the person performing the inspection, and the serial number or other identifier of the LHE that was inspected. Records must be available for review by the Contracting Officer.

m. Maintain written reports of operational and load testing in accordance with EM 385-1-1, Section 16.F, listing the load test procedures used along with any repairs or alterations performed on the LHE. Reports must be available for review by the Contracting Officer.

n. Certify that all LHE operators have been trained in proper use of all safety devices (e.g. anti-two block devices).

o. Take steps to ensure that wind speed does not contribute to loss of control of the load during lifting operations. At wind speeds greater than 20 mph, the operator, rigger and lift supervisor must cease all crane operations, evaluate conditions and determine if the lift may proceed. Base the determination to proceed or not on wind calculations per the manufacturer and a reduction in LHE rated capacity if applicable. Include this maximum wind speed determination as part of the activity hazard analysis plan for that operation.

q. Follow FAA guidelines when required based on project location.

3.6.3 Machinery and Mechanized Equipment

a. Proof of qualifications for operator must be kept on the project site for review.

b. Manufacture specifications or owner's manual for the equipment must be on-site and reviewed for additional safety precautions or requirements that are sometimes not identified by OSHA or USACE EM 385-1-1. Incorporate such additional safety precautions or requirements into the AHAs.

3.6.4 Base Mounted Drum Hoists

a. Operation of base mounted drum hoists must be in accordance with EM 385-1-1.

b. Rigging gear must be in accordance with applicable ASME/OSHA standards.

c. When used on telecommunication towers, base mounted drum hoists must be in accordance with specifications.

d. When used to hoist personnel, the AHA must include a written standard operating procedure. Operators must have a physical examination in accordance with EM 385-1-1 Section 16.B.05 and trained, at a minimum, in accordance with EM 385-1-1 Section 16.U and 16.T. The base mounted drum hoist must also comply with OSHA Instructions.

e. Material and personnel must not be hoisted simultaneously.

f. Personnel cage must be marked with the capacity (in number of persons) and load limit in pounds.

g. Construction equipment must not be used for hoisting material or personnel or with trolley/tag lines. Construction equipment may be used for towing and assisting with anchoring guy lines.

3.6.5 Use of Explosives

Explosives must not be used or brought to the project site.

3.7 EXCAVATIONS

Soil classification must be performed by a competent person in accordance with 29 CFR 1926 and EM 385-1-1.

3.7.1 Utility Locations

Provide a third party, independent, private utility locating company to positively identify underground utilities in the work area in addition to any station locating service and coordinated with the station utility department.

3.7.2 Utility Location Verification

Physically verify underground utility locations, including utility depth, by hand digging using wood or fiberglass handled tools when any adjacent construction work is expected to come within 3 feet of the underground system.

3.7.3 Utilities Within and Under Concrete, Bituminous Asphalt, and Other Impervious Surfaces

Utilities located within and under concrete slabs or pier structures, bridges, parking areas, and the like, are extremely difficult to identify. Whenever Contract work involves chipping, saw cutting, or core drilling through concrete, bituminous asphalt or other impervious surfaces, the existing utility location must be coordinated with station utility departments in addition to location and depth verification by a third party, independent, private locating company. The third party, independent, private locating company must locate utility depth by use of Ground Penetrating Radar (GPR), X-ray, bore scope, or ultrasound prior to the start of demolition and construction. Outages to isolate utility systems must be used in circumstances where utilities are unable to be positively identified. The use of historical drawings does not alleviate the Contractor from meeting this requirement.

3.8 ELECTRICAL

Perform electrical work in accordance with EM 385-1-1, Sections 11 and 12.

3.8.1 Conduct of Electrical Work

As delineated in EM 385-1-1, electrical work is to be conducted in a de-energized state unless there is no alternative method for accomplishing the work. In those cases obtain an energized work permit from the Contracting Officer. The energized work permit application must be accompanied by the AHA and a summary of why the equipment/circuit needs to be worked energized. Underground electrical spaces must be certified safe for entry before entering to conduct work. Cables that will be cut must be positively identified and de-energized prior to performing each cut. Attach temporary grounds in accordance with ASTM F855 and IEEE 1048. Perform all high voltage cable cutting remotely using hydraulic cutting tool. When racking in or live switching of circuit breakers, no additional person other than the switch operator is allowed in the space during the actual operation. Plan so that work near energized parts is minimized to the fullest extent possible. Use of electrical outages clear of any energized electrical sources is the preferred method.

When working in energized substations, only qualified electrical workers are permitted to enter. When work requires work near energized circuits as defined by NFPA 70, high voltage personnel must use personal protective equipment that includes, as a minimum, electrical hard hat, safety shoes, insulating gloves and electrical arc flash protection for personnel as required by NFPA 70E. Insulating blankets, hearing protection, and switching suits may also be required, depending on the specific job and as delineated in the Contractor's AHA. Ensure that each employee is familiar with and complies with these procedures and 29 CFR 1910.147.

3.8.2 Qualifications

Electrical work must be performed by QP with verifiable credentials who are familiar with applicable code requirements. Verifiable credentials consist of State, National and Local Certifications or Licenses that a Master or Journeyman Electrician may hold, depending on work being performed, and must be identified in the appropriate AHA. Journeyman/Apprentice ratio must be in accordance with State, and Local requirements applicable to where work is being performed.

3.8.3 Arc Flash

Conduct a hazard analysis/arc flash hazard analysis whenever work on or near energized parts greater than 50 volts is necessary, in accordance with NFPA 70E.

All personnel entering the identified arc flash protection boundary must be QPs and properly trained in NFPA 70E requirements and procedures. Unless permitted by NFPA 70E, no Unqualified Person is permitted to approach nearer than the Limited Approach Boundary of energized conductors and circuit parts. Training must be administered by an electrically qualified source and documented.

3.8.4 Grounding

Ground electrical circuits, equipment and enclosures in accordance with NFPA 70 and IEEE C2 to provide a permanent, continuous and effective path to ground unless otherwise noted by EM 385-1-1.

Check grounding circuits to ensure that the circuit between the ground and a grounded power conductor has a resistance low enough to permit sufficient current flow to allow the fuse or circuit breaker to interrupt the current.

3.8.5 Testing

Temporary electrical distribution systems and devices must be inspected, tested and found acceptable for Ground-Fault Circuit Interrupter (GFCI) protection, polarity, ground continuity, and ground resistance before initial use, before use after modification and at least monthly. Monthly inspections and tests must be maintained for each temporary electrical distribution system, and signed by the electrical CP or QP.

-- End of Section --

SECTION 01 42 00

SOURCES FOR REFERENCE PUBLICATIONS
02/19, CHG 1: 08/23

PART 1 GENERAL

1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the standards producing organization (e.g., ASTM B564 Standard Specification for Nickel Alloy Forgings). However, when the standards producing organization has not assigned a number to a document, an identifying number has been assigned for reference purposes.

1.2 ORDERING INFORMATION

The addresses of the standards publishing organizations whose documents are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided.

AACE INTERNATIONAL (AACE)
1265 Suncrest Towne Centre Drive
Morgantown, WV 26505-1876 USA
Ph: 304-296-8444
Fax: 304-291-5728
Internet: https://web.aacei.org/

ACOUSTICAL SOCIETY OF AMERICA (ASA)
1305 Walt Whitman Road, Suite 300
Melville, NY 11747-4300
Ph: 516-576-2360
Fax: 631-923-2875
E-mail: asa@acousticalsociety.org
Internet: https://acousticalsociety.org/

AIR BARRIER ASSOCIATION OF AMERICA (ABAA)
1600 Boston-Providence Hwy
Walpole, MA 02081
Ph: 1-866-956-5888
Fax: 1-866-956-5819
Internet: https://www.airbarrier.org/

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC. (AMCA)
30 West University Drive
Arlington Heights, IL 60004-1893
Ph: 847-394-0150
Fax: 847-253-0088
E-mail: communications@amca.org
Internet: http://www.amca.org

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)
2111 Wilson Blvd, Suite 400
Arlington, VA 22201

Ph: 703-524-8800
Internet: http://www.ahrinet.org

ALUMINUM ASSOCIATION (AA)
1400 Crystal Drive
Suite 430
Arlington, VA 22202
Ph: 703-358-2960
E-Mail: info@aluminum.org
Internet: https://www.aluminum.org/

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)
1900 E Golf Rd, Suite 1250
Schaumburg, IL 60173
Ph: 847-303-5664
E-mail: customerservice@aamanet.org
Internet: https://aamanet.org/

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
444 North Capital Street, NW, Suite 249
Washington, DC 20001
Ph: 202-624-5800
Fax: 202-624-5806
E-Mail: info@aashto.org
Internet: https://www.transportation.org/

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)
1 Davis Drive
P.O. Box 12215
Research Triangle Park, NC 27709-2215
Ph: 919-549-8141
Fax: 919-549-8933
Internet: https://www.aatcc.org/

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA)
330 N. Wabash Ave., Suite 2000
Chicago, IL 60611
Ph: 202-367-1155
E-mail: info@americanbearings.org
Internet: https://www.americanbearings.org/

AMERICAN CONCRETE INSTITUTE (ACI)
38800 Country Club Drive
Farmington Hills, MI 48331-3439
Ph: 248-848-3700
Fax: 248-848-3701
Internet: https://www.concrete.org/

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)
1330 Kemper Meadow Drive
Cincinnati, OH 45240
Ph: 513-742-2020
Fax: 513-742-3355
Internet: https://www.acgih.org/

AMERICAN GAS ASSOCIATION (AGA)
400 North Capitol Street, NW
Suite 450

Washington, D.C. 20001
Ph: 202-824-7000
Internet: https://www.aga.org/

AMERICAN HARDBOARD ASSOCIATION (AHA)
1210 West Northwest Highway
Palatine, IL 60067
Ph: 847-934-8800
Fax: 847-934-8803
E-mail: aha@hardboard.org
Internet: http://domensino.com/AHA/

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)
130 East Randolph, Suite 2000
Chicago, IL 60601
Ph: 312-670-5444
Fax: 312-670-5403
Steel Solutions Center: 866-275-2472
E-mail: solutions@aisc.org
Internet: https://www.aisc.org/

AMERICAN INSTITUTE OF TIMBER CONSTRUCTION (AITC)
7012 South Revere Parkway, Suite 140
Centennial, CO 80112
Ph: 503-639-0651
Fax: 503-684-8928
E-mail: mschoen@wclib.org
Internet: http://www.aitc-glulam.org

AMERICAN IRON AND STEEL INSTITUTE (AISI)
25 Massachusetts Avenue, NW Suite 800
Washington, DC 20001
Ph: 202-452-7100
Internet: https://www.steel.org/

AMERICAN LADDER INSTITUTE (ALI)
330 N. Wabash, Suite 2000
Chicago, IL 60611
Ph: 312-321-6806
Fax: 312-673-6929
E-mail: info@americanladderinstitute.org
Internet: https://www.americanladderinstitute.org

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)
7470 New Technology Way, Suite F
Frederick, MD 21703
Ph: 301-972-1700
Fax: 301-540-8004
E-mail: alsc@alsc.org
Internet: http://www.alsc.org

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
1899 L Street, NW,11th Floor
Washington, DC 20036
Ph: 202-293-8020
Fax: 202-293-9287
E-mail: storemanager@ansi.org
Internet: https://www.ansi.org/

AMERICAN PETROLEUM INSTITUTE (API)
1220 L Street, NW
Washington, DC 20005-4070
Ph: 202-682-8000
Internet: https://www.api.org/

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)
P.O. Box 28518
1711 Arlingate Lane
Columbus, OH 43228-0518
Ph: 800-222-2768 or 614-274-6003
Fax: 614-274-6899
E-mail: tjones@asnt.org
Internet: https://www.asnt.org/

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)
1801 Alexander Bell Drive
Reston, VA 20191
Ph: 800-548-2723; 703-295-6300
Internet: https://www.asce.org/

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)
1791 Tullie Circle, NE
Atlanta, GA 30329
Ph: 404-636-8400 or 800-527-4723
Fax: 404-321-5478
E-mail: ashrae@ashrae.org
Internet: https://www.ashrae.org/

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
Two Park Avenue
New York, NY 10016-5990
Ph: 800-843-2763
Fax: 973-882-1717
E-mail: customercare@asme.org
Internet: https://www.asme.org/

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)
520 N. Northwest Highway
Park Ridge, IL 60068
Ph: 847-699-2929
E-mail: customerservice@assp.org
Internet: https://www.assp.org/

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)
18927 Hickory Creek Drive, Suite 220
Mokena, IL 60448
Ph: 708-995-3019
Fax: 708-479-6139
Internet: http://www.asse-plumbing.org

AMERICAN WATER WORKS ASSOCIATION (AWWA)
6666 W. Quincy Avenue
Denver, CO 80235 USA
Ph: 303-794-7711 or 800-926-7337
Fax: 303-347-0804
Internet: https://www.awwa.org/

AMERICAN WELDING SOCIETY (AWS)
8669 NW 36 Street, #130
Miami, FL 33166-6672
Ph: 800-443-9353
Internet: https://www.aws.org/

AMERICAN WOOD COUNCIL (AWC)
222 Catoctin Circle SE, Suite 201
Leesburg, VA 20175
Ph: 800-890-7732
Fax: 412-741-0609
E-mail: publications@awc.org
Internet: https://www.awc.org/

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)
P.O. Box 361784
Birmingham, AL 35236-1784
Ph: 205-733-4077
Fax: 205-733-4075
Internet: http://www.awpa.com

APA - THE ENGINEERED WOOD ASSOCIATION (APA)
7011 South 19th St.
Tacoma, WA 98466-5333
Ph: 253-565-6600
Fax: 253-565-7265
Internet: https://www.apawood.org/

ASPHALT INSTITUTE (AI)
2696 Research Park Drive
Lexington, KY 40511-8480
Ph: 859-288-4960
Fax: 859-288-4999
E-mail: info@asphaltinstitute.org
Internet: http://www.asphaltinstitute.org

ASSOCIATED AIR BALANCE COUNCIL (AABC)
1220 19th St NW, Suite 410
Washington, DC 20036
Ph: 202-737-0202
Fax: 202-315-0285
E-mail: info@aabc.com
Internet: https://www.aabc.com/

ASSOCIATION OF EDISON ILLUMINATING COMPANIES (AEIC)
600 North 18th Street
P.O. Box 2641
Birmingham, AL 35291
Ph: 205-257-3839
Fax: 205-257-2540
Internet: https://aeic.org/

ASTM INTERNATIONAL (ASTM)
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428-2959
Ph: 610-832-9500
Fax: 610-832-9555
E-mail: service@astm.org
Internet: https://www.astm.org/

BACNET INTERNATIONAL (BTL)
BACnet Testing Laboratories
1827 Powers Ferry Road
Building 14, Suite 100
Atlanta, GA 30339
Ph: 770-971-6003
Fax: 678-229-2777
E-mail: info@bacnetinternational.org
Internet: https://www.bacnetlabs.org/

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)
355 Lexington Avenue, 15th Floor
New York, NY 10017
Ph: 212-297-2122
Fax: 212-370-9047
Internet: https://www.buildershardware.com/

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PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

-- End of Section --

SECTION 01 45 00

QUALITY CONTROL
08/23

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D3740	(2019) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM E90	(2009; R2016) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
ASTM E329	(2023) Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2024) Safety -- Safety and Health Requirements Manual

1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program. Include all associated costs in the applicable Bid Schedule item.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

SD-01 Preconstruction Submittals

Contractor Quality Control (CQC) Plan; G

Submit a Construction QC Plan prior to start of construction.

Indoor Air Quality (IAQ) Management Plan; G

Verification Statement

SD-07 Certificates

Certificate Of Readiness; G

Resumes for each member of QC Team, Special Inspection Team, Commissioning Team; G

INFORMATION FOR THE CONTRACTING OFFICER

Prior to commencing work on construction, the Contractor can obtain a single copy set of the current report forms from the Contracting Officer. The report forms will consist of the Contractor Production Report, Contractor Production Report (Continuation Sheet), Contractor Quality Control (CQC) Report, CQC Report (Continuation Sheet), Preparatory Phase Checklist, Initial Phase Checklist, Rework Items List, and Testing Plan and Log.

Deliver the following to the Contracting Officer during Construction

a. CQC Report: Submit the report electronically by 10:00 AM the next working day after each day that work is performed and for every seven consecutive calendar days of no-work.

b. Contractor Production Report: Submit the report electronically by 10:00 AM the next working day after each day that work is performed and for every seven consecutive calendar days of no-work.

c. Preparatory Phase Checklist: Submit the report electronically in the same manner as the CQC Report for each Preparatory Phase held.

d. Initial Phase Checklist: Submit the report electronically in the same manner as the CQC Report for each Initial Phase held.

e. QC Specialist Reports: Submit the report electronically by 10:00 AM the next working day after each day that work is performed.

f. Field Test Reports: Within two working days after the test is performed, submit the report as an electronic attachment to the CQC Report.

g. Monthly Summary Report of Tests: Submit the report as an electronic attachment to the CQC Report at the end of each month.

h. Testing Plan and Log: Submit the report as an electronic attachment to the CQC Report, at the end of each month. Provide a copy of the final Testing Plan and Log to the OMSI preparer for inclusion into the OMSI documentation.

i. Rework Items List: Submit lists containing new entries daily, in the same manner as the CQC Report.

j. CQC Meeting Minutes: Within two working days after the meeting is held, submit the report as an electronic attachment to the CQC Report.

k. QC Certifications: As required by the paragraph entitled "QC Certifications."

l. Special Inspection Report: Submit the Special Inspection reports, in

the same manner as the CQC Report.

m. The Contracting Officer shall be copied on all construction related documents.

1.4 QUALITY CONTROL (QC) PROGRAM REQUIREMENTS

Establish and maintain a QC program as described in this section. This QC program is a key element in meeting the objectives of the Commissioning Process (Cx). The QC program consists of a QC Organization, QC Plan, QC Plan Meeting(s), a Coordination and Mutual Understanding Meeting, QC meetings, three phases of control, submittal review and approval, testing, completion inspections, QC certifications, independent Special Inspections in accordance with Section 01 45 35 SPECIAL INSPECTIONS, and documentation necessary to provide materials, equipment, workmanship, fabrication, construction and operations that comply with the requirements of this Contract. The QC program must cover on-site and off-site work and be keyed to the work sequence. No construction work or testing may be performed unless the QC Manager is on the work site. The QC Manager must report to an officer of the firm and not be subordinate to the Project Superintendent or the Project Manager. The QC Manager, Project Superintendent and Project Manager must work together effectively. Although the QC Manager is the primary individual responsible for quality control, all individuals will be held responsible for the quality of work on the job.

1.4.1 Meetings

1.4.1.1 Quality Control Plan Meeting

Prior to submission of the QC Plan, the Contractor may request a meeting with the Contracting Officer to discuss the QC Plan requirements of this Contract.

The purpose of this meeting is to develop a mutual understanding of the QC Plan requirements prior to plan development and submission and to agree on the Contractor's list of Definable Feature of Work (DFOW).

1.4.1.2 Coordination and Mutual Understanding Meeting

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, meet with the Contracting Officer and discuss the Contractor's quality control system. During the meeting, a mutual understanding of the system details must be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting will be prepared by the QC Manager and signed by the Contractor and the Government. Provide a copy of the signed minutes to all attendees and include in the QC Plan. At a minimum the Coordination and Mutual Understanding Meeting must be repeated when a new QC Manager is appointed. There can be other occasions when subsequent conferences will be called by either party to reconfirm mutual understandings or address deficiencies in the CQC system or procedures which can require corrective action by the Contractor.

1.4.1.2.1 Purpose

The purpose of this meeting is to develop a mutual understanding of the QC details, including documentation, administration for on-site and off-site work, design intent, Cx in accordance with Section 01 91 00.15 BUILDING COMMISSIONING, environmental requirements and procedures, coordination of activities to be performed, Special Inspections, and the coordination of the Contractor's management, production, and QC personnel. At the meeting, the Contractor must explain in detail how three phases of control will be implemented for each DFOW, as well as how each DFOW will be affected by each management plan or requirement as listed below:

a. Waste Management Plan.

b. Procedures for noise and acoustics management.

c. Environmental Protection Plan.

d. Environmental regulatory requirements.

e. Cx Plan requirements in accordance with Section 01 91 00.15 BUILDING COMMISSIONING.

f. Special Inspections.

g. Indoor Air Quality (IAQ) Management Plan.

1.4.1.2.2 Coordination of Activities

Coordinate activities included in various sections to assure efficient and orderly installation of each component. Coordinate operations included under different sections that are dependent on each other for proper installation and operation. Schedule construction operations with consideration for indoor air quality as specified in the IAQ Management Plan.Coordinate Special Inspections.

1.4.1.2.3 Attendees

As a minimum, the Contractor's personnel required to attend include an officer of the firm, the Project Manager, Project Superintendent, QC Manager, Alternate QC Manager, QC Specialists, Special Inspector, Special Inspector of Record, Commissioning Provider (CxC), Environmental Manager, and subcontractor representatives. Each subcontractor who will be assigned QC responsibilities must have a principal of the firm at the meeting.

1.4.1.3 Quality Control (QC) Meetings

After the start of construction, conduct weekly QC meetings led by the QC Manager at the work site with the Project Superintendent, the QC Specialists, the Special Inspector, the Special Inspector of Record, CxC, and the other personnel as necessary. The QC Manager is to prepare the minutes of the meeting and provide a copy to the Contracting Officer within two working days after the meeting. The Contracting Officer may attend these meetings. As a minimum, accomplish the following at each meeting:

a. Review the minutes of the previous meeting.

b. Review the schedule and the status of work and deficiencies/rework. Review the most current approved schedule (in accordance with schedule specification) and the status of work and deficiencies/rework.

c. Review the status of submittals and Request For Information (RFIs).

d. Review the work to be accomplished in the next three weeks as defined by the schedule section paragraph and all documentation required for that work.

e. Review Testing Plan and Log including status of tests performed since last QC Meeting.

f. Resolve QC and production problems. Discuss status of pending change orders.

g. Address items that may require revising the QC Plan.

h. Review Accident Prevention Plan (APP) and effectiveness of the safety program.

i. Review environmental requirements and procedures.

j. Review Environmental Management Plan.

k. Review Waste Management Plan.

l. Review the status of training completion.

m. Review Cx Plan and progress. Review Issues Log and resolution.

n. Review IAQ Management Plan.

1.4.2 Contractor Quality Control (CQC) Plan

Submit no later than 30 days, the CQC Plan proposed to implement the requirements FAR 52.246-12 Inspection of Construction. Construction will be permitted to begin only after acceptance of the CQC Plan and other Contract requirements

1.4.2.1 Content of Contractor Quality Control (CQC) Plan

Provide a CQC Plan, prior to start of construction that includes a table of contents, with major sections identified, pages numbered sequentially, and that documents the proposed methods and responsibilities for accomplishing quality control during the construction of the project. The CQC Plan must at a minimum include the following sections:

a. A description of the quality control organization and acknowledgment that the CQC staff will implement the three phase control system for all aspects of the work specified.

b. An organizational chart showing the quality control organization with individual names and job titles and lines of authority up to an executive of the company at the home office.

c. NAMES AND QUALIFICATIONS: Names and qualifications, in resume format, (including position titles and durations for qualifying experiences) for each person in the QC organization. Include the Construction

Quality Management (CQM) for Contractors course certifications for the QC personnel as required by the paragraph CONSTRUCTION QUALITY MANAGEMENT TRAINING.

d. DUTIES, RESPONSIBILITY AND AUTHORITY OF QC PERSONNEL: Duties, responsibilities, and authorities of each person in the QC organization.

e. OUTSIDE ORGANIZATIONS: A listing of outside organizations, such as architectural and consulting engineering firms, that will be employed by the Contractor and a description of the services these firms will provide.

f. APPOINTMENT LETTERS: Letters signed by an officer of the firm appointing the QC Manager and Alternate QC Manager, CxC, and stating that they are responsible for implementing and managing the QC program as described in this Contract. Include in this letter the responsibility of the QC Manager and Alternate QC Manager to implement and manage the three phases of control, and their authority to stop work that is not in compliance with the Contract. Letters of direction are to be issued by the QC Manager to the Assistant QC Manager and all other QC Specialists or quality control representatives outlining their duties, authorities, and responsibilities. Include copies of the letters in the QC Plan.

g. SUBMITTAL PROCEDURES AND INITIAL SUBMITTAL REGISTER: Procedures for reviewing, approving, scheduling, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. Provide the name(s) of the person(s) in the QC organization authorized to review and certify submittals prior to approval. Provide the initial submittal of the Submittal Register as specified in Section 01 33 00 SUBMITTAL PROCEDURES.

h. TESTING LABORATORY INFORMATION: Testing laboratory information required by the paragraph ACCREDITATION REQUIREMENTS, as applicable.

i. TESTING PLAN AND LOG: A Testing Plan and Log that includes the tests required, associated feature of work required, referenced by the specification paragraph number requiring the test, the frequency, and the person responsible for each test.

j. Procedures to complete construction deficiencies from identification through acceptable corrective action. Establish verification procedures that identified deficiencies have been corrected. This phase is performed prior to beginning work on each definable feature of work, after all required plans, documents, materials are approved, and after copies are at the work site.

k. Reporting procedures, including proposed reporting formats.

l. Procedures for submitting and reviewing design changes/variations prior to submission to the Contracting Officer.

m. LIST OF DEFINABLE FEATURES: A Definable Feature of Work (DFOW) is a task that is separate and distinct from other tasks and has control requirements and work crews unique to that task. A DFOW is identified by different trades or disciplines, or it is work by the same trade in a different environment. A DFOW is by definition any item or activity on the construction schedule, and the schedule specification provides

direction regarding how the DFOWs are to be structured. Include in the list of DFOWs for all activities on the Construction Schedule. Although each section of the specifications can generally be considered as a definable feature of work, there are frequently more than one definable features under a particular section. Identify the specification section number and schedule activity ID for each DFOW listed. The DFOW list will be reviewed in coordination with the construction schedule and agreed upon during the Coordination of Mutual Understanding Meeting.

n. PROCEDURES FOR PERFORMING AND TRACKING THE THREE PHASES OF CONTROL: Identify procedures used to ensure the three phases of control to manage the quality on this project. For each Definable Feature of Work (DFOW), a Preparatory and Initial phase checklist will be filled out during the Preparatory and Initial phase meetings. Conduct the Preparatory and Initial Phases and meetings with a view towards obtaining quality construction by planning ahead and identifying potential problems for each DFOW.

o. Coordinate scheduled work with Special Inspections required by Section 01 45 35 SPECIAL INSPECTIONS, the Statement of Special Inspections and the Special Inspections Project Manual. Where the applicable code issued by the International Code Council (ICC) calls for inspections by the Building Official, the Contractor must include the inspections in the Quality Control Plan and must perform the inspections required by the applicable ICC. The Contractor must perform these inspections using independent qualified inspectors. Include the Special Inspections Project Manual requirements in the QC Plan.

o. PROCEDURES FOR COMPLETION INSPECTION: Procedures for identifying and documenting the completion inspection process. Include in these procedures the responsible party for punch out inspection, pre-final inspection, and final acceptance inspection.

p. TRAINING PROCEDURES AND TRAINING LOG: Procedures for coordinating and documenting the training of personnel required by the Contract.

q. ORGANIZATION AND PERSONNEL CERTIFICATIONS LOG: Procedures for coordinating, tracking and documenting all certifications required for entities such as subcontractors, testing laboratories, suppliers, and personnel. The QC Manager will ensure that certifications are current, appropriate for the work being performed, and will not lapse during any period of the Contract that the work is being performed.

1.4.3 Acceptance of the Quality Control (QC) Plan

The Contracting Officer's acceptance of the Contractor QC Planis required prior to the start of construction. The Contracting Officer reserves the right to require changes in the QC Plan and operations as necessary, including removal or addition of personnel, to ensure the specified quality of work. The Contracting Officer reserves the right to interview any member of the QC organization at any time to verify the submitted qualifications. All QC organization personnel are subject to acceptance by the Contracting Officer. The Contracting Officer may require the removal of any individual for non-compliance with quality requirements specified in the Contract.

1.4.4 Notification of Changes

Notify the Contracting Officer, in writing, of any proposed changes in the QC Plan or changes to the QC organization personnel. Proposed changes are subject to acceptance by the Contracting Officer.

1.4.5 Special Inspections

Perform all required Special Inspections per Section 01 45 35 SPECIAL INSPECTIONS, the statement of Special Inspections and the Schedule of Special Inspections.

1.5 QUALITY CONTROL (QC) ORGANIZATION

1.5.1 Quality Control (QC) Manager

1.5.1.1 Duties

Provide a QC Manager at the work site to implement and manage the QC program, and to serve as the Site Safety and Health Officer (SSHO) as detailed in Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS. The only duties and responsibilities of the QC Manager are to manage and implement the QC program on this Contract. The QC Manager must attend the Coordination and Mutual Understanding Meeting, perform the three phases of control except for those phases of control designated to be performed by QC Specialists, perform submittal review and approval, ensure testing is performed and provide QC certifications and documentation required in this Contract. The QC Manager is responsible for managing and coordinating the three phases of control and documentation performed by the QC Specialists, testing laboratory personnel and any other inspection and testing personnel required by this Contract. The QC Manager is the manager of all QC activities. The QC manager is responsible for notifying the Special Inspector and Special Inspector of Record of activities which require their review. The QC manager is responsible for coordinating the Special Inspection activities, see paragraph CONTRACTOR'S QUALITY CONTROL (QC) MANAGER, in Section 01 45 35 SPECIAL INSPECTIONS. The QC manager is responsible for the quality control for Secure Space Controlled Area Sound Rated perimeter construction.

1.5.1.2 Qualifications

The QC Manager must be an individual with a minimum of 5 years combined experience in the following positions: Project Superintendent, QC Manager, Project Manager, Project Engineer or Construction Manager on similar size and type construction Contracts which included the major trades that are part of this Contract. The individual must have at least 2 years experience as a QC Manager. The individual must be familiar with the requirements of EM 385-1-1 and have experience in the areas of hazard identification, safety compliance, and sustainability.

The QC Manager and all members of the QC organization must be capable of reading, writing, and conversing fluently in the English language.

1.5.1.3 Construction Quality Management Training

In addition to the above experience and education requirements, the QC Manager and all members of the QC team must have completed the CQM for Contractors course. If the QC Manager does not have a current certification, obtain the CQM for Contractors course certification within

90 days of award. This course is periodically offered by the Naval Facilities Engineering Systems Command and the Army Corps of Engineers. Contact the Contracting Officer for information on the next scheduled class.

The Construction Quality Management Training certificate expires after 5 years. If the QC Manager's certificate has expired, retake the course to remain current.

1.5.2 Organizational Changes

Maintain the QC staff with personnel as required by the specification section at all times. When it is necessary to make changes to the QC staff, revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

1.5.3 Assistant Quality Control (QC) Manager Duties and Qualifications

Provide a full-time assistant to the QC Manager at the work site to perform the three phases of control, perform submittal review, ensure testing is performed, and prepare QC certifications and documentation required by this Contract. The qualification requirements for the Assistant QC Manager must be certified. The individual must be familiar with the requirements of EM 385-1-1 and have experience in the areas of hazard identification and safety compliance.

The Assistant QC Manager must be capable of reading, writing, and conversing fluently in the English language.

1.5.4 Commissioning

Commissioning (Cx) is a systematic, quality-focused process for delivery of a project focusing on verifying and documenting all commissioned systems and assemblies are installed, tested, and operating as they were planned and designed to meet the project requirements. The Quality Control requirements outlined in this specification section are key in supporting the objectives of the Cx process, specifically coordinating testing, documenting, and verifying proper system operation. Properly executed the Quality Control support of Cx ensures timely execution of necessary tasks to deliver the fully commissioned and operating systems in coordination with the overall construction and project schedule.

Provide Cx in addition to the quality control requirements of this section and not as a substitute for quality control requirements. The QC Manager is responsible for carrying out the three phases of control while ensuring the functional performance and integrated systems tests are coordinated with the Cx provider as required for each system to be commissioned.

1.5.4.1 Certificate of Readiness

The QC Manager must issue a Certificate of Readiness for Government approval for each system to be commissioned. Schedule Functional Performance Tests for each system only after the Certificate of Readiness has been approved by the Government for the system. The Certificate of Readiness certifies that all required inspections have been completed and deficiencies that were identified through any prior review, inspection, or test activity have been corrected before the start of Functional Performance Tests. Refer to Cx requirements in Section 01 91 00.15 BUILDING COMMISSIONING for a list of systems to be commissioned and

detailed requirements for the Cx provider.

1.5.5 Quality Control (QC) Specialists

Provide a separate QC Specialist at the work site for each of the areas as listed in the Matrix listed below, who must assist and report to the QC Manager and who may perform production related duties but must be allowed sufficient time to perform their assigned quality control duties. These individuals or specialized technical companies are employees of the Prime or subcontractor. QC Specialists must be physically present at the work site with frequency as indicated in the Experience Matrix below, to participate in the QC Meetings, perform the three phases of control, including participation in Preparatory and Initial Phase meetings, and to perform and document Follow-up inspections as an extension of the QC Manager for each definable feature of work in their area of responsibility. QC Specialist must assist and be present for training events, and Critical System Acceptance inspections by the Government. Qualification, experience, Area of Responsibility, and frequency of QC surveillance are provided in Matrix listed herein.

1.5.5.1 Quality Control (QC) for Secure Space Controlled Area Sound Rated Perimeter Construction

1.5.5.1.1 Periodic (Follow-Up Phase) Inspections

Once construction begins, perform periodic inspections of Secure Space Controlled Area Sound Rated Area identified in the Contract drawings at least once every two weeks. Increase frequency to weekly inspections within 30 days of planned acceptance testing. Coordinate periodic inspections with the appointed Government Site Security Manager (SSM) responsible for ensuring the assembly meets the requirements for accreditation. Inspections must verify that construction and materials comply with the Contract documents, the description of the assembly in the ASTM E90 Factory Report for acoustical testing, and the approved submittals. Focus inspections on the construction of the sound rated assemblies, perimeter penetrations, perimeter doors, electronic security system, and TEMPEST countermeasures. Document periodic inspections in Daily QC Reports.

1.5.5.1.2 Preliminary Inspection

The Government and QC Manager will perform a joint preliminary inspection of the Secure Space Controlled Area Sound Rated Area after construction of the assembly is complete to verify compliance with the design requirements and other Contract documents. The Contracting Officer and the appointed Government SSM will participate in the preliminary inspection. Provide the Contracting Officer a minimum 14 calendar days notification in advance of the preliminary inspection.

As a result of the preliminary inspection, prepare a Secure Space Controlled Area Sound Rated Area punch list with deficiencies identified. Include with the punch list the estimated date by which the deficiencies will be corrected. Document the preliminary inspection in the Daily QC Report and attach the punch list. Notify the Contacting Officer when deficiencies are corrected. Deficiencies from the Preliminary Inspection must be corrected prior to scheduling the Final Acceptance Inspection.

1.5.5.1.3 Acceptance Testing for Sound Attenuation

Perform acceptance testing for sound transmission loss of sound rated door assemblies as required in Section 08 34 73 SOUND CONTROL DOOR ASSEMBLIES and Section 09 29 00 GYPSUM BOARD for sound rated assemblies. Acceptance testing must be performed during the preliminary inspection. The Contracting Officer and the appointed Government SSM must witness acceptance testing. Deficiencies identified during acceptance testing must be included in the Secure Space Controlled Area Sound Rated Area punch list and corrected prior to the final acceptance inspection.

1.5.5.1.4 Acceptance Testing for Electronic Security Systems

Perform acceptance testing for Electronic Security Systems in accordance with Section 28 10 05 ELECTRONIC SECURITY SYSTEMS (ESS). Acceptance testing must be performed during the preliminary inspection. The Contracting Officer and the appointed Government SSM must witness acceptance testing. Deficiencies identified during acceptance testing must be included in the Secure Space Controlled Area Sound Rated Area punch list and corrected prior to the Final Inspection.

1.5.5.1.5 Final Inspection

Perform a final inspection of the Secure Space Controlled Area Sound Rated Area after required testing has been successfully completed as part of the preliminary inspection and all punch list items corrected. Testing is not permitted during the final inspection. QC Manager and Superintendent must attend the final inspection and Government attendees will include the Contracting Officer and appointed Government SSM. Request a final inspection by the Contracting Officer a minimum of 14 calendar days in advance.

1.5.6 Quality Control (QC) Specialists

Provide a separate QC speicalist at the work site for each of the areas as listed below, who must assist and report to the QC Manager and who must have no duites other than their assigned quality control duties. These individuals or specialized technical companies are employees of the Prime or subcontractor. A single person can cover more than one area provided that the single person is qualified to perform quality control avtivities in each designated field. QC specialiest must be physically present at the work site to participate in the QC Meetings, perform three phases of control, including participation in prep and intital phase meetings, and to perform and document Follow-Up inspections as an extension of the QC Manager. QC specialists must assist and be present for training events and critical system accpetance inspections by the Government.

1.5.7 Fire Protection QC Specialist (FPQC)

Provide a Fire Protection Quality Control Specialist (FPQC) within the QC organization to perform quality control related activities as specified herein on fire protection and life safety systems installed under this Contract

1.5.8 Qualifications

The FPQC must have the following qualifications:

a. Be a registered Professional Engineer (P.E.) licensed by a Licensing

Board in the United States, the District of Columbia, Guam or Puerto Rico, having passed the National Council of Examiners for Engineering and Surveying (NCEES) examination specifically in the discipline of Fire Protection Engineering.

b. Have a minimum of five years of Fire Protection Engineering experience on projects of similar relevance and complexity to the fire protection work specified under this Contract.

c. Other than the contractual obligations with the Prime Contractor, the FPQC must have no other business relationship (i.e., employee, owner, partner, operating officer, distributor, salesman, technical representative, family relationship, or financial investment) with the Prime Contractor or subcontractors.

d. Be employed by an independent engineering firm or company. The firm may identify multiple, to a maximum of five, licensed Fire Protection Engineers for the performance of the duties under this Contract but must submit the names and qualifications for Government approval for all individuals identified prior to them performing any work under this Contract. These individuals may not be substituted without prior approval from the Contracting Officer.

1.5.9 Responsibilities

FPQC duties and responsibilities:

a. Assist in the development of the QC Plan including the Testing Plan and Log and executing the three phases of control for work involving the installation and testing of fire protection and life safety systems as an extension of the QC Manager.

b. Participate in project QC Meetings. Participate in Preparatory and Initial Phase meetings and perform and Follow-up inspections for work involving the installation and testing of fire protection and life safety systems.

c. Review and certify that all submittals pertaining to fire protection and life safety systems are complete and accurate prior to submission to the Government for approval. The FPQC Specialist is responsible for ensuring submittals are complete and accurate and all corrections have been made prior to submission to the Government. The Government reserves the right to reject any submittal that has not first been reviewed and certified by the FPQC and so marked, in writing, attesting to such review and completeness of the submittal.

d. The Government reserves the right to reject any submittal or construction that is not in compliance to Contract. Government reviews do not relieve the Contractor responsibility for providing adequate quality control measures and do not constitute or imply acceptance of Contract variation.

e. Perform construction surveillance in accordance with the Schedule of Fire Protection System Inspections. Construction surveillance includes but is not limited to performing periodic on-site inspections during construction at specified milestones, performing a pre-final inspection of installed systems and witnessing functional testing; and participating and documenting in an on-site final acceptance inspection of fire protection and life safety systems with the

Government FPE.

f. Document inspection results on a FPQC report prepared each day inspections are performed. The report must include a description of the visual inspection or observation performed, a written summary of findings, a conclusion on compliance with the Contract documents, and signature of the FPQC Specialist. In person inspection must be documented via both video (.mp4) and photo (.jpeg). Video/photographic documentation must include before and after conditions and physical measurements. Forward the FPQC daily report to the QC Manager who must include the report with the submission of their daily QC Report to the Government each day. Every site visit by the FPQC must be documented on a FPQC daily report.

1.5.10 Special Inspections

1.5.11 Special Inspector and Special Inspector of Record

The Special Inspector (SI) and Special Inspector of Record (SIOR) must be an independent third party hired directly by the Prime Contractor. The SI and SIOR must not be a company employee of the Contractor or any subcontractor performing the work to be inspected. The qualifications of the SI and SIOR are defined in Section 01 45 35 SPECIAL INSPECTIONS.

1.5.12 Submittal Reviewer Duties and Qualifications

Provide a Submittal Reviewer, other than the QC Manager or CxC, qualified in the discipline being reviewed, to review and certify that the submittals meet the requirements of this Contract prior to certification or approval by the QC Manager.

1.6 SUBMITTAL AND DELIVERABLES REVIEW AND APPROVAL

Procedures for submission, review and approval of submittals are described in Section 01 33 00 SUBMITTAL PROCEDURES. Procedures must include field verification of relevant dimensions and component characteristics by the QC organization prior to submittal being sent to the Contracting Officer. The CQC organization is responsible for certifying that all submittals and deliverables are in compliance with the Contract. When Section 01 91 00.15 BUILDING COMMISSIONING are included in the Contract, the submittals required by those sections have to be coordinated with Section 01 33 00 SUBMITTAL PROCEDURES to ensure adequate time is allowed for each type of submittal required.

1.7 THREE PHASES OF CONTROL

CQC enables the Contractor to ensure that the construction, including that of subcontractors and suppliers, complies with the requirements of the Contract. At least three phases of control must be conducted by the QC Manager to adequately cover both on-site and off-site work for each definable feature of the construction work as follows:

1.7.1 Preparatory Phase

Document the results of the preparatory phase actions by separate minutes prepared by the QC Manager and attach to the daily CQC report. Instruct applicable workers as to the acceptable level of workmanship required to meet Contract specifications.

Notify the Contracting Officer at least two business days in advance of each preparatory phase meeting. The meeting will be conducted by the QC Manager and attended by the QC Specialists, the Project Superintendent, the CxC, the Special Inspector, the Special Inspector of Record, and the foreman responsible for the DFOW. When the DFOW will be accomplished by a subcontractor, that subcontractor's foreman must attend the preparatory phase meeting. This phase is performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. Perform the following prior to beginning work on each DFOW:

a. Review each paragraph of the applicable specification sections, reference codes, and standards. Make available during the prepatory inspection a copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field. Maintain and make available in the field for use by Government personnel until final acceptance of the work.

b. Review the Contract drawings.

c. Verify that field measurements are as indicated on construction or shop drawings or both before confirming product orders, to minimize waste due to excessive materials.

d. Verify that appropriate shop drawings and submittals for materials and equipment have been submitted and approved. Verify receipt of approved factory test results, when required.

e. Review the testing plan and ensure that provisions have been made to provide the required QC testing.

f. Examine the work area to ensure that the required preliminary work has been completed and complies with the Contract and ensure any deficiencies/rework items in the preliminary work have been corrected and confirmed by the Contracting Officer.

g. Review coordination of product/material delivery to designated prepared areas to execute the work.

h. Examine the required materials, equipment and sample work to ensure that they are on hand and conform to the approved shop drawings and submitted data and are properly stored.

i. Check to assure that all materials and equipment have been tested, submitted, and approved.

j. Discuss specific controls to be used, construction methods, construction tolerances, workmanship standards, and the approach that will be used to provide quality construction by planning ahead and identifying potential problems for each DFOW. Ensure any portion of the plan requiring separate Contracting Officer acceptance has been approved.

k. Review the APP and appropriate Activity Hazard Analysis (AHA) to ensure that applicable safety requirements are met, and that required Safety Data Sheets (SDS) are submitted.

l. Review the Cx requirements in accordance with Section 01 91 00.15 BUILDING COMMISSIONING and ensure all preliminary work items have been

completed and documented.

m. Review Special Inspections required by Section 01 45 35 SPECIAL INSPECTIONS, the Statement of Special Inspections and the Schedule of Special Inspections.

1.7.2 Initial Phase

Notify the Contracting Officer at least two business days in advance of each initial phase. When construction crews are ready to start work on a DFOW, conduct the initial phase with the QC Specialists, the Project Superintendent, the Special Inspector, the Special Inspector of Record, and the foreman responsible for that DFOW. Observe the initial segment of the DFOW to ensure that the work complies with Contract requirements. Document the results of the initial phase in the daily CQC Report and in the Initial Phase Checklist. Repeat the initial phase for each new crew to work on-site when acceptable levels of specified quality are not being met. Indicate the exact location of initial phase for definable feature of work for future reference and comparison with follow-up phases. Perform the following for each DFOW:

a. Check work to ensure that it is in full compliance with Contract requirements. Review minutes of the preparatory meeting.

b. Verify adequacy of controls to ensure full Contract compliance. Verify required control inspection and testing comply with the Contract.

c. Establish level of workmanship and verify that it meets the minimum acceptable workmanship standards. Compare with required sample panels as appropriate.

d. Resolve any workmanship issues.

e. Ensure that testing is performed by the approved laboratory.

f. Check work procedures for compliance with the APP and the appropriate AHA to ensure that applicable safety requirements are met.

g. Review project specific work plans (i.e., Cx, HAZMAT Abatement, Stormwater Management) to ensure all preparatory work items have been completed and documented.

h. Coordinate scheduled work with Special Inspections required by Section 01 45 35 SPECIAL INSPECTIONS, the Statement of Special Inspections and the Schedule of Special Inspections.

1.7.3 Follow-Up Phase

Perform the following for on-going DFOW daily, or more frequently as necessary, until the completion of each DFOW. The Final Follow-Up for any DFOW will clearly note in the daily report the DFOW is completed, and all deficiencies/rework items have been completed in accordance with the paragraph DEFICIENCY/REWORK ITEMS LIST. Each DFOW that has completed the Initial Phase and has not completed the Final Follow-up must be included on each daily report. If no work was performed on that DFOW for the period of that daily report, it must be so noted. Document all Follow-Up activities for DFOWs in the daily CQC Report:

a. Ensure the work including control testing complies with Contract requirements until completion of that particular work feature. Record checks in the CQC documentation.

b. Maintain the quality of workmanship required.

c. Ensure that testing is performed by the approved laboratory.

d. Ensure that deficiencies/rework items are being corrected. Conduct final follow-up checks and correct all deficiencies prior to the start of additional features of work which may be affected by the deficient work.

e. Do not build upon nor conceal non-conforming work.

f. Assure manufacturers' representatives have performed necessary inspections if required and perform safety inspections.

g. Review the Cx requirements in accordance with Section 01 91 00.15 BUILDING COMMISSIONING.

h. Coordinate scheduled work with Special Inspections required by Section 01 45 35 SPECIAL INSPECTIONS, the Statement of Special Inspections and the Schedule of Special Inspections.

1.7.4 Additional Preparatory and Initial Phases

Conduct additional preparatory and initial phases on the same DFOW if the quality of on-going work is unacceptable, if there are changes in the applicable QC organization, if there are changes in the on-site production supervision or work crew, if work on a DFOW has not started within 45 days of the initial preparatory meeting or has resumed after 45 days of inactivity, or if other problems develop.

1.7.5 Notification of Three Phases of Control for Off-Site Work

Notify the Contracting Officer at least two weeks prior to the start of the preparatory and initial phases.

1.7.6 Deficiency/Rework Items List

The QC Manager must maintain a list of work that does not comply with the Contract, identifying what items need to be corrected, the activity ID number associated with the item, the date the item was originally discovered, the date the item will be corrected by, and the date the item was corrected.

The list shall be reviewed at each weekly QC Meeting:

a. There is no requirement to report a deficiency/rework item that is corrected the same day it is discovered.

b. No successor task may be advanced beyond the preparatory phase meeting until all deficiencies/rework items have been cleared by the QC Manager and concurred with by the Contracting Officer. This must be confirmed as part of the Preparatory Phase activities.

c. Attach a copy of the "Deficiency/Rework Items List" to the last daily CQC Report of each month.

d. The Contractor is responsible for including those items identified by the Contracting Officer.

e. All deficiencies/rework items must be confirmed as corrected by the QC Manager, and concurred by the Contracting Officer, prior to commencement of any completion inspections per paragraph COMPLETION INSPECTIONS unless specifically exempted by the Contracting Officer.

f. Non-Compliance with these requirements shall be grounds for removal in accordance with paragraph ACCEPTANCE OF THE QUALITY CONTROL (QC) PLAN.

g. All delays, concurrent or related to failure to manage, monitor, control, and correct deficiencies/rework items are entirely the responsibility of the Contractor and shall not be made the subject, or any component of any request for additional time or compensation.

1.8 TESTING

Perform specified or required tests to verify that control measures are adequate to provide a product which conforms to Contract requirements. Upon request, furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and acceptance tests when specified. Procure the services of an U.S. Army Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. Perform the following activities and record and provide the following data:

a. Verify that testing procedures comply with Contract requirements.

b. Verify that facilities and testing equipment are available and comply with testing standards.

c. Check test instrument calibration data against certified standards.

d. Verify that recording forms and test identification control number system, including all test documentation requirements, have been prepared.

e. Record results of all tests taken, both passing and failing on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test. If approved by the Contracting Officer, actual test reports are submitted later with a reference to the test number and date taken. Provide an information copy of tests performed by an offsite or commercial test facility directly to the Contracting Officer. Failure to submit timely test reports as stated results in nonpayment for related work performed and disapproval of the test facility for this Contract.

1.8.1 Acoustical Testing

Provide complete acoustical testing of every sound rated wall assembly to demonstrate completed construction achieves the required STC. Conduct instrumental audio tests to verify standards are met. Only those with training on audio testing techniques shall conduct the required instrumental acoustic tests. With all rated doors closed, test all Secure Area (SCIF/SAPF) perimeter walls and openings (e.g., air returns, doors, windows, etc.) along multiple points to ensure that Sound Group 3 (STC 45)

is met- Sound Group 4 (STC 50) in spaces where amplified audio is used- such as video teleconference equipment, audio-visual systems, and speaker phones (Security Office, MOC, BDS1, BDS2, Sim1, Sim2, Sim3, Sim4). Audio test sources shall have a variable sound level output. The output frequency range shall include normal speech. Test speakers shall be placed 6 feet from the test wall and 4 feet off the floor. Audio gain of the test source shall produce "loud speech" as defined by Sound Group 3 (STC 45)- "amplified speech" as defined by Sound Group 4 (STC 50). As an alternative, instrumented testing may be performed to Noise Isolation Class(NIC) standards, in which case results shall comply with NIC 40 for Sound Group 3- similar but more stringent for Sound Group 4.

1.8.2 Laboratory Accreditation Authorities

1.8.3 Capability Check

The Contracting Officer retains the right to check laboratory equipment in the proposed laboratory and the laboratory technician's testing procedures, techniques, and other items pertinent to testing, for compliance with the standards set forth in this Contract. Laboratories utilized for testing soils, concrete, asphalt, and steel must meet criteria detailed in ASTM D3740 and ASTM E329.

1.8.4 Test Results

Cite applicable Contract requirements, tests or analytical procedures used. Provide actual results and include a statement that the item tested or analyzed conforms or fails to conform to specified requirements. If the item fails to conform, notify the Contracting Officer immediately. Conspicuously stamp the cover sheet for each report in large red letters "CONFORMS" or "DOES NOT CONFORM" to the specification requirements, whichever is applicable. Test results must be signed by a testing laboratory representative authorized to sign certified test reports. Furnish the signed reports, certifications, and other documentation to the Contracting Officer via the QC Manager.

1.9 COMPLETION INSPECTIONS

1.9.1 Punch-Out Inspection

Near the completion of all work or any increment thereof, established by a completion time stated in the Contract Clause entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the QC Manager must conduct an inspection of the work and develop a "punch list" of items which do not conform to the approved drawings, specifications, and Contract. Include in the punch list any remaining items on the "Deficiency/Rework Items List", that were not corrected prior to the Punch-Out Inspection as approved by the Contracting Officer in accordance with the paragraph DEFICIENCY/REWORK ITEMS LIST. Include within the punch list the estimated date by which the deficiencies will be corrected. Provide a copy of the punch list to the Contracting Officer.

The QC Manager, or staff, must make follow-on inspections to ascertain that all deficiencies have been corrected. All punch list items must be confirmed as corrected by the QC Manager and concurred by the Contracting Officer. Once this is accomplished, notify the Government that the facility is ready for the Government "Pre-Final Inspection".

1.9.2 Pre-Final Inspection

The Government and QC Manager will perform this inspection to verify that the facility is complete and ready to be occupied. A Government "Pre-Final Punch List" will be documented by the QC Manager as a result of this inspection. The QC Manager will ensure that all items on this list are corrected and concurred by the Contracting Officer prior to notifying the Government that a "Final" inspection with the Client can be scheduled. All items noted on the "Pre-Final" inspection must be corrected and concurred by the Contracting Officer in a timely manner and be accomplished before the Contract completion date for the work, or any increment thereof, if the project is divided into increments by separate completion dates unless exceptions are directed by the Contracting Officer.

1.9.3 Final Acceptance Inspection

Notify the Contracting Officer at least 14 calendar days prior to the date a final acceptance inspection can be held. State within the notice that all items previously identified on the pre-final punch list will be corrected and acceptable, along with any other unfinished Contract work, by the date of the final acceptance inspection. The Contractor must be represented by the QC Manager, the Project Superintendent, and others deemed necessary. Attendees for the Government will include the Contracting Officer, other Government QA personnel, and personnel representing the Client. Failure of the Contractor to have all Contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the Contract Clause entitled "Inspection of Construction."

1.10 QUALITY CONTROL (QC) CERTIFICATIONS

1.10.1 Contractor Quality Control (CQC) Report Certification

Contain the following statement within the CQC Report: "On behalf of the Contractor, I certify that this report is complete and correct and equipment and material used, and work performed during this reporting period is in compliance with the Contract drawings and specifications to the best of my knowledge, except as noted in this report."

1.10.2 Completion Certification

Upon completion of work under this Contract, the QC Manager must furnish a certificate to the Contracting Officer attesting that "the work has been completed, inspected, tested and is in compliance with the Contract." Provide a copy of this final QC Certification for completion to the preparer of the Operation & Maintenance (O&M) documentation.

1.11 DOCUMENTATION AND INFORMATION FOR THE CONTRACTING OFFICER

1.11.1 Construction Documentation

Reports are required for each day that work is performed and must be attached to the Contractor Quality Control Report prepared for the same day. Maintain current and complete records of on-site and off-site QC program operations and activities. Reports are required for each day work is performed. Account for each calendar day throughout the life of the Contract.

The Project Superintendent and the QC Manager must prepare and sign the Contractor Production and CQC Reports, respectively. Every space on the forms must be filled in. Use N/A if nothing can be reported in one of the spaces. The reporting of work must be identified by terminology consistent with the construction schedule. In the "Remarks" sections of the reports, enter pertinent information including directions received, problems encountered during construction, work progress and delays, conflicts or errors in the drawings or specifications, field changes, safety hazards encountered, instructions given and corrective actions taken, delays encountered, a record of visitors to the work site, quality control problem areas, deviations from the QC Plan, construction deficiencies encountered, and meetings held. For each entry in the report(s), identify the Schedule Activity No. that is associated with the entered remark.

1.11.2 Quality Control Activities

CQC and Contractor Production reports will be prepared daily to maintain current records providing factual evidence that required quality control activities and tests have been performed. Include in these records the work of subcontractors and suppliers on an acceptable form that includes, as a minimum, the following information:

a. The name and area of responsibility of the Contractors and any subcontractors.

b. Operating plant/equipment with hours worked, idle, or down for repair.

c. Work performed each day, giving location, description, and by whom. When a Network Analysis Schedule (NAS) is used, identify each item of work performed each day by NAS activity number.

d. Control phase activities performed. Preparatory, and Initial phase Checklists associated with the DFOW referenced to the construction schedule. Follow-up phase activities identified to the DFOW. If testing or specific QC Specialist activities are associated with the Follow-up phase activities for a specific DFOW note this and include those reports.

e. Test and control activities performed with results and references to specifications and drawings requirements. Identify the control phase (Preparatory, Initial, Follow-up). List of deficiencies noted, along with corrective action in accordance with the paragraph DEFICIENCY/REWORK ITEMS LIST.

f. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications and drawings requirements.

g. Submittals and deliverables reviewed, with Contract reference, by whom, and action taken.

h. Offsite surveillance activities, including actions taken.

i. Job safety evaluations stating what was checked, results, and instructions or corrective actions.

j. Instructions given/received and conflicts in plans and specifications.

1.11.3 Verification Statement

Indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. Cover both conforming and deficient features and include a statement that equipment and materials incorporated in the work and workmanship comply with the Contract.

Furnish the original and one copy of these records in report form to the Government by 10:00 AM the next working day after the date covered by the report. As a minimum, prepare and submit one report for every seven days of no work and on the last day of a no work period. All calendar days need to be accounted for throughout the life of the Contract. The first report following a day of no work will be for that day only. Reports need to be signed and dated by the QC Manager. Include copies of test reports and copies of reports prepared by all subordinate quality control personnel within the QC Manager Report.

1.11.4 Reports from the Quality Control (QC) Specialist(s)

Document inspection results on a QC specialist report prepared each day work is performed in their area of responsibility. The report must include a description of the visual inspection or observation performed, a written summary of findings, a conclusion on compliance with the Contract documents, and signature of the QC Specialist. In person inspections must be documented with Video/photographs. Video/photographic documentation of deficiencies must include before and after conditions and physical measurements, as necessary. Forward the QC daily report to the QC Manager who must include the report with the submission of their daily QC Report to the Government each day. Every site visit by the QC Specialist must be documented on a QC Specialist daily report.

1.11.5 Quality Control Validation

Establish and maintain the following in an electronic folder. Divide folder into a series of tabbed sections as shown below. Ensure folder is updated at each required progress meeting.

a. CQC Meeting minutes in accordance with paragraph QUALITY CONTROL (QC) MEETINGS.

b. All completed Preparatory and Initial Phase Checklists, arranged by specification section, further sorted by DFOW referenced to the construction schedule. Submit each individual Phase Checklist the day the phase event occurs as part of the CQC daily report.

c. All milestone inspections, arranged by Activity Number referenced to the construction schedule.

d. An up-to-date copy of the Testing Plan and Log with supporting field test reports, arranged by specification section referenced to the DFOW to which individual reports results are associated. Individual field test reports will be submitted within two working days after the test is performed in accordance with the paragraph QUALITY CONTROL ACTIVITIES.

e. Copies of all Contract modifications, arranged in numerical order. Also include documentation that modified work was accomplished.

f. An up-to-date copy of the paragraph DEFICIENCY/REWORK ITEMS LIST.

g. Cx documentation in accordance with Section 01 91 00.15 BUILDING COMMISSIONING.

h. Special Inspection reports.

i. Upon commencement of Completion Inspections of the entire project or any defined portion, maintain up-to-date copies of all punch lists issued by the QC staff to the Contractor and subcontractors and all punch lists issued by the Government in accordance with the paragraph COMPLETION INSPECTIONS.

1.11.6 Testing Plan and Log

As tests are performed, the CxC and the QC Manager will record on the "Testing Plan and Log" the date the test was performed and the date the test results were forwarded to the Contracting Officer. Attach a copy of the updated "Testing Plan and Log" to the last daily CQC Report of each month. Provide a copy of the final "Testing Plan and Log" to the preparer of the Operation & Maintenance (O&M) documentation.

1.11.7 As-Built Drawings

The QC Manager must ensure the as-built drawings, required by Section 01 78 00 CLOSEOUT SUBMITTALS are kept current on a daily basis and marked to show deviations which have been made from the Contract drawings. The as-built drawings document shall commence with the QC Manager ensuring all amendments, or changes to the Contract prior to Contract award are accurately noted in the initial document set creating the accurate baseline of the Contract prior to any work starting. Ensure each deviation has been identified with the appropriate modifying documentation (e.g., PC No., Modification No., Request for Information No.). The QC Manager or QC Specialist assigned to an area of responsibility must initial each revision. Upon completion of work, the QC Manager will furnish a certificate attesting to the accuracy of the as-built drawings prior to submission to the Contracting Officer.

1.12 NOTIFICATION ON NON-COMPLIANCE

The Contracting Officer will notify the Contractor of any detected non-compliance with the Contract. Take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, is deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders will be made the subject of a claim for extension of time for excess costs or damages by the Contractor.

1.13 DELIVERY, STORAGE, AND HANDLING

Designate receiving/storage areas for incoming material to be delivered according to installation schedule and to be placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. Store and handle materials in a manner as to prevent loss from weather and other damage. Keep materials, products, and accessories covered and off the ground, and store in a dry, secure area. Prevent contact with material that may cause corrosion, discoloration, or

staining. Protect all materials and installations from damage by the activities of other trades.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

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SECTION 01 45 35

SPECIAL INSPECTIONS
11/20

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7-16	(2017; Errata 2018; Supp 1 2018) Minimum Design Loads and Associated Criteria for Buildings and Other Structures

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2021) International Building Code

1.2 GENERAL REQUIREMENTS

Perform Special Inspections in accordance with the Statement of Special Inspections, Schedule of Special Inspections and Chapter 17 of ICC IBC. The Statement of Special Inspections and Schedule of Special Inspections are included as an attachment to this specification. Special Inspections are to be performed by an independent third party and are intended to ensure that the work of the Prime Contractor is in accordance with the Contract Documents and applicable building codes. Special inspections do not take the place of the three phases of control inspections performed by the Contractor's QC Manager or any testing and inspections required by other sections of the specifications.

1.3 DEFINITIONS

1.3.1 Continuous Special Inspections

Continuous Special Inspections is the constant monitoring of specific tasks by a special inspector. These inspections must be carried out continuously over the duration of the particular tasks.

1.3.2 Perform

Perform these Special Inspections tasks for each welded joint or member.

1.3.3 Observe

Observe these Special Inspections items on a periodic daily basis. Operations need not be delayed pending these inspections.

1.3.4 Special Inspector (SI)

A qualified person retained by the Contractor and approved by the Contracting Officer as having the competence necessary to inspect a particular type of construction requiring Special Inspections. The SI

must be an independent third party hired directly by the Prime Contractor.

1.3.5 Associate Special Inspector (ASI)

A qualified person who assists the SI in performing Special Inspections but must perform inspection under the direct supervision of the SI and cannot perform inspections without the SI on site.

1.3.6 Third Party

A Special inspector must not be an employee of the Contractor or of any Sub-Contractor performing the work to be inspected.

1.3.7 Special Inspector of Record (SIOR)

A licensed engineer in responsible charge of supervision of all special inspectors for the project and approved by the Contracting Officer. The SIOR must be an independent third party entity hired directly by the Prime Contractor.

1.3.8 Contracting Officer

The Government official having overall authority for administrative contracting actions. Certain contracting actions may be delegated to the Contracting Officer's Representative (COR).

1.3.9 Contractor's Quality Control (QC) Manager

An individual retained by the Prime Contractor and qualified in accordance with the Section 01 45 00 QUALITY CONTROL having the overall responsibility for the Contractor's QC organization.

1.3.10 Structural Engineer of Record (SER)

A registered design professional contracted by the Government as an A/E responsible for the overall design and review of submittal documents prepared by others. The SER is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws in the state in which the design professional works. The SER is also referred to as the Engineer of Record (EOR) in design code documents.

1.3.11 Statement of Special Inspections (SSI)

A document developed by the SER identifying the material, systems, components and work required to have Special Inspections. This statement is included by attachment to this specification section.

1.3.12 Schedule of Special Inspections (SSI)

A schedule which lists each of the required Special Inspections, the extent to which each Special Inspection is to be performed, and the required frequency for each in accordance with ICC IBC Chapter 17. This schedule is included at on sheet G-201 and G-202.

1.3.13 Designated Seismic Systems (DSS)

Those nonstructural components that require design in accordance with ASCE 7-16 Chapter 13 and for which the component importance factor, Ip, is

greater than 1.0. This designation applies to systems that are required to be operational following the Design Earthquake for RC I - IV structures and following the MCER for RC V structures. All systems in RC V facilities designated as MC-1 in accordance with UFC 3-301-02 are considered part of the Designated Seismic Systems. Designated Seismic Systems will have an Importance Factor Ip = 1.5.

1.3.14 Definable Feature of Work (DFOW)

An inspection group that is separate and distinct from other inspection groups, having inspection requirements or inspectors that are unique.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

SIOR Letter of Acceptance; G

Special Inspections Project Manual; G

Special Inspections Agency's Written NDT Practices with method and evidence of regular equipment calibration where applicable

SD-06 Test Reports

Special Inspections Daily Reports

Special Inspections Biweekly Reports

SD-07 Certificates

AISC Certified Steel Fabricator

Steel Truss Plant Quality Assurance Program

Wood Truss Plant Quality Assurance Program

AC472 Accreditation

Steel Joist Institute Membership

Precast Concrete Institute (PCI) Certified Plant

Certificate of Compliance

Special Inspector of Record Qualifications; G

Special Inspector Qualifications; G

Qualification Records for NDT technicians

SD-11 Closeout Submittals

Interim Report of Special Inspections for Each DFOW; G

Comprehensive Final Report of Special Inspections; G

1.5 SPECIAL INSPECTOR QUALIFICATIONS

Submit qualifications for each special inspector and the special inspector of record.

1.5.1 Steel Construction and High Strength Bolting

1.5.1.1 Special Inspector

a. ICC Structural Steel and Bolting Special Inspector certificate with one year of related experience, or

b. Registered Professional Engineer with three years of related experience

1.5.1.2 Associate Special Inspector

Engineer-In-Training with one year of related experience.

1.5.2 Welding Structural Steel

1.5.2.1 Special Inspector

a. ICC Structural Welding Special Inspector certificate with one year of related experience, or

b. AWS Certified Welding Inspector

1.5.2.2 Associate Special Inspector

AWS Certified Associate Welding Inspector

1.5.3 Nondestructive Testing of Welds

1.5.3.1 Special Inspector

NDT Level III Certificate

1.5.3.2 Associate Special Inspector

NDT Level II Certificate plus one year of related experience

1.5.4 Cold Formed Steel Framing

1.5.4.1 Special Inspector

a. ICC Structural Steel and Bolting Special Inspector certificate with one year of related experience, or

b. ICC Commercial Building Inspector with one year of experience, or

c. ICC Residential Building Inspector with one year of experience, or

d. Registered Professional Engineer with three years related experience

1.5.4.2 Associate Special Inspector

Engineer-In-Training with one year of related experience.

1.5.5 Concrete Construction

1.5.5.1 Special Inspector

a. ICC Reinforced Concrete Special Inspector Certificate with one year of related experience, or

b. ACI Concrete Construction Special Inspector, or

c. Registered Professional Engineer with three years of related experience

1.5.5.2 Associate Special Inspector

a. ACI Concrete Construction Special Inspector in Training, or

b. Engineer-In-Training with one year of related experience

1.5.6 Prestressed Concrete Construction

1.5.6.1 Special Inspector

a. ICC Pre-stressed Special Inspector Certificate with one year of related experience, or

b. PCI Quality Control Technician/ Inspector Level II Certificate with one year of related experience, or

c. Registered Professional Engineer with three years of related experience

1.5.6.2 Associate Special Inspector

a. PCI Quality Control Technician/ Inspector Level I Certificate with one year of related experience, or

b. Engineer-In-Training with one year of related experience

1.5.7 Post-tensioned Concrete Construction

1.5.7.1 Special Inspector

a. PTI Level 2 Unbonded PT Inspector Certificate, or

b. Registered Professional Engineer with three years of related experience

1.5.7.2 Associate Special Inspector

a. PTI Level 1 Unbonded PT Inspector Certificate with one year of related experience, or

b. Engineer-In-Training with one year of related experience

1.5.8 Masonry Construction

1.5.8.1 Special Inspector

a. ICC Structural Masonry Special Inspector Certificate with one year of related experience, or

b. Registered Professional Engineer with three years of related experience

1.5.8.2 Associate Special Inspector

Engineer-In-Training with one year of related experience.

1.5.9 Wood

1.5.9.1 Special Inspector

a. ICC Commercial Building Inspector Certificate with one year of related experience, or

b. ICC Residential Building Inspector with on year of experience, or

c. Registered Professional Engineer with three years of related experience

1.5.9.2 Associate Special Inspector

Engineer-In-Training with one year of related experience.

1.5.10 Verification of Site Soil Condition, Fill Placement and Load-Bearing Requirements

1.5.10.1 Special Inspector

a. ICC Soils Special Inspector Certificate with one year of related experience, or

b. NICET Soils Technician Level II Certificate in Construction Material Testing, or

c. Geologist-In-Training with three years of related experience, or

d. Registered Professional Engineer with three years of related experience

1.5.10.2 Associate Special Inspector

a. NICET Soils Technician Level I Certificate in Construction Material Testing with one year of related experience, or

b. Engineer-In-Training with one year of related experience

1.5.11 Deep Foundations

1.5.11.1 Special Inspector

a. NICET Soils Technician Level II Certificate in Construction Material Testing, or

b. Geologist-In-Training with three years of related experience, or

c. Registered Professional Engineer with three years of related experience

1.5.11.2 Associate Special Inspector

a. NICET Soils Technician Level I Certificate in Construction Material Testing with one year of related experience, or

b. NICET Geotechnical Engineering Technician Level I Construction or Generalist Certificate with one year of related experience, or

c. Engineer-In-Training with one year of related experience

1.5.12 Sprayed Fire Resistant Material

1.5.12.1 Special Inspector

a. ICC Spray-applied Fireproofing Special Inspector Certificate, or

b. ICC Fire Inspector I Certificate with one year of related experience, or

c. Registered Professional Engineer or Architect with related experience

1.5.12.2 Associate Special Inspector

Engineer-In-Training with one year of related experience

1.5.13 Mastic and Intumescent Fire Resistant Coatings

1.5.13.1 Special Inspector

a. ICC Spray-applied Fireproofing Special Inspector Certificate, or

b. ICC Fire Inspector I Certificate with one year of related experience, or

c. Registered Professional Engineer or Architect with related experience

1.5.13.2 Associate Special Inspector

Engineer-In-Training with one year of related experience.

1.5.14 Exterior Insulation and Finish System (EIFS)

1.5.14.1 Special Inspector

a. AWCI EIFS Inspector Certificate, or

b. Exterior Design Institute Certificate, or

c. Registered Professional Engineer or Architect with related experience

1.5.14.2 Associate Special Inspector

Engineer-In-Training with one year of related experience.

1.5.15 Fire-Resistant Penetrations and Joints

1.5.15.1 Special Inspector

a. Passed the UL Firestop Exam with one year of related experience, or

b. Passed the FM Firestop Exam with one year of related experience, or

c. Registered Professional Engineer with related experience

1.5.15.2 Associate Special Inspector

Engineer-In-Training with one year of related experience.

1.5.16 Smoke Control

1.5.16.1 Special Inspector

a. AABC Technician Certification with one year of related experience, or

b. Registered Professional Engineer with related experience

1.5.16.2 Associate Special Inspector

Engineer-In-Training with one year of related experience.

1.5.17 Special Inspector of Record (SIOR)

Registered Professional Engineer with five years of related experience.

PART 2 PRODUCTS

2.1 FABRICATOR SPECIAL INSPECTIONS

Special Inspections of fabricator's work performed in the fabricator's shop is required to be inspected in accordance with the Statement of Special Inspections and the Schedule of Special Inspections unless the fabricator is certified by the approved agency to perform such work without Special Inspections. Submit the following certifications to the Contracting Officer for information to allow work performed in the fabricator's shop to not be subjected to Special Inspections.

AISC Certified Steel Fabricator.

Truss Plate Institute (TPI) steel truss plant quality assurance program certification.

Truss Plate Institute (TPI) wood truss plant quality assurance program certification.

International Accreditation Service, AC472 Accreditation

Steel Joist Institute Membership

Precast Concrete Institute (PCI) Certified Plant, Group C

At the completion of fabrication, submit a certificate of compliance, to be included with the comprehensive final report of Special Inspections, stating that the materials supplied and work performed by the fabricator

are in accordance with the construction documents.

PART 3 EXECUTION

3.1 RESPONSIBILITIES

3.1.1 Special Inspector of Record

a. Supervise all Special Inspectors required by the Contract Documents and the IBC.

b. Submit a SIOR Letter of Acceptance to the Contracting Officer attesting to acceptance of the duties of SIOR, signed and sealed by the SIOR.

c. Verify the qualifications of all of the Special Inspectors.

d. Verify the qualifications of fabricators.

e. Submit Special Inspections agency's written NDT practices for the monitoring and control of the agency's operations to include the following:

(1) The agency's procedures for the selection and administration of inspection personnel, describing the training, experience and examination requirements for qualifications and certification of inspection personnel.

(2) The agency's inspection procedures, including general inspection, material controls, and visual welding inspection.

f. Submit qualification records for nondestructive testing (NDT) technicians designated for the project.

g. Submit NDT procedures and equipment calibration records for NDT to be performed and equipment to be used for the project.

h. Prepare a Special Inspections Project Manual, which must cover the following:

(1) Roles and responsibilities of the following individuals during Special Inspections: SIOR, SI, ASI, General Contractor's QC Manager and SER.

(2) Organizational chart or communication plan, indicating lines of communication.

(3) Contractor's internal plan for scheduling inspections. Address items such as timeliness of inspection requests, who to contact for inspection requests, and availability of alternate inspectors.

(4) Indicate the Government reporting requirements.

(5) Propose forms or templates to be used by SI and SIOR to document inspections.

(6) Indicate procedures for tracking nonconforming work and verification that corrective work is complete.

(7) Indicate how the SIOR and SI will participate in weekly QC meetings.

(8) Indicate how Special Inspections of shop fabricated items will be handled when the fabricator's shop is not certified in accordance with paragraph FABRICATOR SPECIAL INSPECTIONS.

(9) Include a section in the manual that covers each specific item requiring Special Inspections that is indicated on the Schedule of Special Inspections. Provide names and qualifications of each special inspector who will be performing the Special Inspections for each specific item. Provide detail on how the Special Inspections are to be carried out for each item so that the expectations are clear for the General Contractor and the Subcontractor performing the work.

Make a copy of the Special Inspections Project Manual available on the job site during construction. Submit a copy of the Special Inspections Project Manual for approval.

i. Attend coordination and mutual understanding meeting where the information in the Special Inspections Project Manual will be reviewed to verify that all parties have a clear understanding of the Special Inspections provisions and the individual duties and responsibilities of each party.

j. Maintain a 3-ring binder for the Special Inspector's daily and biweekly reports and the Special Inspections Project Manual. This file must be located in a conspicuous place in the project trailer/office to allow review by the Contracting Officer and the SER.

k. Submit a copy of the Special Inspector's daily reports to the QC Manager.

l. Discrepancies that are observed during Special Inspections must be reported to the QC Manager for correction. If discrepancies are not corrected before the special inspector leaves the site the observed discrepancies must be documented in the daily report.

m. Submit a biweekly Special Inspections report until all work requiring Special Inspections is complete. A report is required for each biweekly period in which Special Inspections activity occurs, and must include the following:

(1) A brief summary of the work performed during the reporting time frame.

(2) Changes and discrepancies with the drawings, specifications and mechanical or electrical component certification, that were observed during the reporting period.

(3) Discrepancies which were resolved or corrected.

(4) A list of nonconforming items requiring resolution.

(5) All applicable test results including nondestructive testing reports.

n. At the completion of each Definable Feature of Work (DFOW) requiring

Special Inspections, submit an interim report that documents the Special Inspections completed for that DFOW including corrections of all discrepancies noted in the daily reports. Interim reports of Special Inspections must be signed and dated by the SIOR.

o. At the completion of the project submit a comprehensive final report of Special Inspections that documents the Special Inspections completed for the project including corrections of all discrepancies noted in the daily reports. The comprehensive final report of Special Inspections must be signed, dated and bear the seal of the SIOR.

3.1.2 Quality Control Manager

a. Supervise all Special Inspectors required by the Contract Documents and the IBC.

b. Verify the qualifications of all of the Special Inspectors.

c. Verify the qualifications of fabricators.

d. Maintain a 3-ring binder for the Special Inspector's daily and biweekly reports. This file must be located in a conspicuous place in the project trailer/office to allow review by the Contracting Officer and the SER.

e. Maintain a rework items list that includes discrepancies noted on the Special Inspectors daily report.

3.1.3 Special Inspectors

a. Inspect all elements of the project for which the special inspector is qualified to inspect and are identified in the Schedule of Special Inspections.

b. Attend preparatory phase meetings related to the Definable Feature of Work (DFOW) for which the special inspector is qualified to inspect.

c. Submit Special Inspections agency's written NDT practices for the monitoring and control of the agency's operations to include the following:

(1) The agency's procedures for the selection and administration of inspection personnel, describing the training, experience and examination requirements for qualifications and certification of inspection personnel.

(2) The agency's inspection procedures, including general inspection, material controls, and visual welding inspection.

d. Submit qualification records for nondestructive testing (NDT) technicians designated for the project.

e. Submit NDT procedures and equipment calibration records for NDT to be performed and equipment to be used for the project.

f. Submit a copy of the daily reports to the QC Manager.

g. Report discrepancies that are observed during Special Inspections to the QC Manager for correction. If discrepancies are not corrected

before the special inspector leaves the site the observed discrepancies must be documented in the daily report.

h. Submit a biweekly Special Inspection Report until all inspections are complete. A report is required for each biweekly period in which Special Inspections activity occurs, and must include the following:

(1) A brief summary of the work performed during the reporting time frame.

(2) Changes and discrepancies with the drawings, specifications and mechanical or electrical component certification, that were observed during the reporting period.

(3) Discrepancies which were resolved or corrected.

(4) A list of nonconforming items requiring resolution.

(5) All applicable test result including nondestructive testing reports.

i. At the completion of each DFOW requiring Special Inspections, submit an interim report of Special Inspections that documents the Special Inspections completed for that DFOW. Identify the inspector responsible for each item inspected and corrections of all discrepancies noted in the daily reports. The interim report of Special Inspections must be signed, dated and indicate the certification of the special inspector qualifying them to conduct the inspection.

j. At the completion of the project submit a comprehensive final report of Special Inspections that documents the Special Inspections completed for the project and corrections of all discrepancies noted in the daily reports. The comprehensive final report of Special Inspections must be signed, dated and indicate the certification of the special inspector qualifying them to conduct the inspection.

k. Submit daily reports to the SIOR.

3.2 DEFECTIVE WORK

Check work as it progresses, but failure to detect any defective work or materials must in no way prevent later rejection if defective work or materials are discovered, nor obligate the Contracting Officer to accept such work.

-- End of Section --

Project: F-16 MISSION TRAINING CENTER (MTC)
Location: ATLANTIC CITY ANG BASE, EGG HARBOR TOWNSHIP, N.
Project #: FSB2022-130-00
Date: 5/15/2025

STATEMENT OF SPECIAL INSPECTIONS

Project Seismic Design Category: A
Project Risk Category: II
Project Design Wind Speed (mph): 120
Number of Stories: 1
Structure Height Above Grade (ft): 31
Hazardous Occupancy or attached to such? No Group H Occupancies

Special Inspector of Record (SIOR)

A Special Inspector of Record (SIOR) IS NOT required (per UFGS 01 45 35, Section 1.3.8)

Lateral Force Resisting System (LFRS)

2021 IBC 1704.3.2 and 1704.3.3

Following is a listing of critical main wind/seismic force resisting systems for this structure. Carefully inspect these elements as part of the roles and responsiblities of the Special Inspector (reference the Schedule of Special Inspections for inspection checklists).

Vertical LFRS Elements	Notes
SPECIAL INSPECTIONS FOR WIND RESISTANCE NOT REQUIRED	EXPOSURE CATEGORY C, V<140 MPH
SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE NOT REQUIRED	SEISMIC DESIGN CATEGORY A

Horizontal LFRS Elements	Notes
SPECIAL INSPECTIONS FOR WIND RESISTANCE NOT REQUIRED	EXPOSURE CATEGORY C, V<140 MPH
SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE NOT REQUIRED	SEISMIC DESIGN CATEGORY A

Project: F-16 MISSION TRAINING CENTER (MTC)
Location: ATLANTIC CITY ANG BASE, EGG HARBOR TOWNSHIP, NJ
Project #: FSB2022-130-00
Date: 5/15/2025

Designated Seismic Systems (DSS)

(2018 IBC 1705.13.3) (ASCE 7-16, 13.2.2, C13.2.2) (UFC 3-301-1, 2-5.3)

DESIGNATED SEISMIC SYSTEMS DO NOT APPLY TO THIS PROJECT, due to the Seismic Design Category being less than C.

ELECTRICAL Designated Seismic Systems (DSS) Requiring a Certificate of Compliance
N/A
N/A
N/A
N/A
N/A

If additional space is required, append an additional sheet listing the remaining DSS

MECHANICAL/PLUMBING Designated Seismic Systems (DSS) Requiring a Certificate of Compliance
N/A
N/A
N/A
N/A
N/A
N/A

If additional space is required, append an additional sheet listing the remaining DSS

OTHER Designated Seismic Systems (DSS) Requiring a Certificate of Compliance
N/A
N/A
N/A
N/A
N/A
N/A

Final Walk Down Inspection and Report

(UFC 3 301 01 SECTION 2-5.4)

Final Walk Down Inspection of non-structural Designated Seismic Systems does not apply to this project (no Designated Seismic Systems)

SECTION 01 50 00

TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS
11/20, CHG 2: 08/22

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C511	(2017; R 2021) Reduced-Pressure Principle Backflow Prevention Assembly

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2023; ERTA 7 2023; TIA 23-15) National Electrical Code
NFPA 241	(2022) Standard for Safeguarding Construction, Alteration, and Demolition Operations

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2024) Safety -- Safety and Health Requirements Manual

U.S. FEDERAL HIGHWAY ADMINISTRATION (FHWA)

MUTCD	(2009; Rev 2012) Manual on Uniform Traffic Control Devices

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Construction Site Plan; G

Traffic Control Plan; G

Haul Road Plan; G

Contractor Computer Cybersecurity Compliance Statements; G

Contractor Temporary Network Cybersecurity Compliance Statements; G

SD-03 Product Data

Backflow Preventers; G, AE

SD-06 Test Reports

Backflow Preventer Tests

SD-07 Certificates

Backflow Tester Certification

Backflow Preventers Certificate of Full Approval

1.3 CONSTRUCTION SITE PLAN

Prior to the start of work, submit for Government approval a site plan showing the locations and dimensions of temporary facilities (including layouts and details, equipment and material storage area (onsite and offsite), and access and haul routes,emergency access routes, avenues of ingress/egress to the fenced area and details of the fence installation. Identify any areas which may have to be graveled to prevent the tracking of mud. Indicate if the use of a supplemental or other staging area is desired. Show locations of safety and construction fences, site trailers, construction entrances, trash dumpsters, temporary sanitary facilities, and worker parking areas.

1.4 BACKFLOW PREVENTERS CERTIFICATE

1.4.1 Backflow Tester Certificate

Prior to testing, submit to the Contracting Officer certification issued by the State or local regulatory agency attesting that the backflow tester has successfully completed a certification course sponsored by the regulatory agency. Tester must not be affiliated with a company participating in other phases of this Contract.

1.4.2 Backflow Prevention Training Certificate

Submit a certificate recognized by the State or local authority that states the Contractor has completed at least 10 hours of training in backflow preventer installations. The certificate must be current.

1.5 DOD CONDITION OF READINESS (COR)

DOD will set the Condition of Readiness (COR) based on the weather forecast for sustained winds (58 mph) or greater. Contact the Contracting Officer for the current COR setting.

Monitor weather conditions a minimum of twice a day and take appropriate actions according to the approved Emergency Plan in the accepted Accident Prevention Plan, EM 385-1-1 Section 01 Emergency Planning and the instructions below.

Unless otherwise directed by the Contracting Officer, comply with:

a. Condition FOUR (Sustained winds of 58 mph or greater expected within 72 hours): Normal daily jobsite cleanup and good housekeeping practices. Collect and store in piles or containers scrap lumber,

waste material, and rubbish for removal and disposal at the close of each work day. Maintain the construction site including storage areas, free of accumulation of debris. Stack form lumber in neat piles less than 3.3 feet high. Remove all debris, trash, or objects that could become missile hazards. Contact Contracting Officer for weather and COR updates and completion of required actions.

b. Condition THREE (Sustained winds of 58 mph or greater expected within 48 hours): Maintain "Condition FOUR" requirements and commence securing operations necessary for "Condition ONE" which cannot be completed within 18 hours. Cease all routine activities which might interfere with securing operations. Commence securing and stow all gear and portable equipment. Make preparations for securing buildings. Reinforce or remove formwork and scaffolding. Secure machinery, tools, equipment, materials, or remove from the jobsite. Expend every effort to clear all missile hazards and loose equipment from general base areas. Contact Contracting Officer for weather and COR updates and completion of required actions. Review requirements pertaining to "Condition TWO" and continue action as necessary to attain "Condition THREE" readiness.

c. Condition TWO (Sustained winds of 58 mph or greater expected within 24 hours): Secure the jobsite, and leave Government premises.

d. Condition ONE. (Sustained winds of 58 mph or greater expected within 12 hours): Contractor access to the jobsite and Government premises is prohibited.

1.6 CYBERSECURITY DURING CONSTRUCTION

{For Reference Only: This subpart (and its subparts) relates to AC-18, SA-3, CCI-00258.} Meet the following requirements throughout the construction process.

1.6.1 Contractor Computer Equipment

Contractor owned computers may be used for construction. When used, contractor computers must meet the following requirements:

1.6.1.1 Operating System

The operating system must be an operating system currently supported by the manufacturer of the operating system. The operating system must be current on security patches and operating system manufacturer required updates.

1.6.1.2 Anti-Malware Software

The computer must run anti-malware software from a reputable software manufacturer. Anti-malware software must be a version currently supported by the software manufacturer, must be current on all patches and updates, and must use the latest definitions file. All computers used on this project must be scanned using the installed software at least once per day.

1.6.1.3 Passwords and Passphrases

The passwords and passphrases for all computers must be changed from their default values. Passwords must be a minimum of eight characters with a

minimum of one uppercase letter, one lowercase letter, one number and one special character.

1.6.1.4 Contractor Computer Cybersecurity Compliance Statements

Provide a single submittal containing completed Contractor Computer Cybersecurity Compliance Statements for each company using contractor owned computers. Contractor Computer Cybersecurity Compliance Statements must use the template published at http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/forms-graphics-tables. Each Statement must be signed by a cybersecurity representative for the relevant company.

1.6.2 Temporary IP Networks

Temporary contractor-installed IP networks may be used during construction. When used, temporary contractor-installed IP networks must meet the following requirements:

1.6.2.1 Network Boundaries and Connections

The network must not extend outside the project site and must not connect to any IP network other than IP networks provided under this project or Government furnished IP networks provided for this purpose. Any and all network access from outside the project site is prohibited.

1.6.3 Government Access to Network

Government personnel, as defined, prescribed, and identified by the Contracting Officer, must be allowed to have complete and immediate access to the network at any time in order to verify compliance with this specification. Or if there is a Government agency that's responsible, identify that agency.

1.6.4 Temporary Wireless IP Networks

In addition to the other requirements on temporary IP networks, temporary wireless IP (WiFi) networks must not interfere with existing wireless network and must use WPA2 security. Network names (SSID) for wireless networks must be changed from their default values.

1.6.5 Passwords and Passphrases

The passwords and passphrases for all network devices and network access must be changed from their default values. Passwords must be a minimum 8 characters with a minimum of one uppercase letter, one lowercase letter, one number and one special character.

1.6.6 Contractor Temporary Network Cybersecurity Compliance Statements

Provide a single submittal containing completed Contractor Temporary Network Cybersecurity Compliance Statements for each company implementing a temporary IP network. Contractor Temporary Network Cybersecurity Compliance Statements must use the template published at http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/forms-graphics-tables. Each Statement must be signed by a cybersecurity representative for the relevant company. If no temporary IP networks will be used, provide a single copy of the Statement indicating this.

PART 2 PRODUCTS

2.1 TEMPORARY SIGNAGE

2.1.1 Bulletin Board

Prior to the commencement of work activities, provide a clear weatherproof covered bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, a copy of the wage decision contained in the Contract, Wage Rate Information poster, Safety and Health Information as required by EM 385-1-1 Section 01 and other information approved by the Contracting Officer. Coordinate requirements herein with 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS. Locate the bulletin board at the project site in a conspicuous place easily accessible to all employees, and in location as approved by the Contracting Officer.

2.1.2 Project Identification Signs

The requirements for the signs, their content, and location are as indicated and as specified in Section 01 58 00 PROJECT IDENTIFICATION. Erect signs within 15 days after receipt of the notice to proceed. Correct the data required by the safety sign daily, with light colored metallic or non-metallic numerals.

2.1.3 Warning Signs

Post temporary signs, tags, and labels to give workers and the public adequate warning and caution of construction hazards according to the EM 385-1-1 Section 04. Attach signs to the perimeter fencing every 150 feet warning the public of the presence of construction hazards. Signs must require unauthorized persons to keep out of the construction site. Correct the data required by safety signs daily. Post signs at all points of entry designating the construction site as a hard hat area.

2.2 TEMPORARY TRAFFIC CONTROL

2.2.1 Haul Roads

Construct access and haul roads necessary for proper prosecution of the work under this Contract in accordance with EM 385-1-1 Section 04. Construct with suitable grades and widths; avoid sharp curves, blind corners, and dangerous cross traffic. Submit haul road plan for approval. Provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, must be adequate to ensure safe operation at all times. Location, grade, width, and alignment of construction and haul roads are subject to approval by the Contracting Officer. Lighting must be adequate to assure full and clear visibility for full width of haul road and work areas during any night work operations.

2.2.2 Barricades

Erect and maintain temporary barricades to limit public access to hazardous areas. Barricades are required whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Securely place barricades clearly visible with adequate illumination to provide sufficient visual warning of

the hazard during both day and night.

2.3 FENCING

Provide fencing along the construction site and at all open excavations and tunnels to control access by unauthorized personnel. Safety fencing must be highly visible to be seen by pedestrians and vehicular traffic. All fencing must meet the requirements of EM 385-1-1. Remove the fence upon completion and acceptance of the work.

To block public view of the construction, enclose the project work area and Contractor lay-down area with a 8 ft high chain link fence and gates with brown, UV light resistant, plastic fabric mesh netting (similar to tennis court or other screening).

2.3.1 Polyethylene Mesh Safety Fencing

Temporary safety fencing must be a high visibility orange colored, high density polyethylene grid, a minimum of 48 inches high and maximum mesh size of 2 inches. Fencing must extend from the grade to a minimum of 48 inches above the grade and be tightly secured to T-posts spaced as necessary to maintain a rigid and taut fence. Fencing must remain rigid and taut with a minimum of 200 pounds of force exerted on it from any direction with less than 4 inches of deflection.

2.3.2 Chain Link Panel Fencing

Temporary panel fencing must be galvanized steel chain link panels 8 feet high. Multiple fencing panels may be linked together at the bases to form long spans as needed. Each panel base must be weighted down using sand bags or other suitable materials in order for the fencing to withstand anticipated winds while remaining upright. Fencing must remain rigid and taut with a minimum of 200 pounds of force exerted on it from any direction with less than 4 inches of deflection.

2.3.3 Post-Driven Chain Link Fencing

Temporary post-driven fencing must be galvanized chain link fencing 8 feet high supported by an tightly secured to galvanized steel posts driven below grade. Fence posts must be located on minimum 10 foot centers. Posts may be set in various surfaces such as sand, soil, asphalt or concrete as necessary. Chain link fencing must remain rigid and taut with a minimum of 200 pounds of force exerted on it from any direction with less than 4 inches of deflection. Completely remove fencing and posts at the completion of construction and restore surfaces disturbed or damaged to its original condition. Locate and identify underground utilities prior to setting fence posts. Equip fence with a lockable gate. Gate must remain locked when construction personnel are not present.

2.4 TEMPORARY WIRING

Provide temporary wiring in accordance with EM 385-1-1 Section 11, NFPA 241 and NFPA 70. Include monthly inspection and testing of all equipment and apparatus.

2.5 BACKFLOW PREVENTERS

Certificate of Full Approval from FCCCHR List, University of Southern California, attesting that the design, size and make of each backflow

preventer has satisfactorily passed the complete sequence of performance testing and evaluation for the respective level of approval. Certificate of Provisional Approval is not acceptable.

Reduced pressure principle type conforming to the applicable requirements AWWA C511. Provide backflow preventers complete with 150 pound flanged , ductile iron, mounted gate valve and strainer, 304 stainless steel or bronze, internal parts.

PART 3 EXECUTION

3.1 EMPLOYEE PARKING

Construction Contract employees must park privately owned vehicles in an area designated by the Contracting Officer. Employee parking must not interfere with existing and established parking requirements of the Government installation.

3.2 AVAILABILITY AND USE OF UTILITY SERVICES

3.2.1 Temporary Utilities

Provide temporary utilities required for construction. Materials may be new or used, must be adequate for the required usage, not create unsafe conditions, and not violate applicable codes and standards.

3.2.2 Sanitation

Provide and maintain within the construction area minimum field-type sanitary facilities in accordance with EM 385-1-1 Section 02. Locate the facilities behind the construction fence or out of the public view. Clean units and empty wastes at least once a week or more frequently into a municipal, district, or station sanitary sewage system, or remove waste to a commercial facility. Obtain approval from the system owner prior to discharge into a municipal, district, or commercial sanitary sewer system. Penalties or fines associated with improper discharge will be the responsibility of the Contractor. Coordinate with the Contracting Officer and follow station regulations and procedures when discharging into the station sanitary sewer system. Maintain these conveniences at all times. Include provisions for pest control and elimination of odors. Government toilet facilities will not be available to Contractor's personnel.

3.2.3 Telephone

Make arrangements and pay all costs for telephone facilities desired.

3.2.4 Fire Protection

Provide temporary fire protection equipment for the protection of personnel and property during construction. Remove debris and flammable materials weekly to minimize potential hazards.

3.3 TRAFFIC PROVISIONS

3.3.1 Maintenance of Traffic

a. Conduct operations in a manner that will not close a thoroughfare or interfere with traffic on railways or highways except with written permission of the Contracting Officer at least 15 calendar days prior

to the proposed modification date, and provide a Traffic Control Plan for Government approval detailing the proposed controls to traffic movement for approval. The plan must be in accordance with State and local regulations and the MUTCD, Part VI. Make all notifications and obtain all permits required for modification to traffic movements outside Station's jurisdiction. Contractor may move oversized and slow-moving vehicles to the worksite provided requirements of the highway authority have been met. Coordinate such traffic with the 177th CE.

b. Conduct work so as to minimize obstruction of traffic, and maintain traffic on at least half of the roadway width at all times. Obtain approval from the Contracting Officer prior to starting any activity that will obstruct traffic.

c. Provide, erect, and maintain, at Contractor's expense, lights, barriers, signals, passageways, detours, and other items, that may be required by the Life Safety Signage, overhead protection authority having jurisdiction.

d. Provide cones, signs, barricades, lights, or other traffic control devices and personnel required to control traffic. Do not use foil-backed material for temporary pavement marking because of its potential to conduct electricity during accidents involving downed power lines.

3.3.2 Protection of Traffic

Maintain and protect traffic on all affected roads during the construction period except as otherwise specifically directed by the Contracting Officer. Measures for the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment the work, and the erection and maintenance of adequate warning, danger, and direction signs, will be as required by the State and local authorities having jurisdiction. Provide self-illuminated (lighted) barricades during hours of darkness. Brightly-colored (orange) vests are required for all personnel working in roadways. Protect the traveling public from damage to person and property. Minimize the interference with public traffic on roads selected for hauling material to and from the site. Investigate the adequacy of existing roads and their allowable load limit. Contractor is responsible for the repair of damage to roads caused by construction operations.

3.3.3 Rush Hour Restrictions

Do not interfere with the peak traffic flows preceding and during normal operations for without notification to and approval by the Contracting Officer.

3.3.4 Dust Control

Dust control methods and procedures must be approved by the Contracting Officer. Coordinate dust control methods with 01 57 19 ENVIRONMENTAL CONTROLS.

3.4 REDUCED PRESSURE BACKFLOW PREVENTERS

Provide an approved reduced pressure backflow prevention assembly at each location where the Contractor taps into the Government potable water

supply.

Perform backflow preventer tests using test equipment, procedures, and certification forms conforming to those outlined in the latest edition of the Manual of Cross-Connection Control published by the FCCCHR Manual. Test and tag each reduced pressure backflow preventer upon initial installation (prior to continued water use) and monthly thereafter. Tag must contain the following information: make, model, serial number, dates of tests, results, maintenance performed, and signature of tester. Record test results on certification forms conforming to requirements cited earlier in this paragraph.

3.5 CONTRACTOR'S TEMPORARY FACILITIES

Contractor is responsible for security of their property. Provide adequate outside security lighting at the temporary facilities. Trailers must be anchored to resist high winds and meet applicable state or local standards for anchoring mobile trailers. Coordinate anchoring with EM 385-1-1 Section 04. The Contract Clause entitled "FAR 52.236-10, Operations and Storage Areas" and the following apply:

3.5.1 Administrative Field Offices

Provide and maintain administrative field office facilities within the construction area at the designated site. Government office and warehouse facilities will not be available to the Contractor's personnel.

In the event a new building is constructed for the temporary project field office, it must be a minimum 12 feet in width, 16 feet in length and have a minimum of 7 feet headroom. Equip the building with approved electrical wiring, at least one double convenience outlet and the required switches and fuses to provide 110-120 volt power. Provide a work table with stool, desk with chair, two additional chairs, and one legal size file cabinet that can be locked. The building must be waterproof, supplied with a heater, have a minimum of two doors, electric lights, a telephone, a battery-operated smoke detector alarm, a sufficient number of adjustable windows for adequate light and ventilation, and a supply of approved drinking water. Provide approved sanitary facilities. Screen the windows and doors and provide the doors with deadbolt type locking devices or a padlock and heavy-duty hasp bolted to the door. Door hinge pins must be non-removable. Arrange the windows to open and to be securely fastened from the inside. Protect glass panels in windows by bars or heavy mesh screens to prevent easy access. In warm weather, provide air conditioning capable of maintaining the office at 50 percent relative humidity and a room temperature 20 degrees F below the outside temperature when the outside temperature is 95 degrees F. Unless otherwise directed by the Contracting Officer, remove the building from the site upon completion and acceptance of the work.

3.5.2 Storage Area

Construct a temporary 6 foot high chain link fence around trailers and materials. Include plastic strip inserts, colored , so that visibility through the fence is obstructed. Fence posts may be driven, in lieu of concrete bases, where soil conditions permit. Do not place or store trailers, materials, or equipment outside the fenced area unless such trailers, materials, or equipment are assigned a separate and distinct storage area by the Contracting Officer away from the vicinity of the construction site but within the installation boundaries. Trailers,

equipment, or materials must not be open to public view with the exception of those items which are in support of ongoing work on the current day. Do not stockpile materials outside the fence in preparation for the next day's work. Park mobile equipment, such as tractors, wheeled lifting equipment, cranes, trucks, and like equipment within the fenced area at the end of each work day.

Keep fencing in a state of good repair and proper alignment. If the Contractor elects to traverse grassed or unpaved areas which are not established roadways with construction equipment or other vehicles, cover the grassed or unpaved areas with a layer of gravel as necessary to prevent rutting and the tracking of mud onto paved or established roadways; gravel gradation must be at the Contractor's discretion.. Mow and maintain grass located within the boundaries of the construction site for the duration of the project. Grass and vegetation along fences, structures, under trailers, and in areas not accessible to mowers must be edged or trimmed neatly.

3.5.3 Supplemental Storage Area

Upon request, and pending availability, the Contracting Officer will designate another or supplemental area for the use and storage of trailers, equipment, and materials. This area may not be in close proximity of the construction site but will be within the installation boundaries. Maintain the area in a clean and orderly fashion and secured if needed to protect supplies and equipment. Utilities will not be provided to this area by the Government.

3.5.4 Appearance of Trailers

a. Trailers must be roadworthy and comply with all appropriate state and local vehicle requirements. Trailers which are rusted, have peeling paint or are otherwise in need of repair will not be allowed on Installation property. Trailers must present a clean and neat exterior appearance and be in a state of good repair.

b. Maintain the temporary facilities. Failure to do so will be sufficient reason to require their removal at the Contractor's expense.

3.5.5 Safety Systems

Protect the integrity of all installed safety systems or personnel safety devices. Obtain prior approval from the Contracting Officer if entrance into systems serving safety devices is required. If it is temporarily necessary to remove or disable personnel safety devices in order to accomplish Contract requirements, provide alternative means of protection prior to removing or disabling any permanently installed safety devices or equipment and obtain approval from the Contracting Officer.

3.5.6 Weather Protection of Temporary Facilities and Stored Materials

Take necessary precautions to ensure that roof openings and other critical openings in the building are monitored carefully. Take immediate actions required to seal off such openings when rain or other detrimental weather is imminent, and at the end of each workday. Ensure that the openings are completely sealed off to protect materials and equipment in the building from damage.

3.5.6.1 Building and Site Storm Protection

When a warning of gale force winds is issued, take precautions to minimize danger to persons, and protect the work and nearby Government property. Precautions must include, but are not limited to, closing openings; removing loose materials, tools and equipment from exposed locations; and removing or securing scaffolding and other temporary work. Close openings in the work when storms of lesser intensity pose a threat to the work or any nearby Government property.

3.6 TEMPORARY PROJECT SAFETY FENCING

As soon as practicable, but not later than 15 days after the date established for commencement of work, furnish and erect temporary project safety fencing at the work site. Maintain the safety fencing during the life of the Contract and, upon completion and acceptance of the work, remove from the work site.

3.7 CLEANUP

Remove construction debris, waste materials, packaging material and the like from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways must be cleaned away. Store all salvageable materials resulting from demolition activities within the fenced area described above or at the supplemental storage area. Neatly stack stored materials not in trailers, whether new or salvaged.

3.8 RESTORATION OF STORAGE AREA

Upon completion of the project remove the bulletin board, signs, barricades, haul roads, and all other temporary products from the site. After removal of trailers, materials, and equipment from within the fenced area, remove the fence. Restore areas used during the performance of the Contract to the original or better condition. Remove gravel used to traverse grassed areas and restore the area to its original condition, including top soil and seeding as necessary.

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SECTION 01 57 19

ENVIRONMENTAL CONTROLS
08/22

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.1053	Respirable Crystalline Silica
29 CFR 1910.1200	Hazard Communication
40 CFR 82	Protection of Stratospheric Ozone
40 CFR 112	Oil Pollution Prevention
40 CFR 122.26	Storm Water Discharges (Applicable to State NPDES Programs, see section 123.25)
40 CFR 241	Guidelines for Disposal of Solid Waste
40 CFR 258	Subtitle D Landfill Requirements
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 261.7	Residues of Hazardous Waste in Empty Containers
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 262.11	Hazardous Waste Determination and Recordkeeping
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities

40 CFR 268	Land Disposal Restrictions
40 CFR 273	Standards for Universal Waste Management
40 CFR 273.2	Standards for Universal Waste Management - Batteries
40 CFR 273.4	Standards for Universal Waste Management - Mercury Containing Equipment
40 CFR 273.5	Standards for Universal Waste Management - Lamps
40 CFR 273.6	Applicability - Aerosol Cans
40 CFR 279	Standards for the Management of Used Oil
40 CFR 300	National Oil and Hazardous Substances Pollution Contingency Plan
40 CFR 300.125	National Oil and Hazardous Substances Pollution Contingency Plan - Notification and Communications
40 CFR 355	Emergency Planning and Notification
40 CFR 403	General Pretreatment Regulations for Existing and New Sources of Pollution
29 CFR 1926.1153	Respirable Crystalline Silica
40 CFR 50	National Primary and Secondary Ambient Air Quality Standards
40 CFR 60	Standards of Performance for New Stationary Sources
40 CFR 63	National Emission Standards for Hazardous Air Pollutants for Source Categories
40 CFR 64	Compliance Assurance Monitoring
49 CFR 171	General Information, Regulations, and Definitions
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 173	Shippers - General Requirements for Shipments and Packagings
49 CFR 178	Specifications for Packagings

1.2 DEFINITIONS

1.2.1 Class I and II Ozone Depleting Substance (ODS)

Class I ODS is defined in Section 602(a) of The Clean Air Act. A list of Class I ODS can be found on the EPA website at the following weblink. https://www.epa.gov/ozone-layer-protection/ozone-depleting-substances.

Class II ODS is defined in Section 602(s) of The Clean Air Act. A list of Class II ODS can be found on the EPA website at the following weblink. https://www.epa.gov/ozone-layer-protection/ozone-depleting-substances.

1.2.2 Contractor Generated Hazardous Waste

Contractor generated hazardous waste is materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the Contractor to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e., methyl ethyl ketone, toluene), waste thinners, excess paints, excess solvents, waste solvents, excess pesticides, and contaminated pesticide equipment rinse water.

1.2.3 Electronics Waste

Electronics waste is discarded electronic devices intended for salvage, recycling, or disposal.

1.2.4 Environmental Pollution and Damage

Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally or historically.

1.2.5 Environmental Protection

Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.2.6 Hazardous Debris

As defined in paragraph SOLID WASTE, debris that contains listed hazardous waste (either on the debris surface, or in its interstices, such as pore structure) in accordance with 40 CFR 261. Hazardous debris also includes debris that exhibits a characteristic of hazardous waste in accordance with 40 CFR 261.

1.2.7 Hazardous Materials

Hazardous material is any material that: Is defined in 49 CFR 171, listed in 49 CFR 172, regulated as a hazardous material in accordance with 49 CFR 173; or requires a Safety Data Sheet (SDS) in accordance with

29 CFR 1910.1200; or during end use, treatment, handling, packaging, storage, transportation, or disposal meets or has components that meet or have potential to meet the definition of a hazardous waste as defined by 40 CFR 261 Subparts A, B, C, or D. Designation of a material by this definition, when separately regulated or controlled by other sections or directives, does not eliminate the need for adherence to that hazard-specific guidance which takes precedence over this section for "control" purposes. Such material includes ammunition, weapons, explosive actuated devices, propellants, pyrotechnics, chemical and biological warfare materials, medical and pharmaceutical supplies, medical waste and infectious materials, bulk fuels, radioactive materials, and other materials such as asbestos, mercury, and polychlorinated biphenyls (PCBs).

1.2.8 Hazardous Waste

Hazardous Waste is any material that meets the definition of a solid waste and exhibits a hazardous characteristic (ignitability, corrosivity, reactivity, or toxicity) as specified in 40 CFR 261, Subpart C, or contains a listed hazardous waste as identified in 40 CFR 261, Subpart D, or meets a state, local, or host nation definition of a hazardous waste.

1.2.9 Land Application

Land Application means spreading or spraying discharge water at a rate that allows the water to percolate into the soil. No sheeting action, soil erosion, discharge into storm sewers, discharge into defined drainage areas, or discharge into the "waters of the United States" must occur. Comply with federal, state, and local laws and regulations.

1.2.10 Municipal Separate Storm Sewer System (MS4) Permit

MS4 permits are those held by municipalities or installations to obtain NPDES permit coverage for their stormwater discharges.

1.2.11 National Pollutant Discharge Elimination System (NPDES)

The NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.

1.2.12 Oily Waste

Oily waste are those materials that are, or were, mixed with Petroleum, Oils, and Lubricants (POLs) and have become separated from that POLs. Oily wastes also means materials, including wastewaters, centrifuge solids, filter residues or sludges, bottom sediments, tank bottoms, and sorbents which have come into contact with and have been contaminated by, POLs and may be appropriately tested and discarded in a manner which is in compliance with other state and local requirements.

This definition includes materials such as oily rags, "kitty litter" sorbent clay and organic sorbent material. These materials may be land filled provided that: It is not prohibited in other state regulations or local ordinances; the amount generated is "de minimus" (a small amount); it is the result of minor leaks or spills resulting from normal process operations; and free-flowing oil has been removed to the practicable extent possible. Large quantities of this material, generated as a result of a major spill or in lieu of proper maintenance of the processing equipment, are a solid waste. As a solid waste, perform a hazardous waste determination prior to disposal. As this can be an expensive process, it

is recommended that this type of waste be minimized through good housekeeping practices and employee education.

1.2.13 Regulated Waste

Regulated waste are solid wastes that have specific additional federal, state, or local controls for handling, storage, or disposal.

1.2.14 Sediment

Sediment is soil and other debris that have eroded and have been transported by runoff water or wind.

1.2.15 Solid Waste

Solid waste is a solid, liquid, semi-solid or contained gaseous waste. A solid waste can be a hazardous waste, non-hazardous waste, or non-Resource Conservation and Recovery Act (RCRA) regulated waste. Types of solid waste typically generated at construction sites may include:

1.2.15.1 Debris

Debris is non-hazardous solid material generated during the construction, demolition, or renovation of a structure that exceeds 2.5-inch particle size that is: a manufactured object; plant or animal matter; or natural geologic material (for example, cobbles and boulders), broken or removed concrete, masonry, and rock asphalt paving; ceramics; roofing paper and shingles. Inert materials may be reinforced with or contain ferrous wire, rods, accessories and weldments. A mixture of debris and other material such as soil or sludge is also subject to regulation as debris if the mixture is comprised primarily of debris by volume, based on visual inspection.

1.2.15.2 Green Waste

Green waste is the vegetative matter from landscaping, land clearing and grubbing, including, but not limited to, grass, bushes, scrubs, small trees and saplings, tree stumps and plant roots. Marketable trees, grasses and plants that are indicated to remain, be re-located, or be re-used are not included.

1.2.15.3 Material Not Regulated As Solid Waste

Material not regulated as solid waste is nuclear source or byproduct materials regulated under the Federal Atomic Energy Act of 1954 as amended; suspended or dissolved materials in domestic sewage effluent or irrigation return flows, or other regulated point source discharges; regulated air emissions; and fluids or wastes associated with natural gas or crude oil exploration or production.

1.2.15.4 Non-Hazardous Waste

Non-hazardous waste is waste that is excluded from, or does not meet, hazardous waste criteria in accordance with 40 CFR 261.

1.2.15.5 Recyclables

Recyclables are materials, equipment and assemblies such as doors, windows, door and window frames, plumbing fixtures, glazing and mirrors

that are recovered and sold as recyclable, wiring, insulated/non-insulated copper wire cable, wire rope, and structural components. It also includes commercial-grade refrigeration equipment with Freon removed, household appliances where the basic material content is metal, clean polyethylene terephthalate bottles, cooking oil, used fuel oil, textiles, high-grade paper products and corrugated cardboard, stackable pallets in good condition, clean crating material, and clean rubber/vehicle tires. Metal meeting the definition of lead contaminated or lead based paint contaminated may not be included as recyclable if sold to a scrap metal company. Paint cans that meet the definition of empty containers in accordance with 40 CFR 261.7 may be included as recyclable if sold to a scrap metal company.

1.2.15.6 Surplus Soil

Surplus soil is existing soil that is in excess of what is required for this work, including aggregates intended, but not used, for on-site mixing of concrete, mortars, and paving. Contaminated soil meeting the definition of hazardous material or hazardous waste is not included and must be managed in accordance with paragraph HAZARDOUS MATERIAL MANAGEMENT.

1.2.15.7 Scrap Metal

This includes scrap and excess ferrous and non-ferrous metals such as reinforcing steel, structural shapes, pipe, and wire that are recovered or collected and disposed of as scrap. Scrap metal meeting the definition of hazardous material or hazardous waste is not included.

1.2.15.8 Wood

Wood is dimension and non-dimension lumber, plywood, chipboard, hardboard. Treated or painted wood that meets the definition of lead contaminated or lead based contaminated paint is not included. Treated wood includes, but is not limited to, lumber, utility poles, crossties, and other wood products with chemical treatment.

1.2.16 Surface Discharge

Surface discharge means discharge of water into drainage ditches, storm sewers, or creeks meeting the definition of "waters of the United States". Surface discharges from construction sites are discrete, identifiable sources and require a permit from the governing agency. Comply with federal, state, and local laws and regulations.

1.2.17 Wastewater

Wastewater is the used water and solids that flow through a sanitary sewer to a treatment plant.

1.2.17.1 Stormwater

Stormwater is any precipitation in an urban or suburban area that does not evaporate or soak into the ground, but instead collects and flows into storm drains, rivers, and streams.

1.2.18 Waters of the United States

Waters of the United States means Federally jurisdictional waters, including wetlands, that are subject to regulation under Section 404 of

the Clean Water Act or navigable waters, as defined under the Rivers and Harbors Act.

1.2.19 Wetlands

Wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

1.2.20 Universal Waste

The universal waste regulations streamline collection requirements for certain hazardous wastes in the following categories: batteries, pesticides, mercury-containing equipment (for example, thermostats), and lamps (for example, fluorescent bulbs). The rule is designed to reduce hazardous waste in the municipal solid waste (MSW) stream by making it easier for universal waste handlers to collect these items and send them for recycling or proper disposal. These regulations can be found at 40 CFR 273.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Hazardous Materials; G

Air Permits; G

Preconstruction Survey

Regulatory Notifications; G

Environmental Manager Qualifications; G

Employee Training Records; G

Environmental Protection Plan; G

Dirt and Dust Control Plan;

Solid Waste Management Permit;

Stormwater Pollution Prevention Plan (SWPPP); G

Stormwater Notice of Intent (for NPDES coverage under the general permit for construction activities);

Spill Prevention Control And Countermeasure (SPCC) Plan;

SD-06 Test Reports

Monthly Solid Waste Disposal Report; G

Inspection Reports

SD-07 Certificates

Employee Training Records; G

Erosion and Sediment Control Inspector Qualifications

SD-11 Closeout Submittals

Regulatory Notifications; GStormwater Pollution Prevention Plan Compliance Notebook; G

Stormwater Notice of Termination (for NPDES coverage under the general permit for construction activities); G

Waste Determination Documentation; G

Disposal Documentation for Hazardous and Regulated Waste; G

Assembled Employee Training Records; G

Solid Waste Management Permit; G

Solid Waste Management Report; G

Regulatory Notification; G

Sales Documentation; G

Contractor Certification

Hazardous Waste/Debris Management; G

1.4 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection as defined. Plan for and provide environmental protective measures to control pollution that develops during construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Protect the environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire duration of this Contract. Comply with federal, state, and local regulations pertaining to the environment, including water, air, solid waste, hazardous waste and substances, oily substances, and noise pollution.

Tests and procedures assessing whether construction operations comply with Applicable Environmental Laws may be required. Analytical work must be performed by qualified laboratories; and where required by law, the laboratories must be certified.

1.4.1 Conformance with the Environmental Management System

Perform work under this contract consistent with the policy and objectives identified in the installation's Environmental Management System (EMS). Perform work in a manner that conforms to objectives and targets of the environmental programs and operational controls identified by the EMS. Support Government personnel when environmental compliance and EMS audits are conducted by escorting auditors at the Project site, answering questions, and providing proof of records being maintained. Provide monitoring and measurement information as necessary to address environmental performance relative to environmental, energy, and transportation management goals. In the event an EMS nonconformance or environmental noncompliance associated with the contracted services, tasks, or actions occurs, take corrective and preventative actions. In addition, employees must be aware of their roles and responsibilities under the installation EMS and of how these EMS roles and responsibilities affect work performed under the contract.

Coordinate with the installation's EMS coordinator to identify training needs associated with environmental aspects and the EMS, and arrange training or take other action to meet these needs. Provide training documentation to the Contracting Officer. The Installation Environmental Office will retain associated environmental compliance records. Make EMS Awareness training completion certificates available to Government auditors during EMS audits and include the certificates in the Employee Training Records. See paragraph EMPLOYEE TRAINING RECORDS.

1.5 QUALITY ASSURANCE

1.5.1 Preconstruction Survey and Protection of Features

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. Prior to start of any onsite construction activities, perform a Preconstruction Survey of the project site with the Contracting Officer, and take photographs showing existing environmental conditions in and adjacent to the site. Submit a report for the record. Include in the report a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. The Contractor and the Contracting Officer will sign this survey report upon mutual agreement regarding its accuracy and completeness. Protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference that their preservation may cause to the work under the Contract.

1.5.2 Regulatory Notifications

Provide regulatory notification requirements in accordance with federal, state and local regulations. In cases where the Government will also provide public notification (such as stormwater permitting), coordinate with the Contracting Officer. Submit copies of regulatory notifications to the Contracting Officer at least 14 days prior to commencement of work activities. Typically, regulatory notifications must be provided for the following (this listing is not all-inclusive): demolition, renovation, NPDES defined site work, construction, removal or use of a permitted air emissions source, and remediation of controlled substances (asbestos,

hazardous waste, lead paint).

1.5.3 Environmental Manager

Appoint in writing an Environmental Manager for the project site. The Environmental Manager is directly responsible for coordinating contractor compliance with federal, state, local, and installation requirements. The Environmental Manager must ensure compliance with Hazardous Waste Program requirements (including hazardous waste handling, storage, manifesting, and disposal); implement the EPP; ensure environmental permits are obtained, maintained, and closed out; ensure compliance with Stormwater Program requirements; ensure compliance with Hazardous Materials (storage, handling, and reporting) requirements; and coordinate any remediation of regulated substances (lead, asbestos, PCB transformers). This can be a collateral position; however, the person in this position must be trained to adequately accomplish the following duties: ensure waste segregation and storage compatibility requirements are met; inspect and manage Satellite Accumulation areas; ensure only authorized personnel add wastes to containers; ensure Contractor personnel are trained in 40 CFR requirements in accordance with their position requirements; coordinate removal of waste containers; and maintain the Environmental Records binder and required documentation, including environmental permits compliance and close-out. Submit Environmental Manager Qualifications to the Contracting Officer.

1.5.4 Employee Training Records

Prepare and maintain Employee Training Records throughout the term of the contract meeting applicable 40 CFR requirements. Provide Employee Training Records in the Environmental Records Binder. Submit these Assembled Employee Training Records to the Contracting Officer at the conclusion of the project, unless otherwise directed.

Train personnel to meet state requirements. Conduct environmental protection/pollution control meetings for personnel prior to commencing construction activities. Conduct additional meetings for new personnel and when site conditions change. Include in the training and meeting agenda: methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, waters of the United States, and endangered species and their habitat that are known to be in the area. Provide copy of the Erosion and Sediment Control Inspector Certification as required by state.

1.5.5 Non-Compliance Notifications

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with federal, state or local environmental laws or regulations, permits, and other elements of the Contractor's EPP. After receipt of such notice, inform the Contracting Officer of the proposed corrective action and take such action when approved by the Contracting Officer. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. FAR 52.242-14 Suspension of Work provides that a suspension, delay, or interruption of work due to the fault or negligence of the Contractor

allows for no adjustments to the contract for time extensions or equitable adjustments. In addition to a suspension of work, the Contracting Officer may use additional authorities under the contract or law.

1.6 ENVIRONMENTAL PROTECTION PLAN

The purpose of the EPP is to present an overview of known or potential environmental issues that must be considered and addressed during construction. Incorporate construction related objectives and targets from the installation's EMS into the EPP. Include in the EPP measures for protecting natural and cultural resources, required reports, and other measures to be taken. Meet with the Contracting Officer or Contracting Officer Representative to discuss the EPP and develop a mutual understanding relative to the details for environmental protection including measures for protecting natural resources, required reports, and other measures to be taken. Submit the EPP within 15 days after Contractor award and not less than 10 days before the preconstruction meeting. Submit the EPP not less than 60 calendar days before scheduled final site or building design approval. Revise the EPP throughout the project to include any reporting requirements, changes in site conditions, or contract modifications that change the project scope of work in a way that could have an environmental impact. No requirement in this section will relieve the Contractor of any applicable federal, state, and local environmental protection laws and regulations. During Construction, identify, implement, and submit for approval any additional requirements to be included in the EPP. Maintain the current version onsite.

The EPP includes, but is not limited to, the following elements:

1.6.1 General Overview and Purpose

1.6.1.1 Descriptions

A brief description of each specific plan required by environmental permit or elsewhere in this Contract such as stormwater pollution prevention plan, spill control plan, solid waste management plan, wastewater management plan, air pollution control plan, contaminant prevention plan, traffic control plan Non-Hazardous Solid Waste Disposal Plan.

1.6.1.2 Duties

The duties and level of authority assigned to the person(s) on the job site who oversee environmental compliance, such as who is responsible for adherence to the EPP, who is responsible for spill cleanup and training personnel on spill response procedures, who is responsible for manifesting hazardous waste to be removed from the site (if applicable), and who is responsible for training the Contractor's environmental protection personnel.

1.6.1.3 Procedures

A copy of any standard or project-specific operating procedures that will be used to effectively manage and protect the environment on the project site.

1.6.1.4 Communications

Communication and training procedures that will be used to convey environmental management requirements to Contractor employees and

subcontractors.

1.6.1.5 Contact Information

Emergency contact information contact information (office phone number, cell phone number, and e-mail address).

1.6.2 General Site Information

1.6.2.1 Drawings

Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, jurisdictional wetlands, material storage areas, structures, sanitary facilities, storm drains and conveyances, and stockpiles of excess soil.

1.6.2.2 Work Area

Work area plan showing the proposed activity in each portion of the area and identify the areas of limited use or nonuse. Include measures for marking the limits of use areas, including methods for protection of features to be preserved within authorized work areas and methods to control runoff and to contain materials on site, and a traffic control plan.

Show where any fuels, hazardous substances, solvents, or lubricants will be stored. Provide a spill plan to address any releases of those materials.

1.6.2.3 Documentation

A letter signed by an officer of the firm appointing the Environmental Manager and stating that person is responsible for managing and implementing the Environmental Program as described in this contract. Include in this letter the Environmental Manager's authority to direct the removal and replacement of non-conforming work.

1.6.3 Management of Natural Resources

a. Land resources

b. Tree protection

c. Replacement of damaged landscape features

d. Temporary construction

e. Stream crossings

f. Fish and wildlife resources

g. Wetland areas

1.6.4 Protection of Historical and Archaeological Resources

a. Objectives

b. Methods

1.6.5 Stormwater Management and Control

a. Ground cover

b. Erodible soils

c. Temporary measures

(1) Structural Practices

(2) Temporary and permanent stabilization

d. Effective selection, implementation and maintenance of Best Management Practices (BMPs).

e. Stormwater Pollution Prevention Plan (SWPPP).

1.6.6 Protection of the Environment from Waste Derived from Contractor Operations

Control and disposal of solid and sanitary waste.

Control and disposal of hazardous waste.

This item consist of the management procedures for hazardous waste to be generated. The elements of those procedures will coincide with the Installation Hazardous Waste Management Plan when within an installation. The Contracting Officer will provide a copy of the Installation Hazardous Waste Management Plan as applicable.

As a minimum, include the following:

a. List of the types of hazardous wastes expected to be generated

b. Procedures to ensure a written waste determination is made for appropriate wastes that are to be generated

c. Sampling/analysis plan, including laboratory method(s) that will be used for waste determinations and copies of relevant laboratory certifications

d. Methods and proposed locations for hazardous waste accumulation/storage (that is, in tanks or containers)

e. Management procedures for storage, labeling, transportation, and disposal of waste (treatment of waste is not allowed unless specifically noted)

f. Management procedures and regulatory documentation ensuring disposal of hazardous waste complies with Land Disposal Restrictions (40 CFR 268)

g. Management procedures for recyclable hazardous materials such as lead-acid batteries, used oil, and similar

h. Used oil management procedures in accordance with 40 CFR 279; Hazardous waste minimization procedures

i. Plans for the disposal of hazardous waste by permitted facilities; and

Procedures to be employed to ensure required employee training records are maintained.

1.6.7 Prevention of Releases to the Environment

Procedures to prevent releases to the environment

Notifications in the event of a release to the environment

1.6.8 Regulatory Notification and Permits

List what notifications and permit applications must be made. Some permits require up to 180 days to obtain. Demonstrate that those permits have been obtained or applied for by including copies of applicable environmental permits. The EPP will not be approved until the permits have been obtained.

1.6.9 Clean Air Act Compliance

1.6.9.1 Haul Route

Submit truck and material haul routes along with a Dirt and Dust Control Plan for controlling dirt, debris, and dust on Installation roadways. As a minimum, identify in the plan the subcontractor and equipment for cleaning along the haul route and measures to reduce dirt, dust, and debris from roadways.

1.6.9.2 Pollution Generating Equipment

Identify air pollution generating equipment or processes that may require federal, state, or local permits under the Clean Air Act. Determine requirements based on any current installation permits and the impacts of the project. Provide a list of all fixed or mobile equipment, machinery or operations that could generate air emissions during the project to the Installation Environmental Office (Air Program Manager). Ensure required permits are obtained prior to installing and operating applicable equipment/processes.

1.6.9.3 Stationary Internal Combustion Engines

Identify portable and stationary internal combustion engines that will be supplied, used or serviced. Comply with 40 CFR 60 Subpart IIII, 40 CFR 60 Subpart JJJJ, 40 CFR 63 Subpart ZZZZ, and local regulations as applicable. At minimum, include the make, model, serial number, manufacture date, size (engine brake horsepower), and EPA emission certification status of each engine. Maintain applicable records and log hours of operation and fuel use. Logs must include reasons for operation and delineate between maintenance/testing, emergency, and non-emergency operation.

1.6.9.4 Refrigerants

Identify management practices to ensure that heating, ventilation, and air conditioning (HVAC) work involving refrigerants complies with 40 CFR 82 requirements. Technicians must be certified, maintain copies of certification on site, use certified equipment and log work that requires the addition or removal of refrigerant. Any refrigerant reclaimed is the property of the Government, coordinate with the Installation Environmental Office to determine the appropriate turn in location.

1.6.9.5 Air Pollution-engineering Processes

Identify planned air pollution-generating processes and management control measures (including, but not limited to, spray painting, abrasive blasting, demolition, material handling, fugitive dust, and fugitive emissions). Log hours of operations and track quantities of materials used.

1.6.9.6 Compliant Materials

Provide the Government a list of SDSs for all hazardous materials proposed for use on site. Materials must be compliant with all Clean Air Act regulations for emissions including solvent and volatile organic compound contents, and applicable National Emission Standards for Hazardous Air Pollutants requirements. The Government may alter or limit use of specific materials as needed to meet installation permit requirements for emissions.

1.6.9.6.1 Required Air Permits

Air quality construction and or operation permits may be required for any stationary equipment or device that emits pollutants to the atmosphere or controls emissions to the atmosphere unless exempted by regulation.

1.7 LICENSES AND PERMITS

Obtain licenses and permits required for the construction of the project and in accordance with FAR 52.236-7 Permits and Responsibilities. Notify the Government of all equipment that may require permits or special approvals that the Contractor plans to use on site. This paragraph supplements the Contractor's responsibility under FAR 52.236-7 Permits and Responsibilities.

a. The following permits have been obtained by the Government:

(1)

(2)

(3)

1.8 ENVIRONMENTAL RECORDS BINDER

Maintain on-site a separate three-ring Environmental Records Binder and submit at the completion of the project. Make separate parts within the binder that correspond to each submittal listed under paragraph CLOSEOUT SUBMITTALS in this section.

1.9 SOLID WASTE MANAGEMENT PERMIT

Provide the Contracting Officer with written notification of the quantity of anticipated solid waste or debris that is anticipated or estimated to be generated by construction. Include in the report the locations where various types of waste will be disposed or recycled. Include letters of acceptance from the receiving location or as applicable; submit one copy of the receiving location state and local Solid Waste Management Permit or license showing such agency's approval of the disposal plan before transporting wastes off Government property.

1.9.1 Monthly Solid Waste Disposal Report

Monthly, submit a solid waste disposal report to the Contracting Officer. For each waste, the report will state the classification (using the definitions provided in this section), amount, location, and name of the business receiving the solid waste.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PROTECTION OF NATURAL RESOURCES

Minimize interference with, disturbance to, and damage to fish, wildlife, and plants, including their habitats. Prior to the commencement of activities, consult with the Installation Environmental Office as applicable, regarding rare species or sensitive habitats that need to be protected. The protection of rare, threatened, and endangered animal and plant species identified, including their habitats, is the Contractor's responsibility.

Preserve the natural resources within the project boundaries and outside the limits of permanent work. Restore to an equivalent or improved condition upon completion of work that is consistent with the requirements of the Installation Environmental Office or as otherwise specified. Confine construction activities to within the limits of the work indicated or specified.

3.1.1 Flow Ways

Do not alter water flows or otherwise significantly disturb the native habitat adjacent to the project and critical to the survival of fish and wildlife, except as specified and permitted.

3.1.2 Vegetation

Except in areas to be cleared, do not remove, cut, deface, injure, or destroy trees or shrubs without the Contracting Officer's permission. Do not fasten or attach ropes, cables, or guys to existing nearby trees for anchorages unless authorized by the Contracting Officer. Where such use of attached ropes, cables, or guys is authorized, the Contractor is responsible for any resultant damage.

Protect existing trees that are to remain to ensure they are not injured, bruised, defaced, or otherwise damaged by construction operations. Remove displaced rocks from uncleared areas. Coordinate with the Contracting Officer and Installation Environmental Office to determine appropriate action for trees and other landscape features scarred or damaged by equipment operations.

3.1.3 Streams

Stream crossings must allow movement of materials or equipment without violating water pollution control standards of the federal, state, and local governments. Construction of stream crossing structures must be in compliance with all required permits including, but not limited to, Clean

Water Act Section 404, and Section 401 Water Quality.

The Contracting Officer's approval and appropriate permits are required before any equipment will be permitted to ford live streams. In areas where frequent crossings are required, install temporary culverts or bridges. Obtain Contracting Officer's approval prior to installation. Remove temporary culverts or bridges upon completion of work, and repair the area to its original condition unless otherwise required by the Contracting Officer.

3.2 STORMWATER

Do not discharge stormwater from construction sites to the sanitary sewer. If the water is noted or suspected of being contaminated, it may only be released to the storm drain system if the discharge is specifically permitted. Obtain authorization in advance from the Installation Environmental Office for any release of contaminated water.

3.2.1 Construction General Permit

Provide a Construction General Permit as required by 40 CFR 122.26 or the State of New Jersey General Permit. Under the terms and conditions of the permit, install, inspect, maintain BMPs, prepare stormwater erosion and sediment control inspection reports, and submit SWPPP inspection reports. Maintain construction operations and management in compliance with the terms and conditions of the general permit for stormwater discharges from construction activities.

3.2.1.1 Stormwater Pollution Prevention Plan

Submit a project-specific Stormwater Pollution Prevention Plan (SWPPP) to the Contracting Officer for approval, within 30 days of Contract Award and prior to the commencement of work. The SWPPP must meet the requirements of 40 CFR 122.26 and the New Jersey State General Permit for stormwater discharges from construction sites.

Include the following:

a. Comply with terms of the state general permit for stormwater discharges from construction activities. Prepare SWPPP in accordance with state requirements. Use EPA guide Developing your Stormwater Pollution Prevention Plan to prepare the SWPPP.

b. Select applicable BMPs from EPA Fact Sheets located at https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#constr or in accordance with applicable state or local requirements.

c. Include a completed copy of the Notice of Intent, BMP Inspection Report Template, and Stormwater Notice of Termination, except for the effective date.

3.2.1.2 Stormwater Notice of Intent for Construction Activities

Prepare and submit the Notice of Intent for NPDES coverage under the general permit for construction activities to the Contracting Officer for review and approval.

The Contractor upon award will contact Site SWPPP developer (QSD) to

provide billing information and payment for State Water Board permit. The Site SWPPP developer can be reached: (Doug Dowden, (QSD), Environmental Compiance Specialist, LLC, @ stormwaterca@att.net). Once Permit billing information and payment is provided by the Contractor, the SWPPP developer (QSD) shall submit the project Notice of Intent (NOI) and submnit the Site SWPPP Report.. No land disturbing activities may commence without permit coverage. Maintain an approved copy of the SWPPP at the onsite construction office, and continually update as regulations require, reflecting current site conditions.

3.2.1.3 Inspection Reports

Submit "Inspection Reports" to the Contracting Officer in accordance with the State of New Jersey Construction General Permit.

3.2.1.4 Stormwater Pollution Prevention Plan Compliance Notebook

Create and maintain a three ring binder of documents that demonstrate compliance with the Construction General Permit. Include a copy of the permit Notice of Intent, proof of permit fee payment, SWPPP and SWPPP update amendments, inspection reports and related corrective action records, copies of correspondence with the the New JerseyState Permitting Agency, and a copy of the permit Notice of Termination in the binder. At project completion, the notebook becomes property of the Government. Provide the compliance notebook to the Contracting Officer.

3.2.1.5 Stormwater Notice of Termination for Construction Activities

Submit a Notice of Termination to the Contracting Officer for approval once construction is complete and final stabilization has been achieved on all portions of the site for which the permittee is responsible. Once approved, submit the Notice of Termination to the appropriate state or federal agency.

3.2.2 Erosion and Sediment Control Measures

Provide erosion and sediment control measures in accordance with state and local laws and regulations. Preserve vegetation to the maximum extent practicable.

Erosion control inspection reports may be compiled as part of a stormwater pollution prevention plan inspection reports.

3.2.3 Sedimentation and Erosion Control Protection

The Contractor shall implement and maintain all necessary controls to prevent sedimentation runoff to storm water for all constructio projects regardless of size or scope.

3.2.4 Work Area Limits

Mark the areas that need not be disturbed under this Contract prior to commencing construction activities. Mark or fence isolated areas within the general work area that are not to be disturbed. Protect monuments and markers before construction operations commence. Where construction operations are to be conducted during darkness, all markers must be visible in the dark. Personnel must be knowledgeable of the purpose for marking and protecting particular objects.

3.2.5 Contractor Facilities and Work Areas

Place field offices, staging areas, stockpile storage, and temporary buildings in areas designated on the drawings or as directed by the Contracting Officer. Move or relocate the Contractor facilities only when approved by the Government. Provide erosion and sediment controls for onsite borrow and spoil areas to prevent sediment from entering nearby waters. Control temporary excavation and embankments for plant or work areas to protect adjacent areas.

3.2.6 Municipal Separate Storm Sewer System (MS4) Management

Comply with the Installation's MS4 permit requirements.

3.3 SURFACE AND GROUNDWATER

3.3.1 Cofferdams, Diversions, and Dewatering

Construction operations for dewatering, removal of cofferdams, tailrace excavation, and tunnel closure must be constantly controlled to maintain compliance with existing state water quality standards and designated uses of the surface water body. Comply with the State of New Jersey water quality standards and anti-degradation provisions and the Clean Water Act Section 404. Do not discharge excavation ground water to the sanitary sewer, storm drains, or to surface waters without prior specific authorization in writing from the Installation Environmental Office or Contracting Officer. Discharge of hazardous substances will not be permitted under any circumstances. Use sediment control BMPs to prevent construction site runoff from directly entering any storm drain or surface waters.

If the construction dewatering is noted or suspected of being contaminated, it may only be released to the storm drain system if the discharge is specifically permitted. Obtain authorization for any contaminated groundwater release in advance from the Installation Environmental Officer and the federal or state authority, as applicable. Discharge of hazardous substances will not be permitted under any circumstances.

3.3.2 Waters of the United States

Do not enter, disturb, destroy, or allow discharge of contaminants into waters of the United States.

3.4 PROTECTION OF CULTURAL RESOURCES

3.4.1 Archaeological Resources

If, during excavation or other construction activities, any previously unidentified or unanticipated historical, archaeological, and cultural resources are discovered or found, activities that may damage or alter such resources will be suspended. Resources covered by this paragraph include, but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rock or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, immediately notify the Contracting Officer so that the appropriate authorities may be notified and a determination made as to their significance and what, if any, special disposition of the finds

should be made. Cease all activities that may result in impact to or the destruction of these resources. Secure the area and prevent employees or other persons from trespassing on, removing, or otherwise disturbing such resources. The Government retains ownership and control over archaeological resources.

3.5 AIR RESOURCES

Equipment operation, activities, or processes will be in accordance with 40 CFR 64 and state air emission and performance laws and standards.

3.5.1 Preconstruction Air Permits

Notify the Air Program Manager, through the Contracting Officer, at least 6 months prior to bringing equipment, assembled or unassembled, onto the Installation, so that air permits can be secured. Necessary permitting time must be considered in regard to construction activities. Clean Air Act (CAA) permits must be obtained prior to bringing equipment, assembled or unassembled, onto the Installation.

Confirm that these permits have been obtained.

3.5.2 Oil or Dual-fuel Boilers and Furnaces

Provide product data and details for new, replacement, or relocated fuel fired boilers, heaters, or furnaces to the Installation Environmental Office (Air Program Manager) through the Contracting Officer. Data to be reported include: equipment purpose (water heater, building heat, process), manufacturer, model number, serial number, fuel type (oil type, gas type) size (MMBTU heat input). Provide in accordance with paragraph PRECONSTRUCTION AIR PERMITS.

3.5.3 Burning

Burning is prohibited on the Government premises.

3.5.4 Class I and II ODS Prohibition

Class I and II ODS are Government property and must be returned to the Government for appropriate management. Coordinate with the Installation Environmental Office to determine the appropriate location for turn in of all reclaimed refrigerant.

3.5.5 Accidental Venting of Refrigerant

Accidental venting of a refrigerant is a release and must be reported immediately to the Contracting Officer. Intentional venting of refrigerants (including most Non-ODS substitute refrigerants) is prohibited per 40 CFR 82.

3.5.6 EPA Certification Requirements

Heating and air conditioning technicians must be certified through an EPA-approved program. Maintain copies of certifications at the employees' places of business; technicians must carry certification wallet cards, as provided by environmental law.

3.5.7 Dust Control

Keep dust down at all times, including during nonworking periods. Sprinkle or treat, with dust suppressants, the soil at the site, haul roads, and other areas disturbed by operations. Dry power brooming will not be permitted. Instead, use vacuuming, wet mopping, wet sweeping, or wet power brooming. Air blowing will be permitted only for cleaning nonparticulate debris such as steel reinforcing bars. Only wet cutting will be permitted for cutting concrete blocks, concrete, and bituminous concrete. Do not unnecessarily shake bags of cement, concrete mortar, or plaster. Since these products contain Crystalline Silica, comply with the applicable OSHA standard, 29 CFR 1910.1053 or 29 CFR 1926.1153 for controlling exposure to Crystalline Silica Dust.

3.5.7.1 Particulates

Dust particles, aerosols and gaseous by-products from construction activities, and processing and preparation of materials (such as from asphaltic batch plants) must be controlled at all times, including weekends, holidays, and hours when work is not in progress. Maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates that would exceed 40 CFR 50, state, and local air pollution standards or that would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, baghouse, scrubbers, electrostatic precipitators, or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp. Provide sufficient, competent equipment available to accomplish these tasks. Perform particulate control as the work proceeds and whenever a particulate nuisance or hazard occurs. Comply with state and local visibility regulations.

3.5.7.2 Abrasive Blasting

Blasting operations cannot be performed without prior approval of the Installation Air Program Manager. The use of silica sand is prohibited in sandblasting.

Provide tarpaulin drop cloths and windscreens to enclose abrasive blasting operations to confine and collect dust, abrasive agent, paint chips, and other debris.

3.5.8 Odors

Control odors from construction activities. The odors must be in compliance with state regulations and local ordinances and may not constitute a health hazard.

3.6 WASTE MINIMIZATION

Minimize the use of hazardous materials and the generation of waste. Include procedures for pollution prevention/ hazardous waste minimization in the Hazardous Waste Management Section of the EPP. Obtain a copy of the installation's Pollution Prevention/Hazardous Waste Minimization Plan for reference material when preparing this part of the EPP. If no written plan exists, obtain information by contacting the Contracting Officer. Describe the anticipated types of the hazardous materials to be used in the construction when requesting information.

3.6.1 Salvage, Reuse and Recycle

Identify anticipated materials and waste for salvage, reuse, and recycling. Describe actions to promote material reuse, resale or recycling. To the extent practicable, all scrap metal must be sent for reuse or recycling and will not be disposed of in a landfill.

Include the name, physical address, and telephone number of the hauler, if transported by a franchised solid waste hauler. Include the destination and, unless exempted, provide a copy of the state or local permit (cover) or license for recycling.

3.6.2 Nonhazardous Solid Waste Diversion Report

Maintain an inventory of nonhazardous solid waste diversion and disposal of construction and demolition debris. Submit a report to the Contracting Officer on the first working day after each fiscal year quarter, starting the first quarter that nonhazardous solid waste has been generated. Include the following in the report:

Construction and Demolition (C&D) Debris Disposed	, as appropriate
C&D Debris Recycled	, as appropriate
C&D Debris Composted	, as appropriate
Total C&D Debris Generated	, as appropriate
Waste Sent to Waste-To-Energy Incineration Plant (This amount should not be included in the recycled amount)	, as appropriate

3.7 WASTE MANAGEMENT AND DISPOSAL

3.7.1 Waste Determination Documentation

Complete a Waste Determination form (provided at the pre-construction conference) for Contractor-derived wastes to be generated. All potentially hazardous solid waste streams that are not subject to a specific exclusion or exemption from the hazardous waste regulations (e.g., scrap metal, domestic sewage) or subject to special rules, (lead-acid batteries and precious metals) must be characterized in accordance with the requirements of 40 CFR 262.11 or corresponding applicable state or local regulations. Base waste determination on user knowledge of the processes and materials used, and analytical data when necessary. Consult with the Installation environmental staff for guidance on specific requirements. Attach support documentation to the Waste Determination form. As a minimum, provide a Waste Determination form for the following waste (this listing is not exhaustive): oil- and latex -based painting and caulking products, solvents, adhesives, aerosols, petroleum products, and containers of the original materials.

3.7.2 Solid Waste Management

3.7.2.1 Project Solid Waste Disposal Documentation Report

Provide copies of the waste handling facilities' weight tickets, receipts, bills of sale, and other sales documentation. In lieu of sales documentation, a statement indicating the disposal location for the solid waste that is signed by an employee authorized to legally obligate or bind the firm may be submitted. The sales documentation Contractor certification must include the receiver's tax identification number and business, EPA or state registration number, along with the receiver's delivery and business addresses and telephone numbers. For each solid waste retained for the Contractor's own use, submit the information previously described in this paragraph on the solid waste disposal report. Prices paid or received do not have to be reported to the Contracting Officer unless required by other provisions or specifications of this Contract or public law.

3.7.2.2 Control and Management of Solid Wastes

Pick up solid wastes, and place in covered containers that are regularly emptied. Do not prepare or cook food on the project site. Prevent contamination of the site or other areas when handling and disposing of wastes. At project completion, leave the areas clean. Employ segregation measures so that no hazardous or toxic waste will become co-mingled with non-hazardous solid waste. Transport solid waste off Government property and dispose of it in compliance with 40 CFR 260, state, and local requirements for solid waste disposal. A Subtitle D RCRA permitted landfill is the minimum acceptable offsite solid waste disposal option. Verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate. Solid waste disposal offsite must comply with most stringent local, state, and federal requirements, including 40 CFR 241, and 40 CFR 258.

Manage hazardous material used in construction, including but not limited to, aerosol cans, waste paint, cleaning solvents, contaminated brushes, and used rags, in accordance with 49 CFR 173.

3.7.3 Control and Management of Hazardous Waste

Do not dispose of hazardous waste on Government property. Do not discharge any waste to a sanitary sewer, storm drain, or to surface waters or conduct waste treatment or disposal on Government property without written approval of the Contracting Officer and Installation Hazardous Waste Manager.

3.7.3.1 Hazardous Waste/Debris Management

Identify construction activities that will generate hazardous waste or debris. Provide a documented waste determination for resultant waste streams. Identify, label, handle, store, and dispose of hazardous waste or debris in accordance with federal, state, and local regulations, including 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, 40 CFR 266, and 40 CFR 268.

Manage hazardous waste in accordance with the approved Hazardous Waste Management Section of the EPP. Store hazardous wastes in approved containers in accordance with 49 CFR 173 and 49 CFR 178. Hazardous waste generated within the confines of Government facilities is identified as

being generated by the Government. Prior to removal of any hazardous waste from Government property, hazardous waste manifests must be signed by personnel from the Installation Environmental Office. Do not bring hazardous waste onto Government property. Provide the Contracting Officer with a copy of waste determination documentation for any solid waste streams that have any potential to be hazardous waste or contain any chemical constituents listed in 40 CFR 372-SUBPART D.

3.7.3.2 Waste Storage/Satellite Accumulation/90 Day Storage Areas

Accumulate hazardous waste at satellite accumulation points and in compliance with 40 CFR 262 and applicable state or local regulations. Individual waste streams will be limited to 55 gallons of accumulation (or one quart for acutely hazardous wastes). If the Contractor expects to generate hazardous waste at a rate and quantity that makes satellite accumulation impractical, the Contractor may request a temporary 90-day or 180-day, as appropriate, accumulation point be established. Submit a request in writing to the Contracting Officer and provide the following information (Attach Site Plan to the Request):

Contract Number	
Contractor	
Haz/Waste or Regulated Waste POC	
Phone Number	
Type of Waste	
Source of Waste	
Emergency POC	
Phone Number	
Location of the Site	

Attach a Waste Determination form for the expected waste streams. Allow 10 working days for processing this request. Additional compliance requirements (e.g., training and contingency planning) that may be required are the responsibility of the Contractor. Barricade the designated area where waste is being stored and post a sign identifying as follows:

"DANGER - UNAUTHORIZED PERSONNEL KEEP OUT"

3.7.3.3 Hazardous Waste Disposal

3.7.3.3.1 Responsibilities for Contractor's Disposal

Provide hazardous waste manifest to the Installations Environmental Office for review, approval, and signature prior to shipping waste off Government property.

3.7.3.3.1.1 Services

Provide service necessary for the final treatment or disposal of the hazardous material or waste in accordance with 40 CFR 260 - 40 CFR 279, local, and state, laws and regulations, and the terms and conditions of the Contract within 60 days after the materials have been generated.

These services include necessary personnel, labor, transportation, packaging, detailed analysis (if required for disposal or transportation, include manifesting or complete waste profile sheets, equipment, and compile documentation).

3.7.3.3.1.2 Samples

Obtain a representative sample of the material generated for each job done to provide waste stream determination.

3.7.3.3.1.3 Analysis

Analyze each sample taken and provide analytical results to the Contracting Officer. See paragraph WASTE DETERMINATION DOCUMENTATION.

3.7.3.3.1.4 Labeling

During waste accumulation label all containers in accordance with 40 CFR 262. Prior to offering a waste for off-site transport, determine the Department of Transportation's (DOT's) proper shipping names for waste in accordance with 49 CFR 172 (each container requiring disposal) and demonstrate to the Contracting Officer how this determination is developed and supported by the sampling and analysis requirements contained herein. Label all containers of hazardous waste with the words "Hazardous Waste" or other words to describe the contents of the container in accordance with 40 CFR 262 and applicable state or local regulations.

3.7.3.4 Universal Waste Management

Manage the following categories of universal waste in accordance with federal, state, and local requirements and installation instructions:

a. Batteries as described in 40 CFR 273.2

b. Lamps as described in 40 CFR 273.5

c. Mercury-containing equipment as described in 40 CFR 273.4

d. Aerosol cans as described in 40 CFR 273.6

Mercury is prohibited in the construction of this facility, unless specified otherwise, and with the exception of mercury vapor lamps and fluorescent lamps. Dumping of mercury-containing materials and devices such as mercury vapor lamps, fluorescent lamps, and mercury switches, in rubbish containers is prohibited. Remove without breaking, pack to prevent breakage, and transport out of the activity in an unbroken condition for disposal as directed.

3.7.3.5 Electronics End-of-Life Management

Recycle or dispose of electronics waste, including, but not limited to, used electronic devices such computers, monitors, hard-copy devices, televisions, mobile devices, in accordance with 40 CFR 260-262, state, and local requirements, and installation instructions.

3.7.3.6 Disposal Documentation for Hazardous and Regulated Waste

Contact the Contracting Officer for the facility RCRA identification number that is to be used on each manifest.

Submit a copy of the applicable EPA and or state permit(s), manifest(s), or license(s) for transportation, treatment, storage, and disposal of hazardous and regulated waste by permitted facilities. Hazardous or toxic waste manifests must be reviewed, signed, and approved by the Contracting Officer before the Contractor may ship waste. To obtain specific disposal instructions, coordinate with the Installation Environmental Office. Refer to Section 01 57 19 ENVIRONMENTAL CONTROLS for the Installation Point of Contact information.

3.7.4 Releases/Spills of Oil and Hazardous Substances

3.7.4.1 Response and Notifications

Exercise due diligence to prevent, contain, and respond to spills of hazardous material, hazardous substances, hazardous waste, sewage, regulated gas, petroleum, lubrication oil, and other substances regulated in accordance with 40 CFR 300. Maintain spill cleanup equipment and materials at the work site. In the event of a spill, take prompt, effective action to stop, contain, curtail, or otherwise limit the amount, duration, and severity of the spill/release. In the event of any releases of oil and hazardous substances, chemicals, or gases; immediately (within 15 minutes) notify the Installation Fire Department, the Installation Command Duty Officer, the Installation Environmental Office, the Contracting Officer.

Submit verbal and written notifications as required by the federal (40 CFR 300.125 and 40 CFR 355), state, local regulations and instructions. Provide copies of the written notification and documentation that a verbal notification was made within 20 days. Spill response must be in accordance with 40 CFR 300 and applicable state and local regulations. Contain and clean up these spills without cost to the Government.

3.7.4.2 Clean Up

Clean up hazardous and non-hazardous waste spills. Reimburse the Government for costs incurred including sample analysis materials, clothing, equipment, and labor if the Government will initiate its own spill cleanup procedures, for Contractor- responsible spills, when: Spill cleanup procedures have not begun within one hour of spill discovery/occurrence; or, in the Government's judgment, spill cleanup is inadequate and the spill remains a threat to human health or the environment.

3.7.5 Mercury Materials

Immediately report to the Environmental Office and the Contracting Officer instances of breakage or mercury spillage. Clean mercury spill area to the satisfaction of the Contracting Officer.

Do not recycle a mercury spill cleanup; manage it as a hazardous waste for disposal.

3.7.6 Wastewater

3.7.6.1 Disposal of Wastewater

Disposal of wastewater must be as specified below.

3.7.6.1.1 Treatment

Do not allow wastewater from construction activities, such as onsite material processing, concrete curing, foundation and concrete clean-up, water used in concrete trucks, and forms to enter water ways or to be discharged prior to being treated to remove pollutants. Dispose of the construction- related waste water off-Government property in accordance with 40 CFR 403, state, regional, and local laws and regulations.

3.7.6.1.2 Surface Discharge

For discharge of ground water, obtain a state or federal permit specific for pumping and discharging ground water prior to surface discharging. Surface discharge in accordance with the requirements of the NPDES or state STORMWATER DISCHARGES FROM CONSTRUCTION SITES permit.

3.7.6.1.3 Land Application

Water generated from the flushing of lines after disinfection or disinfection in conjunction with hydrostatic testing must be land- applied in accordance with federal, state, and local laws and regulations for land application.

3.8 HAZARDOUS MATERIAL MANAGEMENT

Include hazardous material control procedures in the Safety Plan, in accordance with Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS. Address procedures and proper handling of hazardous materials, including the appropriate transportation requirements. Do not bring hazardous material onto Government property that does not directly relate to requirements for the performance of this contract. Submit an SDS and estimated quantities to be used for each hazardous material to the Contracting Officer prior to bringing the material on the installation. Typical materials requiring SDS and quantity reporting include, but are not limited to, oil and latex based painting and caulking products, solvents, adhesives, aerosol, and petroleum products. Use hazardous materials in a manner that minimizes the amount of hazardous waste generated. Containers of hazardous materials must have National Fire Protection Association labels or their equivalent. Certify that hazardous materials removed from the site are hazardous materials and do not meet the definition of hazardous waste, in accordance with 40 CFR 261 and state and installation requirements.

3.9 PREVIOUSLY USED EQUIPMENT

Clean previously used construction equipment prior to bringing it onto the project site. Equipment must be free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. Consult with the U.S. Department of Agriculture jurisdictional office for additional cleaning requirements.

3.10 PETROLEUM, OIL, LUBRICANT (POL) STORAGE AND FUELING

POL products include flammable or combustible liquids, such as gasoline, diesel, lubricating oil, used engine oil, hydraulic oil, mineral oil, and cooking oil. Store POL products and fuel equipment and motor vehicles in a manner that affords the maximum protection against spills into the environment. Manage and store POL products in accordance with EPA

40 CFR 112, and other federal, state, regional, and local laws and regulations. Use secondary containments, dikes, curbs, and other barriers, to prevent POL products from spilling and entering the ground, storm or sewer drains, stormwater ditches or canals, or navigable waters of the United States. Describe in the EPP (see paragraph ENVIRONMENTAL PROTECTION PLAN) how POL tanks and containers must be stored, managed, and inspected and what protections must be provided. Storage of fuel on the project site is not allowed. Fuel must be brought to the project site each day that work is performed.

3.10.1 Used Oil Management

Manage used oil generated on site in accordance with 40 CFR 279. Determine if any used oil generated while onsite exhibits a characteristic of hazardous waste. Used oil containing 1,000 parts per million of solvents is considered a hazardous waste and disposed of at the Contractor's expense. Used oil mixed with a hazardous waste is also considered a hazardous waste. Dispose in accordance with paragraph HAZARDOUS WASTE DISPOSAL.

3.10.2 Oil Storage Including Fuel Tanks

Provide secondary containment and overfill protection for oil storage tanks. A berm used to provide secondary containment must be of sufficient size and strength to contain the contents of the tanks plus 5 inches freeboard for precipitation. Construct the berm to be impervious to oil for 72 hours that no discharge will permeate, drain, infiltrate, or otherwise escape before cleanup occurs. Use drip pans during oil transfer operations; adequate absorbent material must be onsite to clean up any spills and prevent releases to the environment. Cover tanks and drip pans during inclement weather. Provide procedures and equipment to prevent overfilling of tanks. If tanks and containers with an aggregate aboveground capacity greater than 1320 gallons will be used onsite (only containers with a capacity of 55 gallons or greater are counted), provide and implement a Spill Prevention Control and Countermeasure (SPCC) plan meeting the requirements of 40 CFR 112. Do not bring underground storage tanks to the installation for Contractor use during a project. Submit the SPCC plan to the Contracting Officer for approval.

Monitor and remove any rainwater that accumulates in open containment dikes or berms. Inspect the accumulated rainwater prior to draining from a containment dike to the environment, to determine there is no oil sheen present.

3.11 INADVERTENT DISCOVERY OF PETROLEUM-CONTAMINATED SOIL OR HAZARDOUS WASTES

If petroleum-contaminated soil, or suspected hazardous waste is found during construction that was not identified in the Contract documents, immediately notify the Contracting Officer. Do not disturb this material until authorized by the Contracting Officer.

3.12 SOUND INTRUSION

Make the maximum use of low-noise emission products, as certified by the EPA. Blasting or use of explosives are not permitted without written permission from the Contracting Officer, and then only during the designated times.

Keep construction activities under surveillance and control to minimize environment damage by noise. Comply with the provisions of the State of New Jersey rules.

3.13 POST CONSTRUCTION CLEANUP

Clean up areas used for construction in accordance with Contract Clause: "Cleaning Up". Unless otherwise instructed in writing by the Contracting Officer, remove traces of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. Grade parking area and similar temporarily used areas to conform with surrounding contours.

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SECTION 01 58 00

PROJECT IDENTIFICATION
08/19, CHG 5: 08/22

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

1.2 PROJECT IDENTIFICATION SIGN

Prior to initiating any work on site, provide one project identification sign at the location entrance to the project site. Construct the sign in accordance with project sign detail, which can be downloaded at: http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/forms-graphics-tables. Maintain sign throughout the life of the project. Upon completion of the project, remove the sign from the site.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

-- End of Section --

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SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
02/19, CHG 3: 11/21

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Co-mingle

The practice of placing unrelated materials together in a single container, usually for benefits of convenience and speed.

1.1.2 Construction Waste

Waste generated by construction activities, such as scrap materials, damaged or spoiled materials, temporary and expendable construction materials, and other waste generated by the workforce during construction activities.

1.1.3 Demolition Debris/Waste

Waste generated from demolition activities, including minor incidental demolition waste materials generated as a result of Intentional dismantling of all or portions of a building, to include clearing of building contents that have been destroyed or damaged.

1.1.4 Disposal

Depositing waste in a solid waste disposal facility, usually a managed landfill or incinerator, regulated in the US under the Resource Conservation and Recovery Act (RCRA).

1.1.5 Diversion

The practice of diverting waste from disposal in a landfill or incinerator, by means of eliminating or minimizing waste, or reuse of materials.

1.1.6 Final Construction Waste Diversion Report

A written assertion by a material recovery facility operator identifying constituent materials diverted from disposal, usually including summary tabulations of materials, weight in short-ton.

1.1.7 Recycling

The series of activities, including collection, separation, and processing, by which products or other materials are diverted from the solid waste stream for use in the form of raw materials in the manufacture of new products sold or distributed in commerce, or the reuse of such materials as substitutes for goods made of virgin materials, other than fuel.

1.1.8 Reuse

The use of a product or materials again for the same purpose, in its

original form or with little enhancement or change.

1.1.9 Salvage

Usable, salable items derived from buildings undergoing demolition or deconstruction, parts from vehicles, machinery, other equipment, or other components.

1.1.10 Source Separation

The practice of administering and implementing a management strategy to identify and segregate unrelated waste at the first opportunity.

1.2 CONSTRUCTION WASTE (INCLUDES DEMOLITION DEBRIS/WASTE)

Divert a minimum of 60 percent by weight of the project construction waste and demolition debris/waste from the landfill or incinerator. Follow applicable industry standards in the management of waste. Apply sound environmental principles in the management of waste. (1) Practice efficient waste management when sizing, cutting, and installing products and materials and (2) use all reasonable means to divert construction waste and demolition debris/waste from landfills and incinerators and to facilitate the recycling or reuse of excess construction materials.

1.3 CONSTRUCTION WASTE MANAGEMENT

Implement a Construction Waste Management Program for the project. Take a pro-active, responsible role in the management of construction construction waste, recycling process, disposal of demolition debris/waste, and require all subcontractors, vendors, and suppliers to participate in the Construction Waste Management Program. Establish a process for clear tracking, and documentation of construction waste and demolition debris/waste.

1.3.1 Implementation of Construction Waste Management Program

Develop and document how the Construction Waste Management Program will be implemented in a Construction Waste Management Plan. Submit a Construction Waste Management Plan to the Contracting Officer for approval. Construction waste and demolition debris/waste materials include un-used construction materials not incorporated in the final work, as well as demolition debris/waste materials from demolition activities or deconstruction activities. In the management of waste, consider the availability of viable markets, the condition of materials, the ability to provide material in suitable condition and in a quantity acceptable to available markets, and time constraints imposed by internal project completion mandates.

1.3.2 Oversight

The Quality Control Manager, as specified in Section 01 45 00 QUALITY CONTROL, is responsible for overseeing and documenting results from executing the Construction Waste Management Plan for the project.

1.3.3 Special Programs

Implement special programs involving rebates or similar incentives related to recycling of construction waste and demolition debris/waste materials. Retain revenue or savings from salvaged or recycling, unless otherwise

directed. Ensure firms and facilities used for recycling, reuse, and disposal are permitted for the intended use to the extent required by federal, state, and local regulations.

1.3.4 Special Instructions

Provide on-site instruction of appropriate separation, handling, recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the projects. Designation of single source separating or commingling will be clearly marked on the containers.

The following may not be disposed of in landfills or by incineration:

a. Aluminum, steel, and tin cans.

b. Plastic containers, bottles, tubs, and jugs.
c. Cardboard and cartons.

d. Wood and plastic pallets.

e. Clean dimensional wood: May be used as blocking or furring.

f. Land clearing debris, including brush, branches, logs, and stumps; see Section 31 1000 - SITE CLEARING for use options.

g. Concrete as specified in Sections 03 3000 and 32 1313.

h. Asphalt paving as specified in Section 31 1216.

i. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.

j. Glass bottles and jars.

k. Paper, such as, newspapers, office paper junk mail, magazines, phone books, packing paper, etc.

l. Plastic bags and packing materials.

m. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (http://flooring.dupont.com) and interface (www.interfaceinc.com) conduct reclamation programs.

n. Appliances, water heaters, and water softeners.
o. Tires.

p. Fluorescent lamps (light bulbs).

1.3.5 Waste Streams

Delineate waste streams and characterization, including estimated material types and quantities of waste, in the Construction Waste Management Plan. Manage all waste streams associated with the project. Typical waste streams are listed below. Include additional waste steams not listed:

a. Land Clearing Debris

b. Asphalt

c. Masonry and CMU

d. Concrete

e. Metals (Includes, but is not limited to, banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized, stainless steel, aluminum, copper, zinc, bronze.)

f. Wood (nails and staples allowed)

g. Glass

h. Paper

i. Plastics (PET, HDPE,PVC,LDPE,PP,PS, Other)

j. Gypsum

k. Non-hazardous paint and paint cans

l. Carpet

m. Ceiling Tiles

n. Insulation

o. Beverage Containers

1.4 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Construction Waste Management Plan; G

SD-06 Test Reports

Quarterly Reports

Annual Report

SD-11 Closeout Submittals

Final Construction Waste Diversion Report; S

1.5 MEETINGS

Conduct Construction Waste Management meetings. After award of the Contract and prior to commencement of work, schedule and conduct a meeting with the Contracting Officer to discuss the proposed Construction Waste

Management Plan and to develop a mutual understanding relative to the management of the Construction Waste Management Program and how waste diversion requirements will be met.

The requirements of this meeting may be fulfilled during the coordination and mutual Understanding meeting outlined in Section 01 45 00 QUALITY CONTROL. At a minimum, discuss and document waste management goals at following meetings:

a. Preconstruction meeting.

b. Regular Quality Control meetings.

c. Work safety meeting (if applicable).

1.6 CONSTRUCTION WASTE MANAGEMENT PLAN

Submit Construction Waste Management Plan within 15 days after notice to proceed. Revise and resubmit Construction Waste Management Plan as necessary, in order for construction to begin.. Submit Construction Waste Management Plan not less than 60 calendar days before scheduled final site or building design approval. Revise and resubmit Construction Waste Management Plan until it receives final approval from the Contracting Officer, in order for construction to begin.

An approved Construction Waste Management Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations or meeting project cumulative waste diversion requirement. Ensure all subcontractors receive a copy of the approved Construction Waste Management Plan. The plan demonstrates how to meet the project waste diversion requirement. Also, include the following in the plan:

a. Identify the names of individuals responsible for waste management and waste management tracking, along with roles and responsibilities on the project.

b. Actions that will be taken to reduce solid waste generation, including coordination with subcontractors to ensure awareness and participation.

c. Description of the regular meetings to be held to address waste management.

d. Description of the specific approaches to be used in recycling/reuse of the various materials generated, including the areas on site and equipment to be used for processing, sorting, and temporary storage of materials.

e. Name of landfill and incinerator to be used.

f. Identification of local and regional re-use programs, including non-profit organizations such as schools, local housing agencies, and organization that accept used materials such as material exchange networks and resale stores. Include the name, location, phone number for each re-use facility identified, and provide a copy of the permit or license for each facility.

g. List of specific materials, by type and quantity, that will be salvaged for resale, salvaged and reused on the current project, salvaged and stored for reuse on a future project, or recycled.

Identify the recycling facilities by name, address, and phone number.

h. Identification of materials that cannot be recycled or reused with an explanation or justification, to be approved by the Contracting Officer.

i. Description of the means by which materials identified in item (g) above will be protected from contamination.

j. Description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site).

k. Copy of training plan for subcontractors and other services to prevent contamination by co-mingling materials identified for diversion and waste materials.

Distribute copies of the waste management plan to each subcontractor, Quality Control Manager, and the Contracting Officer.

1.7 RECORDS (DOCUMENTATION)

1.7.1 General

Maintain records to document the types and quantities of waste generated and diverted though re-use, recycling and sale to third parties; through disposal to a landfill or incinerator facility. Provide explanations for materials not recycled, reused or sold. Collect and retain manifests, weight tickets, sales receipts, and invoices specifically identifying diverted project waste materials or disposed materials.

1.7.1.1 Diversion Rate

A. Use the following calculation to determine the construction and demolition waste diversion rate. To verify that the 60% threshold will be met, project teams will calculate the diversion rate periodically (e.g., monthly or bimonthly) so that adjustements can be made, if necessary.
B. Diversion rate can be calculated by either weight or volume by the product) * 10

1.7.2 Accumulated

Maintain a running record of materials generated and diverted from landfill disposal, including accumulated diversion rates for the project. Make records available to the Contracting Officer during construction or incidental demolition activities. Provide a copy of the diversion records to the Contracting Officer upon completion of the construction, incidental demolitions or minor deconstruction activities.

1.8 REPORTS

1.8.1 General

Maintain current construction waste diversion information on site for periodic inspection by the Contracting Officer. Include in the quarterly reports, annual reports and final reports: the project name, contract information, information for waste generated, diverted and disposed of for the current reporting period and show cumulative totals for the project.

Reports must identify quantifies of waste by type and disposal method. Also include in each report, supporting documentation to include manifests, weigh tickets, receipts, and invoices specifically identifying the project and waste material type and weighted sum.

Landfill Disposal: Include the following information: Identification of material, Amount, in pounds/tons and cubic yards, of trash/waste material from the project disposed of in landfills, State the identity of landfills, Include manifests, weight tickets, receipts, and/or invoices as evidence of quantity.

Recycled and Salvaged Materials: Include the following information for each: Identification of material, including those retrieved by installer for use on other projects, Amount, in pounds/tons and cubic yards, date removed from the project site, and receiving party, Include manifests, weight tickets, receipts, and invoices as evidence of quantity, Certification by receiving party that materials will not be disposed of in landfills or by incineration.

Material Reused on Project: Include the following information for each: Identification of material and how it was used in the project, Amount, in pounds/tons and/or cubic yards, Include weight tickets as evidence of quantity.

Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

1.8.2 FINAL CONSTRUCTION WASTE DIVERSION REPORT

A Final Construction Waste Diversion Report is required at the end of the project. Provide Final Construction Waste Diversion Report 60 days prior to the Beneficial Occupancy Date (BOD). The final Construction Waste Diversion Report must be included in the Sustainability eNotebook in accordance with Section 01 33 29 SUSTAINABILITY REPORTING. The report shall show all quantities material quantities (weight & volume) for recycled or salvaged material, Reuse materials and materials donated or sold, and materials disposed of at landfill.

1.8.3 COLLECTION

Collect, store, protect, and handle reusable and recyclable materials at the site in a manner which prevents contamination, and provides protection from the elements to preserve their usefulness and monetary value. Provide receptacles and storage areas designated specifically for recyclable and reusable materials and label them clearly and appropriately to prevent contamination from other waste materials. Keep receptacles or storage areas neat and clean.

Train subcontractors and other service providers to either separate waste streams or use the co-mingling method as described in the construction waste management plan. Handle hazardous waste and hazardous materials in accordance with applicable regulations and coordinate with Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS . Separate materials by one of the following methods described herein:

1.8.4 Quarterly Reporting

Provide cumulative reports at the end of each quarter (December, March, June, and September, corresponding with the federal fiscal year for

reporting purposes). Submit quarterly reports not later than 15 calendar days after the preceding quarter has ended. Submit Quarterly Reports to the appropriate office or identified point of contact.

1.8.5 Annual Reporting

Provide a cumulative construction waste diversion report annually. Submit annual report not later than 30 calendar days after the preceding fourth quarter has ended.

1.9 FINAL CONSTRUCTION WASTE DIVERSION REPORT

A Final Construction Waste Diversion Report is required at the end of the project. Provide Final Construction Waste Diversion Report 60 days prior to the Beneficial Occupancy Date (BOD). The final Construction Waste Diversion Report must be included in the Sustainability eNotebook in accordance with Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING.

1.10 COLLECTION

Collect, store, protect, and handle reusable and recyclable materials at the site in a manner which prevents contamination, and provides protection from the elements to preserve their usefulness and monetary value. Provide receptacles and storage areas designated specifically for recyclable and reusable materials and label them clearly and appropriately to prevent contamination from other waste materials. Keep receptacles or storage areas neat and clean.

Train subcontractors and other service providers to either separate waste streams or use the co-mingling method as described in the Construction Waste Management Plan. Handle hazardous waste and hazardous materials in accordance with applicable regulations and coordinate with Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS. Separate materials by one of the following methods described herein:

1.10.1 Source Separation Method

Separate waste products and materials that are recyclable from trash and sort as described below into appropriately marked separate containers and then transport to the respective recycling facility for further processing. Deliver materials in accordance with recycling or reuse facility requirements (e.g., free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process). Separate materials into the category types as defined in the Construction Waste Management Plan.

1.10.2 Co-Mingled Method

Place waste products and recyclable materials into a single container and then transport to an authorized recycling facility, which meets all applicable requirements to accept and dispose of recyclable materials in accordance with all applicable local, state and federal regulations. The Co-mingled materials must be sorted and processed in accordance with the approved Construction Waste Management Plan.

1.10.3 Other Methods

Other methods proposed by the Contractor may be used when approved by the

Contracting Officer.

1.11 DISPOSAL

Control accumulation of waste materials and trash. Recycle or dispose of collected materials off-site at intervals approved by the Contracting Officer and in compliance with waste management procedures as described in the waste management plan. Except as otherwise specified in other sections of the specifications, dispose of in accordance with the following:

1.11.1 Reuse

Give first consideration to reusing construction and demolition materials as a disposition strategy. Recover for reuse materials, products, and components as described in the approved Construction Waste Management Plan. Coordinate with the Contracting Officer to identify onsite reuse opportunities or material sales or donation available through Government resale or donation programs. Sale of recovered materials is not allowed on the Installation. Consider the use of surplus industrial supply broker services, who match entities with reusable or repurpose industrial materials with entities with need of such materials.

1.11.2 Recycle

Recycle non-hazardous construction and demolition/debris materials that are not suitable for reuse. Track rejection of contaminated recyclable materials by the recycling facility. Rejected recyclables materials will not be counted as a percentage of diversion calculation. Recycle all fluorescent lamps, HID lamps, mercury (Hg) -containing thermostats and ampoules, and PCBs-containing ballasts and electrical components as directed by the Contracting Officer. Do not crush lamps on site as this creates a hazardous waste stream with additional handling requirements.

1.11.3 Waste

Dispose by landfill or incineration only those waste materials with no practical use, economic benefit, or recycling opportunity.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 WASTE MANAGEMENT PROCEDURES

See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.

See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.

See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.2 WASTE MANAGEMENT PLAN IMPLEMENTATION

Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, and the U.S. Government.

Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

Meetings: Discuss trash/waste management goals and issues at project meetings.

1. Pre-construction meeting.

2. Regular job-site meetings.

Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.

1. As a minimum, provide:

    a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking.
    b. Separate dumpsters for each category of recyclable.
    c. Recycling bins at worker lunch area.

2. Provide containers as required.
3. Provide temporary enclosures around piles of separated materials to be recycled or salvaged.
4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
5. Locate enclosures out of the way of construction traffic.
6. Provide adequate space for pick-up and delivery and convenience to subcontractors.
7. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

Not used. -- End of Section --

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SECTION 01 78 00

CLOSEOUT SUBMITTALS
05/19, CHG 1: 08/21

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 As-Built Drawings

As-built drawings are the marked-up drawings, maintained by the Contractor on-site, that depict actual conditions and deviations from the Contract Documents. These deviations and additions may result from coordination required by, but not limited to: contract modifications; official responses to submitted Requests for Information (RFI's); direction from the Contracting Officer; design that is the responsibility of the Contractor, and differing site conditions. Maintain the as-builts throughout construction as red-lined hard copies on site. These files serve as the basis for the creation of the record drawings.

1.1.2 Record Drawings

The record drawings are the final compilation of actual conditions reflected in the as-built drawings.

1.2 SOURCE DRAWING FILES

Request the full set of electronic drawings, in the source format, for Record Drawing preparation, after award and at least 30 days prior to required use.

1.2.1 Terms and Conditions

Data contained on these electronic files must not be used for any purpose other than as a convenience in the preparation of construction drawings and data for the referenced project. Any other use or reuse is at the sole risk of the Contractor and without liability or legal exposure to the Government. The Contractor must make no claim and waives to the fullest extent permitted by law, any claim or cause of action of any nature against the Government, its agents or sub consultants that may arise out of or in connection with the use of these electronic files. The Contractor must, to the fullest extent permitted by law, indemnify and hold the Government harmless against all damages, liabilities or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from the use of these electronic files.

These electronic CAD drawing files are not construction documents. Differences may exist between the CAD files and the corresponding construction documents. The Government makes no representation regarding the accuracy or completeness of the electronic CAD files, nor does it make representation to the compatibility of these files with the Contractor hardware or software. In the event that a conflict arises between the signed and sealed construction documents prepared by the Government and the furnished Source drawing files, the signed and sealed construction documents govern. The Contractor is responsible for determining if any conflict exists. Use of these Source Drawing files does not relieve the Contractor of duty to fully comply with the contract documents, including

and without limitation, the need to check, confirm and coordinate the work of all contractors for the project. If the Contractor uses, duplicates or modifies these electronic source drawing files for use in producing construction drawings and data related to this contract, remove all previous indicia of ownership (seals, logos, signatures, initials and dates).

1.3 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Warranty Management Plan

Warranty Tags

Spare Parts Data

SD-08 Manufacturer's Instructions

Posted Instructions

Operation and Maintenance Manuals; G

SD-11 Closeout Submittals

As-Built Drawings; G

Record Drawings; G,

As-Built Survey of all Buried and Underslab Utilities; G

Warranted Equipment and Materials

Certification of EPA Designated Items; G

1.4 SPARE PARTS DATA

Submit four copies of the Spare Parts Data list.

a. Indicate manufacturer's name, part number, and stock level required for test and balance, pre-commissioning, maintenance and repair activities. List those items that may be standard to the normal maintenance of the system. List those items which have a long-lead procurement time.

1.5 WARRANTY MANAGEMENT

1.5.1 Warranty Management Plan

Develop a warranty management plan which contains information relevant to FAR 52.246-21 Warranty of Construction. At least 30 days before the planned pre-warranty conference, submit one set of the warranty management plan. Include within the warranty management plan all required actions

and documents to assure that the Government receives all warranties to which it is entitled. The plan narrative must contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below must include due date and whether item has been submitted or was accomplished. Submit warranty information, made available during the construction phase, to the Contracting Officer for approval prior to each monthly pay estimate. Assemble approved information in a binder and turn over to the Government upon acceptance of the work. The construction warranty period must begin on the date of project acceptance and continue for the full product warranty period. Conduct a joint 4 month and 9 month warranty inspection, measured from time of acceptance; with the Contractor, Contracting Officer and the Customer Representative. The warranty management plan must include, but is not limited to, the following:

a. Roles and responsibilities of personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the Contractors, subcontractors, manufacturers or suppliers involved.

b. For each warranty, the name, address, telephone number, and e-mail of each of the guarantor's representatives nearest to the project location.

c. A list and status of delivery of Certificates of Warranty for extended warranty items, including roofs, HVAC balancing, pumps, motors, transformers, and for commissioned systems, such as fire protection and alarm systems, sprinkler systems, and lightning protection systems.

d. Warranted Equipment and Materials list for each warranted equipment, item, feature of construction or system indicating:

(1) Name of item.
(2) Model and serial numbers.
(3) Location where installed.
(4) Name and phone numbers of manufacturers or suppliers.
(5) Names, addresses and telephone numbers of sources of spare parts.
(6) Warranties and terms of warranty. Include one-year overall warranty of construction, including the starting date of warranty of construction. Items which have warranties longer than one year must be indicated with separate warranty expiration dates.
(7) Cross-reference to warranty certificates as applicable.
(8) Starting point and duration of warranty period.
(9) Summary of maintenance procedures required to continue the warranty in force.
(10) Cross-reference to specific pertinent Operation and Maintenance manuals.
(11) Organization, names and phone numbers of persons to call for warranty service.
(12) Typical response time and repair time expected for various warranted equipment.

e. The plans for attendance at the 4 and 9 month post-construction warranty inspections conducted by the Government.

f. Procedure and status of tagging of equipment covered by warranties longer than one year.

g. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty or safety reasons.

h. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with the U.S. Government's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

i. Provide warranties specified in each section. Verify that documents are in proper form, contain full information, and are notarized.

j. Co-execute submittals when required.

k. Retain warranties and bonds until time specified for submittal.

l. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable vinyl covers.

m. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of the Construction Contractor and equipment supplier; and name of responsible company principal.

n. Table of Contents (Index): Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

o. Text: Manufacturer's printed data and all other data on 20 pound paper.

p. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

q. Manufacturer Warranties: Manufacturer's standard product warranty running for the manufacturer's standard term, unless otherwise indicated.

r. Submit copies of all manufacturer warranties which extend beyond the end of the contract correction period.

1.5.2 Performance Bond

The Performance Bond must remain effective throughout the construction and warranty period .

a. In the event the Contractor fails to commence and diligently pursue any construction warranty work required, the Contracting Officer will have the work performed by others, and after completion of the work, will charge the remaining construction warranty funds of expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.

b. In the event sufficient funds are not available to cover the construction warranty work performed by the Government at the

Contractor's expense, the Contracting Officer will have the right to recoup expenses from the bonding company.

c. Following oral or written notification of required construction warranty repair work, respond in a timely manner. Written verification will follow oral instructions. Failure to respond will be cause for the Contracting Officer to proceed against the Contractor.

1.5.3 Pre-Warranty Conference

Prior to contract completion, and at a time designated by the Contracting Officer, meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of this section. At this meeting, establish and review communication procedures for Contractor notification of construction warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty In connection with these requirements and at the time of the Contractor's quality control completion inspection, furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue construction warranty work action on behalf of the Contractor. This point of contact must be located within the local service area of the warranted construction, be continuously available, and be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of its responsibilities in connection with other portions of this provision.

1.5.4 Warranty Tags

At the time of installation, tag each warranted item with a durable, oil and water resistant tag approved by the Contracting Officer. Attach each tag with a copper wire and spray with a silicone waterproof coating. Also, submit two record copies of the warranty tags showing the layout and design. The date of acceptance and the QC signature must remain blank until the project is accepted for beneficial occupancy. Show the following information on the tag.

Type of product/material	
Model number	
Serial number	
Contract number	
Warranty period from/to	
Inspector's signature	
Construction Contractor	
Address	
Telephone number	
Warranty contact	
Address	
Telephone number	
Warranty response time priority code	

WARNING - PROJECT PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE DURING THE WARRANTY PERIOD.

PART 2 PRODUCTS

2.1 CERTIFICATION OF EPA DESIGNATED ITEMS

Submit the Certification of EPA Designated Items as required by FAR 52.223-9 Estimate of Percentage of Recovered Material Content for EPA Designated Items and FAR 52-223-17 Affirmative Procurement of EPA designated items in Service and Construction Contracts. Include on the certification form the following information: project name, project number, Contractor name, license number, Contractor address, and certification. The certification will read as follows and be signed and dated by the Contractor. "I hereby certify the information provided herein is accurate and that the requisition/procurement of all materials listed on this form comply with current EPA standards for recycled/recovered materials content. The following exemptions may apply to the non-procurement of recycled/recovered content materials:

a. The product does not meet appropriate performance standards;

b. The product is not available within a reasonable time frame;

c. The product is not available competitively (from two or more sources);

d. The product is only available at an unreasonable price (compared with a comparable non-recycled content product)."

Record each product used in the project that has a requirement or option of containing recycled content in accordance with SECTION 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING, noting total price, total value of post-industrial recycled content, total value of post-consumer recycled content, exemptions (a, b, c, or d, as indicated), and comments. Recycled content values may be determined by weight or volume percent, but must be consistent throughout.

2.2 GOVERNMENT FURNISHED MATERIALS

The Government will provide an optical disc (CD or DVD) following award of the contract that contains the following:
a. One set of "as-designed" electronic media (REVIT files) reflecting all amendments and the final Contract Documents. The sealed Contract Documents are the A/E's instruments of professional services and the electronic media are not substitutions for these instruments as differences may exist. The electronic media were developed by the A/E in support of the Contract Documents, for Proof of Concept and to the appropriate Level of Development (LoD) as required by the A/Es contract. The electronic media were not developed to depict actual conditions to a "shop drawing" level of development and are being provided to the Contractor to support preparation of as-built drawings. If discrepancies exist between the electronic media and the Contract Documents, Contractor is to correct the electronic media as required to complete as-built drawings and other contract requirements. If the Contractor uses these files, the Contractor accepts all risk of incomplete, inaccurate, defective and variant

information contained in the electronic media, and waives, quits, and forever discharges and releases A/E and their officers, directors, employees and successors from every claim arising out of or related to any error, discrepancy, inaccuracy, variation or other defect in the electronic media, whether or not resulting in whole or in part from an act, error or omission of A/E and whether or not such claim is known or unknown as of the date of this waiver and release. The electronic media are not suitable for reuse in any way, without complete verification by appropriate architects and engineers on any project, including without limitation, modifications, additions or extensions of this project. Contractor agrees that republication or distribution of the electronic media is not authorized by the A/E. Contractor shall, to the fullest extent permitted by law, defend, indemnify and hold the A/E and their officers, directors, employees and successors harmless from all claims, damages, including bodily injury or death, losses and expenses, including attorneys fees, arising out of or resulting in whole or in part from the use, reuse, republication or distribution of the electronic media. A/E claims their copyright to the electronic media, reserve same, and release of copies to Contractor shall not be
construed as publication in derogation of the A/E’s reserved rights.

PART 3 EXECUTION

3.1 AS-BUILT DRAWINGS

Provide and maintain (1) full size and (2) half size sets of hard copies - printed to scale and provide electronic copies (Record Drawings and Specifications) on Cd-Rom. Maintain the as-builts throughout construction as red-lined hard copies on site and or red-lined PDF files. Submit As-Built Drawings 30 days prior to Beneficial Occupancy Date (BOD).

3.1.1 Markup Guidelines

Make comments and markup the contract documents (specifications and drawings) complete without reference to letters, memos, or materials that are not part of the As-Built drawing. Show what was changed, how it was changed, where item(s) were relocated and change related details. These working as-built markup prints must be neat, legible and in color to easily locate comments and markups.

a. Provide a legend if multiple colors are used.

b. Add and denote any additional equipment or material facilities, service lines, incorporated under As-Built Revisions if not already shown in legend.

c. Use frequent written explanations on markup drawings to describe changes. Do not totally rely on graphic means to convey the revision.

d. Use legible lettering and precise and clear digital values when marking prints. Clarify ambiguities concerning the nature and application of change involved.

e. Wherever a revision is made, also make changes to related section views, details, legend, profiles, plans and elevation views, schedules, notes and call out designations, and mark accordingly to avoid conflicting data on all other sheets.

f. For deletions, cross out all features, data and captions that relate to that revision.

g. For changes on small-scale drawings and in restricted areas, provide large-scale inserts, with leaders to the applicable location.

h. Indicate one of the following when attaching a print or sketch to a markup print:

1) Add an entire drawing to contract drawings

2) Change the contract drawing to show changes on the drawing.

3) Provided for reference only to further detail the initial design.

i. Incorporate all shop and fabrication drawings into the markup drawings.

3.1.2 As-Built Drawings Content

Show on the as-built drawings, but not limited to, the following information:

a. The actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, show by offset dimensions to two permanently fixed surface features the end of each run including each change in direction on the record drawings. Locate valves, splice boxes and similar appurtenances by dimensioning along the utility run from a reference point. Also record the average depth below the surface of each run.

b. The location and dimensions of any changes within the building structure.

c. Layout and schematic drawings of electrical circuits and piping.

d. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract plans.

e. Changes in details of design or additional information obtained from working drawings specified to be prepared or furnished by the Contractor; including but not limited to shop drawings, fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment, and foundations.

f. The topography, invert elevations and grades of drainage installed or affected as part of the project construction.

g. Changes or Revisions which result from the final inspection.

h. Where contract drawings or specifications present options, show only the option selected for construction on the working as-built markup drawings.

i. If borrow material for this project is from sources on Government property, or if Government property is used as a spoil area, furnish a contour map of the final borrow pit/spoil area elevations.

j. Systems designed or enhanced by the Contractor, such as HVAC controls, fire alarm, fire sprinkler, and irrigation systems.

k. Changes in location of equipment and architectural features.

l. Modifications (include within change order price the cost to change working as-built markup drawings to reflect modifications).

m. Actual location of anchors, construction and control joints, etc., in concrete.

n. Unusual or uncharted obstructions that are encountered in the contract work area during construction.

o. Location, extent, thickness, and size of stone protection particularly where it will be normally submerged by water.

3.2 RECORD DRAWINGS

3.3 OPERATION AND MAINTENANCE MANUALS

Provide project operation and maintenance manuals as specified in Section 01 78 23 OPERATION AND MAINTENANCE DATA.Provide four electronic copies of the Operation and Maintenance Manual files and one hard copy of the Operation and Maintenance Manuals. Submit to the Contracting Officer for approval within 30 calendar days of the Beneficial Occupancy Date (BOD). Update and resubmit files for final approval at BOD.

3.4 AS-BUILT SURVEY OF ALL BURIED AND UNDERSLAB UTILITIES

Provide an as-built survey of all buried and underslab (both building slab at grade and site pavements) in both hardcopy and REVIT (BIM). Locate both horizontally and vertically tied to facility controls and include information on utility type and size tied back to the utilities shown in the contract documents.

3.5 DD FORM 1354

Complete DD Form 1354 per instructions in Specification Section 01 30 00 paragraph 3.1

3.6 CLEANUP

Leave premises "broom clean." Clean interior and exterior glass surfaces exposed to view; remove temporary labels, stains and foreign substances; polish transparent and glossy surfaces; vacuum carpeted and soft surfaces. Clean equipment and fixtures to a sanitary condition. Replace filters of operating equipment. Clean debris from roofs, gutters, downspouts and drainage systems. Sweep paved areas and rake clean landscaped areas. Remove waste and surplus materials, rubbish and construction facilities from the site..

-- End of Section --

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SECTION 01 78 23

OPERATION AND MAINTENANCE DATA
05/23

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE GUIDELINE 1.4	(2019) Preparing Systems Manuals for Facilities

ASTM INTERNATIONAL (ASTM)

ASTM E1971	(2005; R 2011) Standard Guide for Stewardship for the Cleaning of Commercial and Institutional Buildings
ASTM E2166	(2016; R 2023) Standard Practice for Organizing and Managing Building Data

U.S. DEPARTMENT OF DEFENSE (DOD)

FC 1-300-09N	(2014; with Change 6, 2021) Navy and Marine Corps Design

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-10 Operation and Maintenance Data

Facility Data Workbook; G

Training Plan; G

Training Outline; G

Training Content; G

Operation And Maintenance Manual, Progress Submittal; G

Operation And Maintenance Manual, Prefinal Submittal; G

Operation And Maintenance Manual, Final Submittal; G

SD-11 Closeout Submittals

Training Video Recording; G

Validation of Training Completion; G

Record Drawings And Utility Systems; G

1.3 MEETINGS

To assure that Operation and Maintenance Manual and Facility Data Workbook requirements are being met through the duration of the project, organize the following meetings and discuss the subsequent topics:

1.3.1 Post-Award Kickoff Meeting

At a minimum, discuss the following:

a. The requirement for Operation and Maintenance Manuals and Facility Data deliverables under this contract including coordination meetings

b. Processes and method of gathering Facility Data information during construction

c. Primary roles and responsibilities associated with the development and delivery of the Operation and Maintenance Manuals and Facility Data deliverables, and

d. Identify and agree upon a date and attendance list for the meetings described below:

1.3.2 Operation and Maintenance Manual and Facility Data Workbook Coordination Meeting

Facilitate a meeting after the Pre-Construction Meeting or Post-Award Kickoff Meeting prior to the submission of the Operation and Maintenance Manual Progress Submittal. Meeting attendance must include the Contractor's Operation and Maintenance Manual and Facility Data Workbook Preparer, Designer of Record (DOR), Quality Control Manager, the Commissioning Authority (CxA), the Government's Design Manager (DM), Contracting Officer's Representative, and Government's facility data reviewer. Include any Mechanical, Electrical, and Fire Protection Sub-Contractors.

The purpose of this meeting is to reach a mutual understanding of the scope of work concerning the contract requirements for Operation and Maintenance Manual and coordinate the efforts necessary by both the Government and Contractor to ensure an accurate collection, preparation and timely Government review of Operation and Maintenance Manual.

1.3.3 Submittal Coordination Meeting

Facilitate a meeting following submission and Government review of each design or progress submittal of the Operation and Maintenance Manual and Facility Data Workbook.

a. Include personnel from the Coordination meeting and any additional personnel identified.

b. The purpose of this meeting is to demonstrate ongoing compliance with the requirements identified in this specification. Discuss Government review comments and unresolved items preventing completion and Government approval of the Operation and Maintenance Manuals and Facility Data Workbook (FDW).

c. The applicable deliverables, along with Government remarks associated with review of these submittals serve as the primary guide and agenda for this meeting.

1.3.4 Facility Turnover Meeting

Include Operation and Maintenance Manual in facility turnover meetings as specified in Section 01 30 00, ADMINISTRATIVE REQUIREMENTS.

1.4 FACILITY DATA WORKBOOK

Develop an editable, electronic spreadsheet based on the equipment in the Operation and Maintenance Manuals that contains the information required to start a preventive maintenance program as outlined in FACILITY DATA WORKBOOK (FDW). As a minimum, provide Facility Data Workbook as a list of system equipment, location installed, warranty expiration date, manufacturer, model, and serial number.

1.5 OPERATION AND MAINTENANCE MANUAL MEDIA

Assemble Operation and Maintenance Manual into an electronically bookmarked file using the most current version of Adobe Acrobat or similar software capable of producing PDF file format. Provide compact disks (CD) or data digital versatile disk (DVD) as appropriate, so that each one contains operation, maintenance and record files, project record documents, and training videos. Include a complete bookmarked operation and maintenance directory.

1.5.1 CD or DVD Label and Disk Holder or Case

Provide the following information on the disk label and disk holder or case:

a. Building Number

b. Project Title

c. Activity and Location

d. Construction Contract Number

e. Prepared For: (Contracting Agency)

f. Prepared By: (Name, title, phone number and email address)

g. Include the disk content on the disk label

h. Date

i. Virus scanning program used

1.5.2 O&M Manual Tabbed Hard Copy

Provide a hard copy of the O&M manual upon completion of the project. Provide tabs for each section and subsection for ease of navigation by the user.

1.6 O&M MANUAL CONTENT

Organize the bookmarked Operation and Maintenance Manual into the following Parts in accordance with ASHRAE GUIDELINE 1.4, and as modified and detailed below. Word template for O&M Manual is available at: https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/ufgs-01-78-23.

1.6.1 Part 1: Executive Summary

Provide a summary of the information found in the O&M manual including the purpose of the manual and a description of the manual's organization.

1.6.2 Part 2: Facility Design and Construction

1.6.2.1 General Facility and Systems Description

Provide an overview of the intent for design and use of the facility. Provide a PDF of the Record Drawings prepared in accordance with FC 1-300-09N and 01 78 00 CLOSEOUT SUBMITTALS and bookmarked using the sheet title and sheet number. Include uncluttered 11 by 17 inches floor plans with room numbers, type or function of space, and overall facility dimensions on the floor plans. Do not include items such as construction instructions, references, or frame numbers.

Detail the overall dimensions of the facility, number of floors, foundation type, expected number of occupants, and facility Category Code list and generally describe all the facility systems and any special building features (for example, HVAC Controls, Sprinkler Systems, Cranes, Elevators, and Generators). Include photographs marked up and labeled to show key operating components and the overall facility appearance.

1.6.2.2 Basis of Design

Provide a copy of the contract Basis of Design.

1.6.2.3 Contract Documents, RFP, Amendments, and Modifications

Provide the contract construction documents complete, to include specifications, drawings, Request for Proposal, amendments, and modifications.

1.6.2.4 Room Inventory of Real Property and Finishes

Provide a list of installed equipment furnished under this contract. Include all information usually listed on manufacturer's name plate. Include, as applicable, the following information for each piece of equipment installed: description of item, all dimensions, location by room number, model number, serial number, capacity, name and address of manufacturer, name and address of equipment supplier, condition, spare parts list, manufacturer's catalog, and warranty. Real property includes, but is not limited to, floor coverings, wall surfaces, ceiling surfaces, windows, roofing, HVAC filters, plumbing fixtures, and lighting fixtures.

Submit the final list 30 days after transfer of the completed facility.

Include spatial data defining actual net square footage and data of each room. Also include the room finish schedule including room names and numbers. Include schedules in the construction drawings in the room inventory. Add a column to each schedule to record what was provided by the contractor during construction. Provide a PDF of room inventory. Key the designations to the related area depicted on the contract drawings. List the following data:

RECORD OF DESIGNATED EQUIPMENT AND MATERIALS DATA				
Description	Specification Section	Manufacturer and Catalog, Model, and Serial Number	Composition and Size	Where Used

1.6.3 Part 3: Facilities, Systems, and Assemblies Information

1.6.3.1 Organization

Bookmark information in this section using the current version of ASTM E2166 Uniformat II, UFGS numbers, and document type as outlined in the example below. Bookmark/tab each item to the third level for easy navigation of the manual.

Example as shown in Table below:

PARTS AND SUBPART NUMBERING
3.1 B20 EXTERIOR CLOSURE (System)
3.1.1 B2030 EXTERIOR DOORS (Subsystem)
3.1.1.1 B2030110 GLAZED DOORS (Component)
3.1.1.1.1 Applicable specifications List in UFGS Format
3.1.1.1.2 Manufacturer's Operations and Maintenance Data
3.1.1.1.3 Approved Submittal
3.1.1.1.4 Coordination/Shop Drawings
3.1.1.1.5 Sequence of Operation for Operating Equipment
3.1.1.1.6 Testing Equipment Information and Performance Data
3.1.1.1.7 Routine Maintenance Requirements
3.1.1.1.8 Repair Procedures
3.1.1.1.9 Emergency Procedures & Locations of Applicable Controls

PARTS AND SUBPART NUMBERING
3.1.1.1.10 Warranties
3.1.1.1.11 Record Drawings and Utility Systems
3.1.1.1.12 Contractor / Supplies Listing and Contact Information

1.6.3.2 Related Specifications

Reference each specification related to the subsystem in this section, and locate the actual specification section in Part 2 of the O&M Manual. List specifications in table format as shown in the below example.

UFGS Number	Specification Title	Page Spec Begins in Part 2

1.6.3.3 Manufacturer's Operations and Maintenance Data

Provide a copy of all manufacturer specifications and cutsheets. Provide text-searchable, high-quality document files from the manufacturer's online or electronic documentation. Color documents are preferred. Provide documents specific to the product(s) installed under this Contract. Provide identification and coverage for the parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Provide Uniformat II Level 3 identification for D20, D30, D40 installed equipment. When possible, do not submit document files containing multiple product catalogs from the same manufacturer, or product data from multiple manufacturers in the same files. Provide documents directly from the manufacturer whenever possible. Do not provide scanned copies of hardcopy documents. Provide identification and coverage for the parts of each component, assembly, subassembly, and accessory of the end items subject to replacement. Include special hardware requirements, such as requirement to use high-strength bolts and nuts. Identify parts by make, model, serial number, and source of supply to allow reordering without further identification. Provide clear and legible illustrations, drawings, and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing must show the index, reference, or key number that will cross-reference the illustrated part to the listed part. Group the parts shown in the listings by components, assemblies, and subassemblies in accordance with the manufacturer's standard practice. Parts data may cover more than one model or series of equipment, components, assemblies, subassemblies, attachments, or accessories, such as typically shown in a master part catalog.

1.6.3.4 Approved Submittals and Certificates

Provide a copy of all submittals documented with the required approval as applicable for each UFGS specification listed in the table outlined in applicable specifications. Include copies of SD-07 Certificates submittals documented with the required approval, SD-08 Manufacturer's Instructions submittals documented with the required approval, and SD-10 Operation and Maintenance Data submittals documents with the required approval.

1.6.3.5 Approved Coordination/Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work. Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project. Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

1.6.4 Sequence of Operation for Operating Equipment

Provide record one-line diagrams for each floor, delineating mechanical equipment location within the building. Provide specific instructions, procedures, and illustrations for the following phases of operation for the installed model and features of each system:

1.6.4.1 Safety Precautions and Hazards

List personnel hazards and equipment or product safety precautions for operating conditions. List all residual hazards identified in the Activity Hazard Analysis provided under Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS. Provide recommended safeguards for each identified hazard. Specify if any certifications or licenses are required to operate the equipment.

1.6.4.2 Operator Prestart

Provide procedures required to install, set up, and prepare each system for use.

1.6.4.3 Startup, Shutdown, and Post-Shutdown Procedures

Provide narrative description for Startup, Shutdown and Post-shutdown operating procedures including the control sequence for each procedure.

1.6.4.4 Normal Operations

Provide Control Diagrams with data to explain operation and control of systems and specific equipment. Provide narrative description of Normal Operating Procedures.

1.6.4.5 Emergency Operations

Provide Emergency Procedures for equipment malfunctions to permit a short period of continued operation or to shut down the equipment to prevent further damage to systems and equipment. Provide Emergency Shutdown Instructions for fire, explosion, spills, or other foreseeable contingencies. Provide guidance and procedures for emergency operation of utility systems including required valve positions, valve locations and

zones or portions of systems controlled.

1.6.4.6 Operator Service Requirements

Provide instructions for services to be performed by the operator such as lubrication, adjustment, inspection, and recording gauge readings.

1.6.4.7 Environmental Conditions

Provide a list of Environmental Conditions (temperature, humidity, and other relevant data) that are best suited for the operation of each product, component or system. Describe conditions under which the item equipment should not be allowed to run.

1.6.4.8 Operating Log

Provide forms, sample logs, and instructions for maintaining necessary operating records.

1.6.4.9 Additional Requirements for Equipment Control Systems

Provide Data Package 5 and the following for all control systems:

a. Provide a narrative description on how to perform and apply functions, features, modes, and other operations, including unoccupied operation, seasonal changeover, manual operation, and alarms. Include detailed technical manual for programming and customizing control loops and algorithms.

b. Submit complete controls equipment schedules, full as-built sequence of operations, wiring and logic diagrams, Input/Output Tables, equipment schedules, copies of checkout tests and calibrations performed by the Contractor (not Cx tests), and all associates information.

c. Full points list. Provide a listing of rooms with the following information for each room:

(1) Floor

(2) Room number

(3) Room name

(4) Air handler unit ID

(5) Reference drawing number

(6) Air terminal unit tag ID

(7) Heating or cooling valve tag ID

(8) Minimum cfm

(9) Maximum cfm

d. Full print out of all schedules and set points after testing and acceptance of the system.

e. Full as-built print out of software program.

f. Marking of system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.

1.6.4.10 Testing Equipment Information and Performance Data

Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components. Provide final set points.

Include completed prefunctional checklists, functional performance test forms, and monitoring reports. Include recommended schedule for retesting and blank test forms. Provide final set points.

1.6.5 Routine Maintenance Requirements

1.6.5.1 Preventive Maintenance Plan, Schedule, and Procedures

Provide manufacturer's schedule for routine preventive maintenance, inspections, condition monitoring (predictive tests) and adjustments required to ensure proper and economical operation and to minimize repairs. Provide instructions stating when the systems should be retested. Provide manufacturer's projection of preventive maintenance work-hours on a daily, weekly, monthly, and annual basis including requirements by type of activity. For periodic calibrations, provide manufacturer's specified frequency and procedures for each separate operation.

a. Define the anticipated time required to perform each of each test (work-hours), test apparatus, number of personnel identified by responsibility, and a testing validation procedure permitting the record operation capability requirements within the schedule. Provide a remarks column for the testing validation procedure referencing operating limits of time, pressure, temperature, volume, voltage, current, acceleration, velocity, alignment, calibration, adjustments, cleaning, or special system notes. Delineate procedures for preventive maintenance, inspection, adjustment, lubrication and cleaning necessary to minimize repairs.

b. Repair requirements must inform operators how to check out, troubleshoot, repair, and replace components of the system. Include electrical and mechanical schematics and diagrams and diagnostic techniques necessary to enable operation and troubleshooting of the system after acceptance.

1.6.5.2 Lubrication Data

Include the following preventive maintenance lubrication data, in addition to instructions for lubrication required under paragraph OPERATOR SERVICE REQUIREMENTS:

a. A table showing recommended lubricants for specific temperature ranges and applications.

b. Charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities. Provide procedural instructions for Oil Sampling for all equipment.

c. A Lubrication Schedule showing service interval frequency.

1.6.6 Repair Procedures

Provide instructions and a list of tools required to repair or restore the product or equipment to proper condition or operating standards. Provide manufacturer's recommended procedures and instructions for correcting problems and making repairs for the installed model and features of each system. Include potential environmental and indoor air quality impacts of recommended maintenance procedures and materials. Specify if any certifications or licenses are required to repair the equipment.

1.6.6.1 Troubleshooting Guides and Diagnostic Techniques

Provide step-by-step procedures to promptly isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or require replacement.

1.6.6.2 Wiring Diagrams and Control Diagrams

Provide point-to-point drawings of wiring and control circuits including factory-field interfaces. Provide a complete and accurate depiction of the actual job specific wiring and control work. On diagrams, number electrical and electronic wiring and pneumatic control tubing and the terminals for each type, identically to actual installation configuration and numbering.

1.6.6.3 Removal and Replacement Instructions

Provide step-by-step procedures and a list of required specialty tools and supplies for removal, replacement, disassembly, and assembly of components, assemblies, subassemblies, accessories, and attachments. Provide tolerances, dimensions, settings and adjustments required. Use a combination of text and illustrations.

1.6.6.4 Repair Work-Hours

Provide manufacturer's projection of repair work-hours including requirements by type of craft. Identify, and tabulate separately, repair that requires the equipment manufacturer to complete or to participate.

1.6.6.5 Warranty Information

List and explain the various warranties and clearly identify the servicing and technical precautions prescribed by the manufacturers or contract documents in order to keep warranties in force. Identify if replacement of a subassembly, attachment or accessory requires the entire assembly to be replaced. Include warranty information for primary components of the system. Provide copies of warranties required by Section 01 78 00 CLOSEOUT SUBMITTALS.

1.6.6.6 Extended Warranty Information

List all warranties for products, equipment, components, and sub-components whose duration exceeds one year. For each warranty listed, indicate the applicable specification section, duration, start date, end date, and the point of contact for warranty fulfillment. Also, list or

reference the specific operation and maintenance procedures that must be performed to keep the warranty valid. Provide copies of warranties required by Section 01 78 00 CLOSEOUT SUBMITTALS.

1.6.6.7 Record Drawings and Utility Systems

The record drawings are the final compilation of actual conditions reflected in the as-built drawings. Provide record drawings as outlined in 01 78 00 CLOSEOUT SUBMITTALS.

Using Record Source Drawings, show and document details of the actual installation of the utility systems, annotate and highlight the Operation and Maintenance information. Provide the following drawings at a large enough scale to differentiate designated isolation units from surrounding valves and switches.

1.6.6.8 Personnel Training Requirements

Provide information available from the manufacturers that is needed for use in training designated personnel to properly operate and maintain the equipment and systems.

1.6.6.9 Contractor / Supplier Listing and Contact Information

Provide a list that includes the name, address, telephone number, email and website of the General Contractor and each Subcontractor who installed the product or equipment, or system. For each item, also provide the name address and telephone number of the manufacturer's representative and service organization that can provide replacements most convenient to the project site. Provide the name, address, and telephone number of the product, equipment, and system manufacturers.

1.6.7 Part 4: Facility Operations

1.6.7.1 Completed Facility Operating Plan

Provide a plan that documents that procedures for the operation of systems and assemblies in the facility. The systems that should be included in the Operating Plan include, but are not limited to:

a. Electrical systems and equipment

b. Mechanical systems and equipment

c. Fire Protection systems and equipment

d. Control Systems and equipment

e. Architectural and Structural systems, fixtures, structures, and equipment

1.6.7.2 Testing Equipment and Special Tool Information

Include information on test equipment required to perform specified tests and on special tools needed for the operation, maintenance, and repair of components. Provide final set points.

1.6.7.3 Testing and Performance Data

Include completed prefunctional checklists, functional performance test forms, and monitoring reports. Include recommended schedule for retesting and blank test forms. Provide final set points.

1.6.7.4 Approved Field Test Reports and Manufacturer's Field Reports

Compile and provide approved Field Test Reports (SD-06) and Manufacturer's Field Reports (SD-09) submittals.

1.6.7.5 Maintenance Plans, Procedures, Checklists, Records, and Spare Parts Inventory

1.6.7.5.1 Maintenance Schedules

Include recommended maintenance schedules for systems and equipment.

1.6.7.5.2 Ongoing Commissioning Operational and Maintenance Record Keeping

Include ongoing commissioning and optimization procedures and documentation to monitor and improve the performance of facility systems.

1.6.7.5.3 Janitorial and Cleaning Plans and Procedures

Include a copy of facility cleaning and janitorial plan with procedures and intended chemicals and equipment.

Provide environmentally friendly cleaning recommendations in accordance with ASTM E1971.

1.6.7.6 Utility Record Drawings

1.6.7.6.1 Utility Schematic Diagrams

Provide a one-line schematic diagram for each utility system such as power, water, wastewater, and gas/fuel. Schematic diagram must show from the point where the utility line is connected to the mainline up to the 5 foot connection point to the facility. Indicate location or area designation for route of transmission or distribution lines; locations of duct banks, manholes/handholes or poles; isolation units such as valves and switches; and utility facilities such as pump stations, lift stations, and substations.

1.6.7.6.2 Enlarged Connection and Cutoff Plans

Provide enlarged floor plans and provide information between the 5 foot utilities connection point and where utilities connect to facility distribution. Enlarge floor plans/elevations of the rooms where the utility enters the building and indicate on these plans the locations of the main interiors and exterior connection and cutoff points for the utilities. Also enlarge floor plans/elevations of the rooms where equipment is located. Include enough information to enable someone unfamiliar with the facility to locate the connection and cutoff points. Indicate designations such as room number, panel number, circuit breaker, or valve number of each utility and equipment connection and cutoff point, and what that connection and cutoff point controls.

1.6.7.6.2.1 Description of Utility Metering and Monitoring Systems

Provide in narrative format a description of the utility metering and monitoring systems. Include locations, function, and related systems.

1.6.7.6.2.2 Procedures for Tracking Utility Use and Reporting

Procedures for usage reporting and tracking in support of establishing and monitoring utility budgets and costs, and in developing annual energy reports.

1.6.7.6.2.3 One-Line Diagrams and Meter Location of System

Provide one-line diagrams and design drawings that highlight meter locations on the site.

1.6.7.6.3 Spare Parts and Supply Lists

Provide lists of spare parts and supplies required for repair to ensure continued service or operation without unreasonable delays. Special consideration is required for facilities at remote locations. List spare parts and supplies that have a long lead-time to obtain.

1.6.8 Part 5: Training

Provide a copy of training plans used for each type of equipment along with training materials used, arranged in specification sequence. Provide a copy of training records, sign-in sheets, and agendas. Include training and documentation on the updating and continued use of the O&M Manual.

1.6.9 Part 6: Cx Project Report and TAB Report

Provide the final Cx Plan and complete Cx reports with evaluation and testing forms and records for each building system. Include relevant commissioned system assemblies test reports including installers checklists of assemblies. Provide all Cx Progress Reports, issues and resolutions logs with resolution or status of each item, and a list of any open items and seasonal or additional testing required.

1.6.10 Part 7: Regulatory Requirements

Provide information describing regulatory and policies compliance requirements or provide a reference to where it is stored.

1.6.11 Part 8: Permits

Provide information requiring frequently asked questions and associated answers or provide a reference to where it is stored.

1.6.12 Part 9: Operations and Maintenance Manual Approval

Provide a signed document stating that the project O&M Manual has been reviewed and confirming agreement with the approach it presents. Include contact information for the signer for coordination of any future changes.

1.7 SCHEDULE OF OPERATION AND MAINTENANCE DATA PACKAGES

Provide the O&M data packages specified in individual technical sections. O&M Data Packages are one of the components of the O&M Manual. The

information required in each type of data package follows:

1.7.1 Package Quality

Documents must be fully legible. Operation and Maintenance data must be consistent with the manufacturer's standard brochures, schematics, printed instructions, general operating procedures, and safety precautions.

1.7.2 Data Package 1

a. Safety precautions and hazards

b. Cleaning recommendations

c. Maintenance and repair procedures

d. Warranty information

e. Extended warranty information

f. Contractor information

g. Spare parts and supply list

1.7.3 Data Package 2

a. Safety precautions and hazards

b. Normal operations

c. Environmental conditions

d. Lubrication data

e. Preventive maintenance plan, schedule, and procedures

f. Cleaning recommendations

g. Maintenance and repair procedures

h. Removal and replacement instructions

i. Spare parts and supply list

j. Parts identification

k. Warranty information

l. Extended warranty information

m. Contractor information

1.7.4 Data Package 3

a. Safety precautions and hazards

b. Operator prestart

c. Startup, shutdown, and post-shutdown procedures

d. Normal operations

e. Emergency operations

f. Environmental conditions

g. Operating log

h. Lubrication data

i. Preventive maintenance plan, schedule, and procedures

j. Cleaning recommendations

k. Troubleshooting guides and diagnostic techniques

l. Wiring diagrams and control diagrams

m. Maintenance and repair procedures

n. Removal and replacement instructions

o. Spare parts and supply list

p. Product submittal data

q. O&M submittal data

r. Parts identification

s. Warranty information

t. Extended warranty information

u. Testing equipment and special tool information

v. Testing and performance data

w. Contractor information

x. Field test reports

1.7.5 Data Package 4

a. Safety precautions and hazards

b. Operator prestart

c. Startup, shutdown, and post-shutdown procedures

d. Normal operations

e. Emergency operations

f. Operator service requirements

g. Environmental conditions

h. Operating log

i. Lubrication data

j. Preventive maintenance plan, schedule, and procedures

k. Cleaning recommendations

l. Troubleshooting guides and diagnostic techniques

m. Wiring diagrams and control diagrams

n. Repair procedures

o. Removal and replacement instructions

p. Spare parts and supply list

q. Repair work-hours

r. Product submittal data

s. O&M submittal data

t. Parts identification

u. Warranty information

v. Extended warranty information

w. Personnel training requirements

x. Testing equipment and special tool information

y. Testing and performance data

z. Contractor information

aa. Field test reports

1.7.6 Data Package 5

a. Safety precautions and hazards

b. Operator prestart

c. Start-up, shutdown, and post-shutdown procedures

d. Normal operations

e. Environmental conditions

f. Preventive maintenance plan, schedule, and procedures

g. Troubleshooting guides and diagnostic techniques

h. Wiring and control diagrams

i. Maintenance and repair procedures

j. Removal and replacement instructions

k. Spare parts and supply list

l. Product submittal data

m. Manufacturer's instructions

n. O&M submittal data

o. Parts identification

p. Testing equipment and special tool information

q. Warranty information

r. Extended warranty information

s. Testing and performance data

t. Contractor information

u. Field test reports

v. Additional requirements for HVAC control systems

1.7.7 Changes to Submittals

Provide manufacturer-originated changes or revisions to submitted data if a component of an item is so affected subsequent to acceptance of the O&M Data. Submit changes, additions, or revisions required by the Contracting Officer for final acceptance of submitted data within 30 calendar days of the notification of this change requirement.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 TRAINING

Prior to acceptance of the facility by the Contracting Officer for Beneficial Occupancy, provide comprehensive training for the systems and equipment specified in the technical specifications. The training must be targeted for the building maintenance personnel, and applicable building occupants. Instructors must be well-versed in the particular systems that they are presenting. Address aspects of the Operation and Maintenance Manual submitted in accordance with Section 01 78 00 CLOSEOUT SUBMITTALS. Training must include classroom or field lectures based on the system operating requirements. The location of classroom training requires approval by the Contracting Officer.

3.1.1 Training Plan

Submit a written training plan to the Contracting Officer for approval at least 4 weeks prior to the scheduled training. Training plan must be approved by the Quality Control Manager (QC) or the Commissioning

Authority (CxA), as appropriate prior to forwarding to the Contracting Officer. Also, coordinate the training schedule with the Contracting Officer and QC or CxA. Include within the plan an overall schedule showing all training sessions. Include at least the following for each training session:

a. Equipment included in training

b. Intended audience

c. Location of training

d. Dates of training

e. Objectives and suggested methods of ensuring adequate training

f. Outline of the information to be presented and subjects covered including description

g. Start and finish times and duration of training on each subject

h. Methods (e.g. classroom lecture, video, site walk-through, actual operational demonstrations, written handouts)

i. Instructor names and instructor qualifications for each subject

j. List of texts and other materials to be furnished by the Contractor that are required to support training

k. Description of proposed software to be used for video recording of training sessions.

l. Intended audience, such as job description

3.1.2 Training Content

The core of this training must be based on manufacturer's recommendations and the operation and maintenance information. The QCappropriate is responsible for overseeing and approving the content and adequacy of the training. Spend 95 percent of the instruction time during the presentation on the OPERATION AND MAINTENANCE DATA. Include the following for each system training presentation:

a. Start-up, normal operation, shutdown, unoccupied operation, seasonal changeover, manual operation, controls set-up and programming, troubleshooting, and alarms.

b. Relevant health and safety issues.

c. Discussion of how the feature or system is environmentally responsive. Advise adjustments and optimizing methods for energy conservation.

d. Design intent.

e. Use of O&M Manual Files.

f. Review of control drawings and schematics.

g. Interactions with other systems.

h. Special maintenance and replacement sources.

i. Tenant interaction issues.

3.1.3 Training Outline

Provide the Operation and Maintenance Manual Files (Bookmarked PDF) and a written course outline listing the major and minor topics to be discussed by the instructor on each day of the course to each trainee in the course. Provide the course outline 14 calendar days prior to the training.

3.1.4 Training Manuals

Provide training manual for each attendee; allow for minimum of two attendees per training session.

1. Include applicable portion of O&M manuals.
2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
3. Provide one extra copy of each training manual to be included with operation and maintenance data.

3.1.5 Training Reports

1. Identification of each training session, date, time, and duration.
2. Sign-in sheet showing names and job titles of attendees.
3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.
4. Include Commissioning Authority's formal acceptance of training session.

3.1.6 Training Video Recording

Record classroom training session(s) on video. Provide to the Contracting Officer two copies of the training session(s) in DVD video recording format. Capture within the recording, in video and audio, the instructors' training presentations including question and answer periods with the attendees. The recording camera(s) must be attended by a person during the recording sessions to assure proper size of exhibits and projections during the recording are visible and readable when viewed as training. Label each disc and container with session identification and date.

3.1.7 Unresolved Questions from Attendees

If, at the end of the training course, there are questions from attendees that remain unresolved, the instructor must send the answers, in writing, to the Contracting Officer for transmittal to the attendees, and the training video must be modified to include the appropriate clarifications.

3.1.8 Validation of Training Completion

Ensure that each attendee at each training session signs a class roster daily to confirm Government participation in the training. At the completion of training, submit a signed validation letter that includes a

sample record of training for reporting what systems were included in the training, who provided the training, when and where the training was performed, and copies of the signed class rosters. Provide two copies of the validation to the Contracting Officer, and one copy to the Operation and Maintenance Manual Preparer for inclusion into the Manual's documentation.

3.1.9 Quality Control Coordination

Coordinate this training with the QC in accordance with Section 01 45 00 QUALITY CONTROL.

Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.

1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

3.1.10 DEMONSTRATION GENERAL

Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by the U.S. Government.

Demonstrations conducted during Functional Testing need not be repeated unless U.S. Government personnel training is specified.

Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.

1. Perform demonstrations not less than two weeks prior to Substantial Completion.
2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.

1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.1.11 TRAINING GENERAL

The Commissioning Authority will prepare the Training Plan based on draft plans submitted.

Conduct training on-site unless otherwise indicated.

The U.S. Government will provide classroom and seating at no cost to the Construction Contractor.

Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.

Provide training in minimum two hour segments.

The Commissioning Authority is responsible for determining that the training was satisfactorily completed and will provide approval forms.

Training schedule will be subject to availability of the U.S. Government's personnel to be trained; re-schedule training sessions as required by the U.S. Government; once schedule has been approved by the U.S. Government failure to conduct sessions according to schedule will be cause for the U.S. Government to charge the Construction Contractor for personnel "show-up" time.

Review of Facility Policy on Operation and Maintenance Data: During training discuss:

1. The location of the O&M manuals and procedures for use and preservation; backup copies.
2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
3. Typical uses of the O&M manuals.

Product- and System-Specific Training:

1. Review the applicable O&M manuals.
2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
4. Provide hands-on training on all operational modes possible and preventive maintenance.
5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
6. Discuss common troubleshooting problems and solutions.
7. Discuss any peculiarities of equipment installation or operation.
8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
9. Review recommended tools and spare parts inventory suggestions of manufacturers.
10. Review spare parts and tools required to be furnished by the Construction Contractor.
11. Review spare parts suppliers and sources and procurement procedures.

Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

3.2 SUBMITTAL SCHEDULING

3.2.1 Operation and Maintenance Manual, Progress Submittal

Submit the Progress submittal when construction is approximately 50 percent complete, to the Contracting Officer for approval. Provide Operation and Maintenance Manual Files (Bookmarked PDF). Include the elements and portions of system construction completed up to this point. The purpose of this submittal is to verify progress is in accordance with contract requirements as discussed during the Operation and Maintenance Manual Coordination Meeting.

3.2.2 Operation and Maintenance Manual, Prefinal Submittal

Submit the 100 percent submittal of the Operation and Maintenance Prefinal Submittal to the Contracting Officer for approval within 90 calendar days of the Beneficial Occupancy Date (BOD). This submittal must provide a complete, working document that can be used to operate and maintain the facility. Any portion of the submittal that is incomplete or inaccurate requires the entire submittal to be returned for correction. Any discrepancies discovered during the Government's review of Operation and Maintenance Progress submittal must be corrected prior to the Prefinal submission. The Prefinal Submittal must include Operation and Maintenance Manual Files (Bookmarked PDF).

3.2.3 Operation and Maintenance Manual, Final Submittal

Submit completed Operation and Maintenance Manual Files (Bookmarked PDF). The Final submittal is due at BOD. Any discrepancies discovered during the Government's review of the Prefinal submittal, including the Field Verification, must be corrected prior to the Final submission.

-- End of Section --

SECTION 01 91 00.15

BUILDING COMMISSIONING
05/23, CHG 2: 11/23

PART 1 GENERAL

Building Commissioning is a systematic, quality-focused process for enhancing the delivery of a project that focuses on verifying and documenting that all of the commissioned systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the project requirements. The purpose is to reduce the cost and performance risks associated with delivering facilities projects, and to increase value to owners, occupants, and users.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 202	(2018) Commissioning Process for Buildings and Systems

1.2 DEFINITIONS

Commissioning Process (Cx) - a quality-focused process for enhancing the delivery of a project. Refer to ASHRAE 202 for a comprehensive description of the commissioning process.

(CxC) - The entity who leads, plans, and coordinates the Commissioning Team. The terms Commissioning Provider, Commissioning Firm, Lead Commissioning Specialist, Commissioning Specialist, and Commissioning Authority (CA or CxA) when used by sustainable Third Party Certification (TPC) programs, are interchangeable.

Commissioning Authority – The Government retains the authority for oversight and assurance of the entire commissioning process, and final approval of all commissioning deliverables.

Owner's Project Requirements (OPR) - document that details the stakeholders' requirements for the project and the expectations for how it will be used and operated. The OPR is provided for commissioning review purposes only and is not a contract requirement.

1.3 COMMUNICATION WITH THE GOVERNMENT

The Lead Commissioning Specialist (CxC) must submit all plans, schedules, reports, and documentation directly to the Contracting Officer's Representative concurrent with submission to theManager.

The Lead Commissioning Specialist must have direct communication with the Contracting Officer's Representative regarding all elements of the commissioning process; however, the Government has no direct contract authority with the Lead Commissioning Specialist.

1.4 SYSTEMS TO BE COMMISSIONED

Coordinate commissioning and quality control activities for the following systems, equipment, and associated controls. System-specific requirements are located in the associated specification sections. Commission the following systems, equipment, and associated controls in accordance with this section and the inspection, testing, and quality control requirements of their respective sections:

Heating, ventilating, air-conditioning, and refrigeration systems (mechanical and passive) and associated controls (HVAC)

Lighting systems: interior and exterior, automatic and manual daylighting controls, occupancy sensing devices, automatic shut-off controls, time switching, and other lighting control devices, and dimming systems

Water pressure-booster systems

Building Control Systems

Metering and sub-metering

Building Envelope in accordance with Section 01 91 19 BUILDING ENCLOSURE COMMISSIONING.

1.5 RELATED SECTIONS

Refer to the following technical sections for additional commissioning requirements for respective systems:

Section 01 91 19 BUILDING ENCLOSURE COMMISSIONING

1.6 COMMISSIONING TEAM

The Commissioning team will include, but is not limited to the following team members.

Ensure all Construction Activities for systems to be commissioned are coordinated with the appropriate commissioning team members.

a. Sub-Contractor Representatives for each trade responsible for construction/installation of systems to be commissioned

b. Technical Commissioning Specialists for each system to be commissioned

c. TAB Representative

d. Equipment manufacturer representatives

e. Government Contracting Officer

f. Government Representatives

g. Installation Maintenance Representative

h. Facility End User

1.7 PROJECT SCHEDULE

Include the following tasks in the project schedule required by Section. Ensure sufficient time is scheduled to complete each item. The order of items listed below is not intended to imply a specified sequence:

a. Submission and approval of the Commissioning Firm Qualifications

b. Submission and approval of the Interim and Final Construction Phase Commissioning Plans

c. Commissioning Kickoff Meeting

d. Regular Commissioning Coordination Meetings

e. Installation of permanent utilities (gas, water, electric, steam)

f. Building Enclosure Construction

g. Submission and approval of the Completed Building Enclosure Inspection Checklists

h. Manufacturer's Equipment Start-Up for each of the systems to be commissioned

i. Submission and approval of the Completed Commissioning Observation Checklists

j. Submission and approval of Certificate of Readiness for each system to be commissioned

k. Commissioning Testing, including Functional Performance Testing, for each system to be commissioned

l. Integrated Systems Tests

m. Post-test deficiency correction for each system to be commissioned

n. Re-Testing

o. Training for each of the systems to be commissioned

p. Submission and approval of the Final Commissioning Reports

1.8 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Completed Construction Observation Checklists; G

Design Review Report; G

Interim Construction Phase Commissioning Plan; G

Final Construction Phase Commissioning Plan; G; S

Issues Log; G

SD-07 Certificates

Commissioning Firm; G

SD-10 Operation and Maintenance Data

Systems Manual; G

SD-11 Closeout Submittals

Final Commissioning Report; G

Updated Final Commissioning Report; G

1.9 COMMISSIONING FIRM

Employ the services of a Commissioning Firm and all Commissioning Specialists required to perform work for this project. The Commissioning Firm must be a first-tier subcontractor that is financially and corporately independent from prime contractor and all other subcontractors and the Designer of Record and that is not participating in any other work on this Contract, including design, furnishing equipment, construction, or testing, adjusting, and balancing.

a. Submit the Commissioning Firm's and Commissioning Specialists' qualifications, including the name of the firm and each CxC and each certification, no later than 30 calendar days after.

b. If, for any reason, a specialist loses a certification during this period, immediately notify the Contracting Officer and submit another Commissioning Specialist for approval. An approved successor must validate all work performed for this project by the CxC who lost a certification.

1.9.1 Commissioning Specialists (CxC)

Assign Lead Commissioning Specialist and other appropriate Commissioning Specialists for the systems to be commissioned.

1.9.1.1 Lead Commissioning Specialist (CxC)

Lead Commissioning Specialist (CxC) coordinates all aspects of the commissioning process. Duties include leading and overseeing the commissioning work and acting as the primary point of contact for the commissioning work. CxC may serve as a systems Specialist if all requirements for both designations are met. CxC must have a minimum of five years of commissioning experience, including two projects of similar size and complexity to this project.

CxC must be certified in one of the following:

NEBB Building System Commissioning Professional (CxCP)

ACG Certified Commissioning Authority (CxA)

ICB/TABB Certified Commissioning Supervisor

BCA Certified Commissioning Professional (CCP)

AEE Certified Building Commissioning Professional (CBCP)

University of Wisconsin-Madison Qualified Commissioning Process Provider (QCxP)

ASHRAE Building Commissioning Professional (BCxP).

1.9.1.2 Commissioning Specialists

Refer to the related technical commissioning specification section for additional qualifications for each Commissioning Specialist associated with each system. Include all Commissioning Specialist qualifications with the Commissioning Firm submittal:

a. Mechanical Commissioning Specialist: The technical work associated with mechanical systems to be commissioned must be performed by a Commissioning Specialist certified by NEBB, ACG, ICB/TABB, AEE, University of Wisconsin-Madison, ASHRAE, or BCA in the commissioning of HVAC systems with five years of experience in the commissioning of HVAC systems.

b. Electrical Commissioning Specialist: The technical work associated with electrical systems to be commissioned must be performed by an engineering technician certified by the International Electrical Testing Association (NETA) or an experienced Electrical Commissioning Agent with five years of experience inspecting, testing, and calibrating electrical distribution and generation equipment, systems, and devices.

c. Building Enclosure Commissioning Specialist: The technical work associated with the Building Envelope system must be performed by a Building Enclosure Commissioning Specialist that is a registered architect or engineer, or building scientist, with five years of building enclosure design or construction experience or a professional with training and Certification in Building Enclosure Commissioning from a third-party certification organization plus five years of commissioning experience. The commissioning provider must have the necessary training, experience, and FPT equipment.

1.10 COMMISSIONING STANDARD

Comply with the requirements of the commissioning standard under which the Commissioning Firm and Specialists qualifications are approved. When the firm and specialists are certified by ACG, BCA, AEE, ASHRAE, or the University of Wisconsin-Madison, comply with the requirements of one of the acceptable standards unless otherwise stated herein. The acceptable standards are ACG Commissioning Guideline, NEBB Commissioning Standard, ANSI/SMACNA 014, or ASHRAE 202. Comply with applicable International Electrical Testing Association (NETA) testing standards for electrical systems. The following requirements apply to all project commissioning and test standards:

a. Implement all recommendations and suggested practices contained in the Commissioning Standard and test standards.

b. Use the Commissioning Standard for all aspects of Commissioning, including calibration of instruments.

c. Where the instrument manufacturer calibration recommendations are more stringent than those listed in the Commissioning Standard, adhere to the manufacturer calibration recommendations.

d. All quality assurance provisions of the Commissioning Standard such as performance guarantees are part of this contract.

e. The Commissioning Specialists must develop commissioning procedures for any systems or system components not covered in the Commissioning Standard.

f. Use any new requirements, recommendations, and procedures published or adopted by the body responsible for the applicable Commissioning Standards at the time of project award.

g. If there is a conflict between the requirements of the contract documents and the commissioning standard used, the contract documents take precedent.

1.11 SUSTAINABILITY THIRD PARTY CERTIFICATION (TPC)

The Commissioning Specialist must execute and document the commissioning activities required of the Commissioning Authority for the purposes of complying with the Third-Party Certification (TPC) requirements for the project in accordance with Specifications defining sustainability requirements and associated reporting. Provide all commissioning documentation required to meet the TPC requirements.

1.12 ISSUES LOG

The Commissioning Specialist develops and maintains an Issues Log for the systems to be commissioned. The issues log documents and tracks resolution of deficiencies identified during submittal reviews, inspection, and testing. At any point during construction, any commissioning team member finding deficiencies may communicate those deficiencies in writing to the Commissioning Specialist for inclusion into the Issues Log. For each issue, the Issues Log includes, but is not limited to, a unique reference number, description of the issue with contract requirement referenced, location of or equipment name/tags exhibiting the issue, the initials of the individual's name whom reported the issue, the date of first observation, the proposed resolution of the issue and date proposed, the date of any subsequent observations with applicable additional information, and the date of implementation of the final resolution of the issue as confirmed by the Commissioning Specialist and Contracting Officer. Issues must not be deleted from the issues log.

CxC must submit the Issues Log monthly and within three working days from changes to the Issue Log. The CxC is responsible for distributing the Issues Log to the Commissioning Team.

1.13 CERTIFICATE OF READINESS

Prior to scheduling Commissioning Tests for each system, the Quality Control Manager must issue a Certificate of Readiness for each system, certifying that inspections have been completed, open issues have been resolved, and the system is ready for Commissioning Tests. Refer to each related technical commissioning specification section for additional requirements.

Submit the Certificate of Readiness for each system prior to Commissioning Tests of that system. Do not schedule Commissioning Tests for a system until the Certificate of Readiness is approved by the Government.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 DESIGN REVIEW

The CxC and other Commissioning Specialists must review design documents.

Provide a Design Review Report identifying discrepancies or deficiencies that would prevent the systems to be commissioned from operating or performing or being maintained. Report must include individual list of each deficiency and corresponding corrective action necessary for proper system performance. Identify any discrepancies between the design and the Owner's Project Requirements Document. The Owner's Project Requirements Document is provided for commissioning review purposes only and does not form a part of the contract documents for this project. **Submit the Design Review Report no later than 14 calendar days after approval of the Commissioning Firm and Commissioning Specialists.** The Contracting Officer, the CxC, and the Designers of Record for the associated systems must meet, discuss, and resolve any outstanding items contained in the report no later than 14 calendar days after submission of the report.

3.2 CONSTRUCTION SUBMITTAL REVIEWS

Coordinate construction submittal document reviews for commissioned systems and assemblies with the CxC. The commissioning submittal review does not replace the Government submittal review, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

The CxC must identify construction submittals to be provided by the contractor for the commissioned systems. The CxC must evaluate construction submittals for compliance with the contract documents. Include a copy of the submittal document review transmittal and response in the Commissioning Report.

3.3 COMMISSIONING KICKOFF MEETING

Conduct a Commissioning Kickoff Meeting, led by the CxC, after approval of the Commissioning Firm and Commissioning Specialists, and no later than 60 days following construction notice to proceed. Discuss the commissioning process including contract requirements, lines of communication, roles and responsibilities, schedules, documentation requirements, inspection and test procedures, and logistics as specified in this section.

The Quality Control team, Designer of Record, and the Government must attend this meeting. Invite the User and Base Civil Engineering Representative to attend this meeting.

3.4 REGULAR COMMISSIONING COORDINATION MEETINGS

The Quality Control team, Designer of Record, and the Government must attend this meeting. Sub-Contractor Representatives for each trade responsible for construction/installation of systems to be commissioned must attend this meeting as requested by the CxC. Invite the User and a Base Civil Engineering Representative to attend this meeting.

CxC must conduct monthly commissioning coordination meetings when installation of commissioned systems begins. Provide status of commissioned systems, open issues log items, outstanding submittals, and upcoming commissioning activities. Conduct bi-weekly commissioning coordination meetings within 30 days of the scheduled date for commissioning testing.

Participate in monthly commissioning coordination meetings led by the CxC when installation of commissioned systems begins. Provide status of commissioned systems, open issues log items, outstanding submittals, and upcoming commissioning activities. Participate in bi-weekly commissioning coordination meetings within 30 days of the scheduled date for commissioning testing.

3.5 CONSTRUCTION PHASE COMMISSIONING PLANS

The Interim Construction Phase Commissioning Plan identifies the commissioning and testing standards and outline the overall commissioning process, the commissioning schedule, the commissioning team members and responsibilities, lines of communication, documentation requirements for the construction phase of the project, and Template Building Enclosure Inspection Checklists. Submit the Interim Construction Phase Commissioning Plan, prepared by the CxC, 14 calendar days after the Construction Commissioning Coordination Meeting and 14 days prior to the start of construction of the building enclosure. Include the following items in the commissioning schedule in addition to the items in paragraph PROJECT SCHEDULE: Seasonal Testing, Warranty Phase Site Visit, Post-Construction Endurance Testing, and Updated Commissioning Report.

The Final Construction Phase Commissioning Plan includes the information provided in the Interim Construction Phase Commissioning Plan as well as commissioning construction observation checklists and test procedures such as Pre-Functional Checklists, Integrated Systems Test Checklists, and Functional Performance Test Checklists and other Commissioning Test Checklists for each building, for each system required to be commissioned, and for each component for inclusion in the Final Construction Phase Commissioning Plan. Refer to the related technical commissioning specification section for additional requirements for checklists. Submit the Final Construction Phase Commissioning Plan, prepared by the CxC, no later than 90 calendar days prior to the start of Commissioning Inspections.

3.5.1 Construction Observation Checklists

Construction Observation Checklists must include items for physical inspection or testing that demonstrate that installation and start-up of equipment and systems is complete. Refer to paragraph COMMISSIONING

INSPECTIONS. Construction observation checklists must be tailored to verify the specific installation requirements and details of the construction documents and manufacturer's instructions.

3.5.2 Test Procedures and Checklists

Test procedures and checklists must include procedures that explain, step-by-step, the actions and expected results that will demonstrate that the systems perform in accordance with the contract. Refer to paragraph COMMISSIONING TESTS. Include the following sections and details appropriate to the systems being tested in the test procedures and checklists:

a. Notable system features including information about controls to facilitate understanding of system operation

b. Conclusions and recommendations. Conclusions must clearly indicate if system does or does not perform in accordance with contract requirements. Recommendation must clearly indicate that the system should or should not be approved by the Government.

c. Test conditions including date, beginning and ending time, and beginning and ending outdoor air conditions

d. Attendees

e. Identification of the equipment involved in the test

f. Control system feature identification

g. As-found condition of the system operation

h. List of test items with step numbers along with the corresponding feature or operation, intended test procedure, expected system response, and pass/fail indication.

i. Space for comments for each test item.

3.6 COMMISSIONING INSPECTIONS

Complete inspections using Construction Observation Checklists for each individual item of equipment or system for each system required to be commissioned in accordance with the commissioning plan. Indicate commissioning team member inspection and validation of each checklist item by initials. Validation of each checklist item by each team member indicates that item conforms to the contract documents and design in their area of responsibility. Commissioning Specialist validation of each checklist item indicates that each item has been installed correctly and in accordance with contract documents. Submit the initialed and Completed Construction Observation Checklists no later than 7 calendar days after completion of inspection of all checklists items for each system.

3.7 COMMISSIONING TESTS

Demonstrate that all systems, equipment, and components have been installed correctly and that the systems operate and perform, including interactive operation between systems, in accordance with contract documents. Perform tests as specified in related technical commissioning specifications. Provide all materials, services, and labor required to

perform all commissioning tests.

Commissioning Specialist's duties include leading and documenting all tests for the systems to be commissioned with appropriate sub-contractors performing the Tests. The representatives listed in the paragraph COMMISSIONING TEAM must attend the tests with the exception of the.

3.7.1 Test Scheduling and Coordination

Schedule Commissioning Tests for each system only after the Certificate of Readiness has been approved by the Government for the system. Correct all deficiencies identified through any prior review, inspection, or test activity before the start of Commissioning tests.

Commissioning Tests and Integrated Systems Tests must be performed with the CxC present. Government reserves the right to witness all tests. Coordinate test schedule with Government representatives.

3.7.2 Testing Procedures

Commissioning tests include tests such as functional performance and integrated systems tests. For electrical systems testing, include testing of sensor calibrations, control responses, safeties, interlocks, operating modes, capacity, lighting levels, and verification of all other electrical system contract performance requirements. Perform test procedures in accordance with the commissioning standards specified. In addition, comply with the testing procedures specified in the sections listed in paragraph RELATED SECTIONS.

3.7.3 Sample Strategy

Refer to the sections identified in paragraph RELATED SECTIONS for sample strategy.

For mechanical and plubming systems, text 100 percent of all equipment and systems including but not limited to : Chilled Water, Supply Air, Exhause Air, Outside Air, Boilers, Air Handling Units, CRAC Units, Fan Coil Units, VAV Boxes, Fans, Pumps Unit Heaters, Water Heaters, and Plumbing Fixtures.

For electrical systems, test 100 percent of all equipment and systems except for the following. Test at the sample rate shown:

a. Lighting Controls

3.7.4 Aborted Tests and Re-Testing

Abort any test if any deficiency prevents successful completion of the test or if any required commissioning team member is not present for the test. Re-test after all deficiencies identified during the original test have been corrected. Contracting Officer may withhold payment equivalent to lost time, re-testing, and aborted tests. These costs may include salary, travel costs, and per diem for Government team members.

3.8 TRAINING PLAN

CxC must review the training plan for training associated with the equipment and systems to be commissioned, checking that each plan has the trainer name, trainer contract information, training schedule and location. Submit review at least 30 days prior to the first training

event. Incorporate CxC review comments prior to submitting training plan in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA. Update and resubmit the training plan based on any corrective action taken.

3.9 SYSTEMS MANUAL

Prepare and submit a Systems Manual including a signed certification or letter from the Technical Commissioning Specialists and the Lead Commissioning Specialist stating that the Systems Manual is complete, clear, and accurate. The Systems Manual, for all commissioned systems, must conform to Appendix A SYSTEMS MANUAL ORGANIZATION AND CONTENT to ER 25-345-1, available at the USACE Publications website at the following location:
https://www.publications.usace.army.mil/USACE-Publications/Engineer-Regulations/. Update and resubmit the Systems Manual based on any corrective action taken during the warranty period.

Submit Systems Manual no later than 30 calendar days following completion of Functional Performance Tests. Submit three hard copies and an electronic copy.

3.10 COMMISSIONING REPORT

Submit an no later than 14 calendar days following commissioning team validation of all Commissioning Tests, including Functional Performance Tests, and Integrated Systems Tests, with the exception of Seasonal Tests. Include the following information in the Final Commissioning Report:

a. An executive summary describing the overall commissioning process, the results of the commissioning process, outstanding deficiencies and recommended resolutions, and seasonal testing that must be scheduled for a later date. Indicate, in the executive summary, whether the systems meet the requirements of the contract documents.

b. A list of deficiencies discovered during the commissioning process and the corrective actions taken in the report.

c. Completed Building Enclosure Inspection Checklists, Pre-Functional Checklists and other Commissioning Observation Checklists, Commissioning Test Checklists such as Functional Performance Test Checklists and Integrated Systems Test Checklists, the Final Construction Phase Commissioning Plan, the Issues Log, Training Attendance Rosters, the Design Review Reports, Submittal Review Report, and any other documents as specified by related technical commissioning specification sections.

3.11 WARRANTY PHASE SITE VISIT

The Lead Commissioning Specialist must visit the building site concurrent with the Architect/Engineer's warranty inspection to inspect building system equipment and review building operation with the building operating/maintenance staff, and identify any deficiency of the building systems to operate in accordance with the contract documents. The Commissioning Specialist must notify the Contracting Officer of any identified deficiencies and the proposed corrective action. Submit Updated Final Commissioning Report and Systems Manuals, documenting the results of the warranty phase inspection. Include other warranty or post-construction phase activities as specified in related technical commissioning specification sections, such as Seasonal testing results and

Post-Construction Endurance Test and Trend Log Report.

APPENDIX A - OWNER'S PROJECT REQUIREMENTS DOCUMENT

Owner's Requirements Document (ORD)

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1. Owner and User Requirements

   a. Primary Purpose, Program, and Use

      The Owner's Requirements Document (ORD) document is a collection of minimal performance expectations, objectives and general criteria associated with the design and construction of a project. The document is intended for use by a wide audience. Through continued development, the document will ensure that the project and owner goals align and that benefits achieved are continued during building occupancy and operation. The typical audience will include the design team, construction team, building users, maintenance staff, energy management team, and future renovation teams, as well as anyone who needs access to the original project information.

      The ORD is not a substitute for traditional architectural programming. While it does contain beneficial programming information such as space usage, its primary contents are the owner's goals, expectations, performance, and success criteria as discussed above.

      The F-16 Mission Training Center (MTC) for the New Jersey Air National Guard – 177th Fighter Wing stationed in Egg Harbor Township (Atlantic City), New Jersey is based upon a similar "prototype" facility designed for the DC Air National Guard at Joint Base Andrews, Maryland. This is a Training Facility for pilots who fly F-16 fighter jets. Training and operation of weapons systems of this nature are classified as secret by the Federal Government, requiring "secure areas" within the building limiting access to authorized personnel. Pilots will utilize this facility for mission specific training, simulator hours, and general training.

   b. Project History

      Atkins, Black & Veatch, FSB Joint Venture (the Design A/E) was awarded design services as part of an Air National Guard IDIQ contract- based primarily on our experience designing Flight Simulator Facilities for other aircraft platforms. The ANG decided to site-adapt the described prototype facility design at the Atlantic City Air National Guard Base, Egg Harbor Township, New Jersey.

      It was understood that the prototype design would be modified as needed to function in the (similar) Atlantic City, New Jersey climate conditions. Most of these modifications involved building systems and equipment (internal to the building). Substantial modifications of the Floor Plan and / or major external building materials are not within the scope of this contract. Every effort was made to identify and implement energy savings and sustainability goals as the design phases progressed, but again that was limited by the project scope.

      The scope of work was defined by contract as a Design / Bid / Build contract.

   c. Broad Goals

      i. Future Expansion: The prototype project was designed for the future expansion of this facility to support an F-35 Flight Simulator platform- with minor building expansion and minimal building internal reconfiguration.

      ii. Flexibility: The prototype design consisted of (4) simulator bays which can function individually or in a dual configuration depending on the mission and / or training requirements. Each simulator bay is also on its own isolated mechanical unit(s) allowing some flexibility under maintenance conditions. One of the Brief/Debrief Stations (BDS) doubles as a MOC / Briefing Room for shared program. At a minimum, there will be an annual security certification inspection of the shell of the secure areas of this facility.

      iii. Quality of Materials: The Air National Guard has Design Quality Standards that are outlined in ANGETL 15-01-00, UFC 3-101-01 – ARCHITECTURE and other documents. These quality standards were for the most part met in the prototype project. The standard design-life of an Air National Guard project is 40 years.

iv. Construction Costs: This is a typical military project in it utilizes DD Form 1391 for allocation (from congress) of scope and funding of construction projects. DD1391s provide a Program Amount (PA) dollar value which identifies the total cost of the project. A portion of the PA is identified on the DD1391 as the Maximum Construction Cost (MCC)- the amount of the total project cost allocated for construction only. A portion of this MCC is identified by the Contracting Officer (typically around 87%) to be used as the design budget- our project cost goal. The National Guard Bureau has a goal / requirement that items equivalent to 10% of the set construction budget (Base Bid) be moved to Bid Options to reduce Base Bid costs and to provide protection of the award on bid day. There are currently (8) Optional Line Items in the project, the total of which is nowhere near the 10% goal. It is understood at this time that removing additional items from the base bid might impact the mission which the 177FW is against.

v. Operational Costs: Per National Guard Bureau dictate - The project energy conservation goal is to achieve an energy reduction of greater than 30% when compared to the ASHRAE 90.1-2013 Baseline building in accordance with UFC 1-200-02 “High Performance and Sustainable Building Requirements”. The mechanical system was selected as the most life-cycle cost effective option, determined according to a life cycle cost analysis, which compares 3 alternative systems as they relate to installed cost, 40- year maintenance and replacement cost, and utility cost. Indoor water usage fixtures were selected to be EPA WaterSense rated. Whole building energy and water usage is metered and trended at the building automation system.

2. Environmental and Sustainability Goals

a. Green Building Certification Institute (GBCI) Third Party Certification

The project sustainability goal is Green Building Certification Institute (GBCI) Third Part Certification (TPC); however, the mission and simulators' operation are critical and of paramount importance. Energy conservation measures will be evaluated and employed where they will not jeopardize the mission.

GBCI has issued a Guiding Principles Assessment checklist supporting the UFC 1-200-02. The checklist addresses a number of measures associated with integrated design, optimized energy performance, water conservation, indoor environmental quality, reduction in the environmental impact of materials, and addressing climate risk.

b. Other

Building commissioning (Cx) must be provided to ensure that all building systems are installed and perform interactively according to the Owner's requirements in support of the flight simulator training program. Commissioning should be conducted by an independent (third party) provider with proven experience in testing mission critical facilities. Benefits of construction and acceptance phase commissioning include:

- Verification that applicable equipment and systems are installed according to the manufacturers' recommendations and to industry accepted minimum standards and that each receives adequate operational checkout by installing Contractors.

- Verification and documentation of energy/water efficient performance of equipment.

- Functional performance testing of mechanical and electrical systems to verify their ability to meet the prescribed capacity

- Verification that O&M documentation that is required of the Contractor is complete.

While commissioning shall be provided in general accordance with ANG ETL 15-01-04, project specifications will define several specific requirements associated with this facility. When the building's construction reaches an initial beneficial occupancy date (BOD), prior to installation of the simulators, initial functional performance testing will be performed to verify HVAC capacity and environmental control within the simulator bays, server rooms, BDS and IOS spaces.

Once the simulators have been constructed and all associated supporting equipment have been installed and set-up, the Commissioning (Cx) Provider shall return to verify operation of the completed systems. Due to security constraints, the Cx Provider will have to provide these later services either without devices which store memory or will have to leave them in the building at the completion of the work.

For security reasons, the Cx provider will not be permitted to bring into the certified (operating and staffed) SAPF any instrumentation that is capable of storing data unless intended to leave the instrumentation in the SAPF.

3. Energy Efficiency Goals

a. Goals/Policy

There are numerous regulations governing energy conservation including the ANG ETL 15- 01-01, UFC 1-200-02, Energy Policy Act of 2005, ASHRAE 90.1, and the USGBC Leadership in Energy and Environmental Design (LEED) program.

The project sustainability goal is Green Building Certification Institute (GBCI) Third Part Certification (TPC); however, the mission and simulators' operation are critical and of paramount importance. Energy conservation measures will be evaluated and employed where they will not jeopardize the mission.

b. Systems and Feature Energy Impacts

While the F-16 Mission Training Center (Flight Simulator Facility) is based upon a prototypical facility design, site adaptation will consider compliance with applicable national, state and local energy codes and guidelines.

Energy conserving features will include:

- Tight and well insulated envelope meeting ASHRAE 90.1 criteria.
- Incorporation of a direct digital control (DDC) facility management control system (FMCS)
- Chilled water HVAC system with variable primary flow distribution
- LED lighting with various controls, including dimmers and occupancy (or vacancy) controls.

4. Indoor Environmental Quality Requirements

   a. Space Type 1 (Simulator Equipment Spaces – Simulator Bays, IOSs, BDSs, UPS, MX Work Area/Spares, and Network Room)

      i. Intended Use: – Flight Simulator Training

      ii. Occupancy Schedule: – Simulator Bays and Support Spaces are anticipated to be utilized continually (on a scheduled basis) throughout the operating hours of the facility. Room Occupancies are identified on Drawing Sheet G-003. According to Business and Storage load factors the occupant load totals 60. Actual building occupants will be far fewer (14 anticipated). Hours of operation will be 0645 to 1730 Monday through Friday, plus (2) Unit Training Assembly (UTA) weekends. Additional days/hours may be worked as needed to complete the mission of the Guard.

      iii. Environmental Requirements: The ANG F-16 MTT-G Facility Requirements Document (FRD) stipulates that the flight simulator training areas (Space Type 1) shall be maintained between 65 deg. F and 71 deg. F with relative humidity (RH) held between 40% and 70%. It is recommended that control setpoints be mid-range.

         Lighting in the simulator bays will consist of high bay LED fixtures for maintenance lighting and LED indirect wall fixtures, as needed. Specific lighting requirements inside the F-16 flight simulator training enclosures will be provided by the simulator manufacturer.

      iv. Occupant System Control Ability: Due to the tight environmental requirements required for the simulator training equipment, occupants will have very limited control over any adjustment of the HVAC systems. Individual space temperatures and relative humidity will be monitored and limited access to the HVAC facility management control system (FMCS) will be provided to authorized personnel within the secure area for adjustment of setpoints and/or schedules.

      v. Type of Lighting: Specific lighting requirements associated with the simulator bays are defined in the FRD. In general, lighting will be dimmable, LED, with a 4100k maximum color temperature. Training activities should require 20 foot-candles or less during training. Zone-controlled lighting will be provided.

      vi. After-hour Use Accommodations: – This facility has the capability of being occupied and utilized 24/7, though this is not anticipated to occur on a regular basis. The Owner, NJANG – Atlantic City, will determine the specific hours for training activities. However, it is envisioned that the required HVAC environmental conditions for the flight simulator areas (Space Type 1) will be maintained continuously, 24/7/365.

   b. Space Type 2 (All Other Conditioned Spaces)

      i. Intended Use: – As shown on the drawings and to support Flight Simulator Training.

      ii. Occupancy Schedule: – “Other Conditioned Spaces” in this facility are anticipated to be utilized continually throughout the operating hours of the facility. Room Occupancies are identified on Drawing Sheet G-003. According to Business and Storage load factors the occupant load totals 60. Actual building occupants will be far fewer (14 anticipated). Hours of operation will be 0645 to 1730 Monday through Friday, plus (2) Unit Training Assembly (UTA) weekends. Additional days/hours may be worked as needed to complete the mission of the Guard.

      iii. Environmental Requirements: UFC 3-410-01 stipulates that conditioned spaces are to be designed around cooling / heating setpoints of 78 / 68 °F DB. An evaluation of thermal comfort based upon ASHRAE 55 guidelines indicates that these design conditions would not meet the thermal comfort standard at the heating setpoint. ASHRAE Standard 189.1 requires that spaces shall be designed in compliance with ASHRAE Standard 55.

Thermostat set points are adjustable and the user may set the heating setpoint to 70.5 deg. F with would be compliant.

iv. Occupied spaces shall have initial setpoints of 78 deg. F for cooling and 68 deg. F for heating. Unoccupied equipment and storage spaces shall have setpoints of 80 deg. F for cooling and 65 deg. F for heating. Unoccupied building mechanical and electrical rooms are ventilation cooled to 10°F above ambient temperature and heated to 55°F.

v. Occupant System Control Ability: Thermostats with a limited range of temperature set-point adjustment may be provided in select areas depending upon the Owner's direction.

vi. Type of Lighting: General lighting within the Space Type 2 areas will consist of 2'x4' LED ceiling mounted troffers with round LED downlights in select office areas and LED strip lighting in equipment and maintenance rooms.

vii. vii. After-hour Use Accommodations: – This facility has the capability of being occupied and utilized 24/7, though this is not anticipated to occur on a regular basis. While the required environmental conditions for the flight simulator areas (Space Type 1) will be maintained continuously, 24/7/365, it is envisioned that the supporting Type 2 spaces may have occupied and unoccupied setpoints, permitting a measure of energy savings when these spaces are not occupied.

5. Equipment and System Expectations

   a. HVAC Systems

      i. Quality and Reliability: Equipment efficiency should meet ASHRAE 90.1 and FEMP/Energy Star requirements. Due to the critical nature of this facility, additional capacity / redundancy in the cooling systems is required, i.e. multiple chillers, pumps and computer room units. Equipment should remain accessible and serviceable over the life of building or to the extent typical of these types of equipment.

      ii. Type: Primary cooling system shall utilize air-cooled chillers (minimum two) each equipped with multiple compressors. Total chiller capacity shall provide at least 33% spare capacity, above peak building load. (Depending upon budget constraints, 100% redundant chiller capacity is desired.)

      Chilled water distribution shall be by means of a variable primary pumping system, with a stand-by (redundant) pump being provided.

      Heating will be provided by hydronic heat or electric heat, with coils located in air handling units, computer room air conditioning (CRAC) units, and variable air volume (VAV) terminal units.

      Each of the four simulator bays shall be served by a dedicated computer room unit equipped with a chilled water coil and an electric heating coil. In addition, each simulator bay will be equipped with an electric infrared humidifier.

      The Network room will be conditioned by a dedicated ceiling hung computer room air conditioning (CRAC) unit. This unit will be equipped with chilled water coils, hydronic heating coils and integral humidifier.

      The COMM, SEC COMM, STO/AV, and UPS rooms will be conditioned by dedicated ceiling hung fan coil units with chilled water coils and hydronic heating coils.

      The MECH and ELEC rooms will be conditioned by ventilation cooling. The MECH room will be heated by an electric unit heater. The ELEC room VEST will be heated by a hydronic unit heater.

      The remainder of the building will be conditioned by a multi-zone VAV air handling unit equipped with chilled water coil, hydronic heating coil, and serving multiple VAV terminal units, each equipped with a hydronic reheat coil.

      iii. Automation: A direct digital control (DDC) facility management control system (FMCS) will be provided for the facility, with the intent to employ a native BACnet protocol. Different levels of control access shall be provided between the systems serving the classified (training) areas of the building versus the systems serving the unclassified areas of the building.

      Equipment with packaged controls (such as the chillers) shall be connected to and integrated with the FMCS.

      In addition, system shall trend various parameters including zone temperature and relative humidity, with the capability to alarm when any spaces are outside of prescribed ranges.

      A dedicated FMCS panel shall be located in Area 1 to serve Type 1 spaces. A fiberoptic cable shall connect to a primary FCMS panel located in the mechanical room. This limits wall penetrations through the Area 1 perimeter and consolidates Area 1 controllers into a single panel to help facilitate security settings.

      iv. Flexibility: Little flexibility is anticipated for the HVAC systems, especially in the classified (secure training) areas. In the unclassified areas, the VAV terminal units provide a measure of flexibility for future changes in the floor plan.

v. Maintenance Requirements: All HVAC equipment should be located to allow easy maintenance and servicing access. Specific HVAC system maintenance shall conform with manufacturers' recommendations. Equipment vendors / contractors should be able to respond within 24 hrs.

b. Lighting Systems

i. Quality and Reliability: The building lighting systems need to meet the energy requirements of ANG ETL 15-01-01, UFC 1-200-02, the Energy Policy Act of 2005 and ASHRAE 90.1.

ii. Average illumination levels of the various spaces shall be in accordance with ASHRAE 90.1; UFC 3-530-01, Interior, Exterior Lighting and Controls; Illuminating Engineering Society (IESNA) of North America; and the Facility Requirements Document (FRD) guidelines.

iii. Type: With the exception of any specific lighting source that may be required in the flight simulator (training) bays, high-efficiency LED lighting will be used throughout the facility.

iv. Automation: A central lighting controller for both interior and exterior lighting will be provided to meet ASHRAE 90.1.

v. Automatic occupancy or vacancy lighting controls will be utilized in interior office and meeting spaces, as well as restrooms and storage areas.

vi. Flexibility: Provide the desired level of flexibility for lighting and controls associated with the simulator bays and equipment rooms, including zone controls, dimmable lighting systems, and lighting above the dropped ceilings for inspection purposes.

vii. Maintenance Requirements: Lighting system maintenance shall conform with manufacturers' recommendations and may include lamp replacement, periodic cleaning of luminaires, verification of controls' operation, and periodic measurement of lighting levels.

c. Domestic Hot Water System

i. Quality and Reliability: Plumbing systems need to be designed in accordance with ANG ETL 15-01-04 and UFC 3-420-01. Domestic hot water is required for typical hand washing, kitchenette and janitorial requirements. Demand is anticipated to be between 24 and 30 gallons per day.

Equipment efficiency should meet ASHRAE and FEMP/Energy Star requirements. While no specific quality or reliability requirements have been specified, the equipment should remain serviceable over the life of building or to the extent typical for these types of equipment.

ii. Type: Given the small domestic hot water demand, it is envisioned that point of use instantaneous electric water heaters will be provided.

As an alternative, a life cycle cost analysis will be performed to evaluate the feasibility of utilizing solar water heating.

iv. Flexibility: No anticipated changes to restroom or janitor's closet, so no additional flexibility in the domestic hot water system is required.

Similarly, there are no anticipated changes to the locations of the humidifiers associated with the HVAC system, so no additional flexibility is required.

Maintenance Requirements: Equipment should be located to allow easy maintenance access, and routine (preventative) maintenance of these systems should align with the manufacturer's recommendations. Water heater maintenance should include periodic inspection

of the piping connection and heater elements. A certified equipment vendor / contractor should be able to respond within 24 hrs.

d. On-site Power Systems

i. Quality and Reliability: No on-site generation at the facility will be provided. However, there is a requirement to provide a connection cabinet for a portable, stand-by generator, along with a manual transfer switch.

Battery back-up system(s) will be provided for exit lights, egress lights, the security panel, the access control panel, and fire alarm/MNS control panel.

Classified process (flight simulator) systems will include uninterruptible power supply (UPS) systems to support these training systems; however, details of these systems are not for public use and cannot be disclosed.

ii. Type: As noted above, no on-site power generation will be provided. Emergency and egress systems will be equipped with battery back-up systems.

iii. Automation: Battery back-up systems will automatically engage upon a power outage.

iv. Flexibility: The connection cabinet and associated manual transfer switch provides all the flexibility needed with respect to stand-by power.

v. Maintenance Requirements: Consult the manufacturer, along with IEEE and NETA, regarding recommendations for maintenance of battery systems.

e. Other Systems (Flight Simulator Systems)

The Flight Simulator system equipment will be provided, installed and certified for operation by the Manufacturer in coordination with a Government Program Management group. Pertinent Training Facility Requirements for these systems have been quantified to the extents allowed in an Unclassified, For Official Use Only (FOUO) document provided by the Government and utilized by the Design A/E to design these facilities. Specifics of these systems are not for public use and cannot be provided.

i. Quality and Reliability: Details regarding quality and reliability of these systems is classified and cannot be disclosed.

ii. Type: Details regarding the types of systems being employed for training are classified and cannot be disclosed.

iii. Automation: Details regarding any automation and/or technology associated with the training systems is classified and cannot be disclosed.

iv. Flexibility: There is very little flexibility in these systems.

v. Maintenance Requirements: Maintenance of these simulator / training systems will be provided by the manufacturer in coordination with an on-site systems' management team.

6. Building Occupant and O&M Personnel Requirements

a. Facility Operation

The Facility will be operated by the New Jersey Air National Guard – Atlantic City, who will be responsible for maintenance of the facility's systems and associated utility bills.

Accurate documentation is critical for ensuring the proper operation and maintenance of all systems within this facility. Documentation will include final as-built contract drawings, control system documentation and various manuals addressing normal systems' operations,

emergency procedures, product maintenance manuals, and system and equipment maintenance manuals. Responsibility for these manuals will be outlined in the contract documents, but typically require input from the contractors, vendors, Cx Provider, Engineer-of-Record and the Owner's O&M staff.

- Emergency manuals should be complete with instructions and procedures for systems for each type of emergency, including warnings, error messages, responsibilities of building occupants for notification of installer, supplier, or manufacturer, and stopping/shutdown procedures.

- Operation manuals should include system and equipment descriptions, operating standards and procedures, system and equipment controls, and color-coded piping diagrams.

- Product maintenance manuals for each product, material, and finish should include source information, product information, maintenance procedures, repair and material sources, and warranties and bonds.

- System and equipment maintenance manuals should include source information, maintenance documentation, maintenance procedures, maintenance service schedules, spare parts list, and source information, maintenance service contracts, and warranty and bond information.

Depending upon the number of on-site O&M personnel and their level of expertise and experience in facility mechanical and electrical systems, some maintenance may be outsourced to various third-party contractors.

Due to their complexity and specialized systems, it is expected that maintenance of the process systems (simulator PODs with their supporting hardware and software) will be handled by technicians trained in these specific systems.

b. Facility Management Control System (FMCS)

The Air National Guard base in Atlantic City, New Jersey does not have a base-wide facility management control system (FMCS). A couple of buildings currently utilize a Metasys building automation system (BAS) by Johnson Controls Inc.

The new Flight Simulator Facility's mechanical HVAC, select electrical and utility monitoring systems will be connected to a dedicated FMCS. The system will be a direct digital control (DDC) system envisioned to utilize native BACnet protocol, permitting select scheduling, monitoring and control of the connected systems.

Due to the critical environmental requirements for the Type 1 spaces (Simulator Equipment Spaces – Simulator Bays, IOSs, BDSs, UPS, MX Work Area/Spares, and Network Room) the control system serving the HVAC systems for these spaces must be secure, primarily providing monitoring, with limited access to trained personnel within the classified area.

HVAC controls serving the Type 2 spaces will provide automatic environmental control for the spaces served. Equipment scheduling and space temperature setpoints may be adjusted within pre-set ranges by authorized personnel.

c. O&M Staff Training and Orientation

While the number of on-site O&M personnel at NJANG – Atlantic City and their level of expertise and experience in facility mechanical and electrical systems may be limited, the on-site

O&M staff require training in the mechanical and electrical systems supporting the new Flight Simulator Facility.

It is expected that the operations and maintenance personnel will follow the manufacturer's recommended frequencies and activities for preventative maintenance and that they are able to easily maintain the system documentation to include changes to components and systems.

Training should occur during the completion of construction and acceptance phases and needs to contain a variety of sessions that shall be digitally recorded and processed for long-term availability to changing staff.

The following defines what is considered successful training:

- O&M training for building systems (HVAC equipment, emergency power, lighting controls, and life safety)
- HVAC building automation system – detailed instruction on use of the building automation system in troubleshooting and fixing problems.
- Training with an operational plan – provide training around an operational management plan on how the building will actually be managed to provide direct context to the training.
- Safety training on building systems for O&M – include safety training for the O&M staff relative to such items as confined spaces, handling of chemicals, emergency response, etc.
- Energy systems along with related mechanical system – training on the interaction of the mechanical systems relative to the energy efficiency of the facility.
- Component training – training provided for specific components relative to preventative maintenance procedures and interaction with its connected systems.
- Training for contractors on installing special systems/equipment – provide training by the manufacturer on the proper installation and start-up of systems and equipment.
- Troubleshooting on building systems – a session on typical problems that will likely be encountered in operating the facility and guidance (matrix) on how to troubleshoot and resolve the problem.
- Scheduled construction walkthroughs – periodic guided walkthroughs of the facility during construction where the O&M staff can ask questions of the design professionals and contractors so that they can learn the systems as they are being constructed.

d. Occupant Training and Orientation

Occupants should be trained with an overview of the mechanical (HVAC and plumbing) and electrical (lighting and power distribution systems) serving the F-16 Simulator Facility.

While occupants will not be asked to perform maintenance and do not need to understand the details of the FMCS, they should be trained in emergency procedures (system shutdown, shutoff valves, etc.).

In addition, where Type 2 spaces will permit an adjustment to setpoints or scheduling of select spaces, occupants should be trained in same.

SECTION 01 91 19

BUILDING ENCLOSURE COMMISSIONING
05/2023

PART 1 GENERAL

1.1 SUMMARY

Use this Section in conjunction with UFGS 01 91 00.15 BUILDING COMMISSIONING. Building Enclosure Commissioning (BECx) is an essential part of overall Building Commissioning. The final BECx report is part of the Final Commissioning Report as defined in 01 91 00.15 BUILDING COMMISSIONING. This Section covers Building Enclosure Commissioning for all six surfaces (4 walls, roof, and floor, for a rectangular shaped zone) of a building. Additional Quality Control and testing requirements for specific components of the building enclosure are described in the Division 03 thru 08 UFGS Sections of the project specifications.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referenced within the text by the basic designation only.

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ANSI/ASNT CP-105	(2020) ASNT Standard Topical Outlines for Qualification of Nondestructive Testing Personnel
ANSI/ASNT CP-189	(2020) ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel
ASNT SNT-TC-1A	(2020) Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 90.1 - IP	(2019) Energy Standard for Buildings Except Low-Rise Residential Buildings
ASHRAE 202	(2018) Commissioning Process for Buildings and Systems
ASHRAE RP-935	(1998) Protocol for Field Testing of Tall Buildings to Determine Envelope Air Leakage Rate

ASTM INTERNATIONAL (ASTM)

ASTM D3464	(1996; R 2014) Standard Test Method for Average Velocity in a Duct Using a Thermal Anemometer

ASTM E779	(2019) Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
ASTM E1186	(2022) Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems
ASTM E1258	(1988; R 2018) Standard Test Method for Airflow Calibration of Fan Pressurization Devices
ASTM E1827	(2022) Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door
ASTM E2029	(2011) Standard Test Method for Volumetric and Mass Flow Rate Measurement in a Duct Using Tracer Gas Dilution
ASTM E2813	(2018) Standard Practice for Building Enclosure Commissioning
ASTM E2947	(2021) Standard Guide for Building Enclosure Commissioning

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 6781	(1983) Thermal Insulation - Qualitative Detection of Thermal Irregularities in Building Envelopes - Infrared Method
ISO 6781-2	(2010) Performance of Buildings - Detection of Heat, Air, and Moisture Irregularities in Buildings by Infrared Methods - Part2: Equipment Requirements
ISO 6781-3	(2015) Performance of Buildings - Detection of Heat, Air, and Moisture Irregularities in Buildings by Infrared Methods - Part 3: Qualifications of Equipment Operators, Data Analysts, and Report Writers

1.3 DEFINITIONS

The definitions included here are specific to this Section. Refer to UFGS 01 91 00.15 for definitions that apply to both Sections. The following terms as they apply to this section:

1.3.1 Air Barrier Envelope

The surface that separates the inside air from the outside air. The combination of air barrier assemblies and air barrier components, connected by air barrier accessories are designed to provide a continuous barrier to the movement of air through an environmental separator. A single building may have more than one air barrier envelope. The air barrier surface includes the top, bottom, and sides of the envelope. The term "air barrier envelope" is also known as "air barrier system" or

simply "air barrier".

1.3.2 Air Leakage Rate

A measurement of air infiltration or exfiltration through the building envelope over time. The air leakage rate is the rate of air flow across the air barrier per unit surface area of the envelope at a defined differential pressure.

1.3.3 Basis of Design (BoD)

A document developed by the design team which includes technical concepts, assumptions, calculations, decisions, and product selections to support the Owner's Project Requirements (OPR).

1.3.4 Bias Pressure

Also known as zero flow pressure, baseline pressure, offset pressure or background pressure. With the envelope not artificially pressurized, bias is the differential pressure that always exists between the envelope that has been prepared (sealed) for the pressure test and the outdoors. Bias pressure is made up of two components, fixed static offset (usually due to stack effect or the HVAC system) and fluctuating pressure (usually due to wind or a moving elevator). Because of pressure fluctuations many bias pressure readings are recorded and averaged for use in the calculations.

1.3.5 Blower Door

Commonly used term for an apparatus used to pressurize and depressurize the space within the building envelope and quantify air leakage through the envelope. The blower door typically includes a door fan and an air resistant fabric or a series of hard panels that extends to cover and seal the door opening between the fan shroud and door frame. The door fan is a calibrated fan capable of measuring air flow and is usually placed in the opening of an exterior door. With the air barrier otherwise sealed, air produced by the door fan pressurizes or de-pressurizes the envelope, depending on the fan's orientation.

1.3.6 Building Enclosure (or envelope)

The materials, components, systems, and assemblies intended to provide an environmental separator between the interior and exterior or between interior spaces with different environment requirements. "Enclosure" is used interchangeably with "envelope".

1.3.7 Building Enclosure Commissioning (BECx)

Technical service provided on behalf of the Government to provide a quality-focused process for enhancing the performance of the building enclosure by validating the design phase and verifying during the construction phase that the performance of the building enclosure materials components, assemblies, and systems are designed and installed to meet the Owner's Project Requirements (OPR).

1.3.8 Building Enclosure Commissioning Provider (BECxP)

An entity that functions as part of the overall Commissioning Team and is responsible for validating the design phase and verifying during the construction phase that the performance of the building enclosure

materials, components, assemblies, and systems are designed and installed to meet the Owner's Project Requirements (OPR).

1.3.9 Construction Phase

The period of a project following the award of construction Contract to project completion.

1.3.10 Design Phase

The period of the project delivery process when a design supporting the Owner's Project Requirements is developed and translated into Contract Documents.

1.3.11 Environmental Separator

The parts of a building that separate the controlled interior environment from the uncontrolled exterior environment, or that separate spaces within a building that have dissimilar environments. The term "environmental separator" is also known as the "control layer".

1.3.12 Functional Performance Test (FPT)

A systematic process to verify that controls and other elements of the building project are capable of and configured to operate or perform as required.

1.3.13 Owner's Project Requirements (OPR)

A document that details the stakeholders' requirements for the project and the expectations for how it will be used and operated. The OPR is provided for commissioning review purposes only and is not a Contract requirement.

1.3.14 Pressure Test

A generic term for a test in which the envelope is either pressurized or de-pressurized with respect to the outdoors.

1.3.15 Negative Pressure Test (Depressurization Test)

A test wherein air inside the envelope is drawn to the outdoors. This places the envelope at a lower (negative) pressure with respect to the outdoors.

1.3.16 Positive Pressure Test (Pressurization Test)

A test wherein outdoor air is pushed into the envelope. This air movement places the envelope at a higher (positive) pressure with respect to the outdoors.

1.3.17 Verification & Testing (V&T) Provider

An entity who completes the activities needed to implement the building functional performance testing (FPT) activities or verify that elements of the building project meet stated requirements.

1.4 COMMUNICATION WITH THE GOVERNMENT COMMISSIONING PROVIDER

For communication responsibilities, see Section 01 91 00.15 BUILDING COMMISSIONING.

1.5 ENCLOSURE COMPONENTS TO BE COMMISSIONED

1.5.1 Verification of the Design and Installation of the Continuous Air Barrier

a. Conduct periodic field inspection of the continuous air barrier materials and assemblies, including all penetrations through the six sides of the air barrier, during construction while the continuous air barrier is still accessible for inspection and repair (after installation of all penetrations and wall cladding anchoring devices and before the installation of interior finishes) to verify and document compliance with the requirements. Conduct inspections at initial installation of each building envelope component and at in-progress construction intervals as stated in Part 3 section titled BUILDING ENVELOPE INSPECTION AND TESTING.

b. Conduct Performance Verification Testing of the entire building envelope (systems, components, and assemblies) for air tightness in accordance with Part 3 section titled BUILDING ENVELOPE AIR TIGHTNESS REQUIREMENT.

1.5.2 Inspection of Fenestration and Doors

a. Fenestration and Doors must be labeled and inspected to verify compliance with Building Envelope energy requirements, including applicable U-factors, Solar Heat Gain Coefficient (SHGC), Visible Transmittance (VT), and air leakage rates.

b. Inspect doors and windows for coordination with the insulating plane of the wall, continuity with the air/weather barrier, and flashing.

c. Inspect operation of doors, closers, and operating mechanisms for conformance with manufacturer's instructions.

d. Inspect seals and gaskets for fenestration and doors (including loading dock, sectional, and coiling doors) for proper installation and to verify that seals are in good condition.

1.5.3 Inspection of Opaque Roof, Walls, and Floors

Opaque roof, above-grade and below-grade walls, and floors, must be subject to the following inspections during construction:

a. Use of ASHRAE 90.1 - IP-compliant materials and assemblies.

b. Insulation material meets design specifications and is continuous.

1.5.4 Fenestration Inspections

Conduct inspections of the following fenestration-related items during construction:

a. Skylights size and location in relation to the designed primary sidelighted area and secondary sidelighted area below.

b. Roof monitor size and location in relation to the designed primary sidelighted area and secondary sidelighted area below.

c. Dynamic glazing compliance with SHGC and U-factors, and testing of the operation for conformance with the manufacturer's instructions.

d. Permanent fenestration projections installation and performance in accordance with ASHRAE 90.1 - IP requirements and the Contract documents.

1.6 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Building Enclosure Commissioning Specialist Qualifications; G

Building Enclosure Testing Work Plan; G

SD-03 Product Data

Thermal Imaging Camera; G

Test Equipment; G

SD-05 Design Data

Envelope Surface Area Calculations; G

SD-06 Test Reports

Completed Building Envelope Inspection Checklists; G

Pressure Test Procedures; G

Air Leakage Test Report; G

Diagnostic Test Report; G

SD-07 Certificates

Pressure Test Agency

Thermographer Qualifications

Certificate of Readiness

SD-10 Operation and Maintenance Data

Training; G

1.7 BUILDING ENCLOSURE TESTING WORK PLAN

For each building enclosure test to be performed, submit the following not later than 120 calendar days after Contract award, but before start of testing work, steps to be taken by the lead test technician to accomplish the required testing.

a. Memorandum of test procedure.

(1) Proposed dates for conducting the tests.

(2) Submit detailed test procedures prior to the test. Provide a plan view showing proposed locations (personnel doors or other similar openings) to install equipment (such as blower doors or flexible ducts for trailer-mounted fans, if used).

b. Test equipment to be used.

c. Scaffolding, scissor lifts, power, electrical extension cords, duct tape, plastic sheeting and other Contractor's support equipment required to perform all tests.

d. Other Contractor's support personnel who will be on site for testing.

1.8 ACCESSIBILITY REQUIREMENTS

Air barrier components, insulation, fenestration, and doors for commissioned systems must be made accessible for inspections. Contractor must make necessary modifications at Contractor's own expense if systems and enclosures are not accessible for inspections and testing. Assist commissioning team in testing and inspections by removing equipment covers, opening access panels, and other required activities that assist with visual oversight. Furnish ladders, flashlights, meters, gauges, or other inspection equipment as necessary.

1.9 COORDINATION

Refer to Section 01 91 00.15 BUILDING COMMISSIONING for requirements pertaining to coordination during the commissioning process. Coordinate with the Commissioning Provider in accordance with Section 01 91 00.15 and in accordance with the Commissioning Plan to schedule inspections as required to support the commissioning process. Furnish additional information requested by the Commissioning Provider.

Coordinate scheduling of air barrier inspections and air barrier pressure testing with the commissioning team. Upload plans, reports, notes, and other documentation to the Commissioning Provider's web-based commissioning software, or as specified in the commissioning plan, as it is completed.

1.10 QUALITY CONTROL

1.10.1 Modification of References

Perform all pressure and diagnostic tests according to the referenced publications listed in paragraph REFERENCES and as modified by this section. Consider the advisory or recommended provisions, of the referred references, as mandatory.

1.10.2 Qualifications

1.10.2.1 Building Enclosure Commissioning Specialist Qualifications

See UFGS 01 91 00.15 BUILDING COMMISSIONING for the qualification requirements of the Building Enclosure Commissioning Specialist.

1.10.2.2 Pressure Test Agency

Submit, no later than 15 calendar days after Contract award, information certifying that the pressure test agency is not affiliated with any other company participating in work on this Contract. The work of the test agency is limited to pressure testing the building envelope, performing a thermography test and fog test, and investigating, through various methods, the location of air leaks through the air barrier. See Part 3 paragraph PRESSURE TEST AGENCY for additional requirements. For thermographer qualifications, see paragraph THERMOGRAPHER QUALIFICATIONS.

Use the sample TEST AGENCY QUALIFICATIONS SHEET form (Appendix C), to submit the following information.

a. Verification of 2 years of experience as an agency in pressure testing commercial or industrial buildings.

b. List of at least ten commercial/industrial facilities with building envelopes that the agency has tested within the past 2 years. Include building name, address, and name of prime construction Contractor and Contractor's point-of-contact information.

c. Confirmation of 2 years of commercial and or industrial building pressure test experience for the lead pressure test technician and the thermographer in using the specified ASTM E779 or ASTM E1827 testing standard. References from five Contracting Officers for facilities where the lead test technician has supervised commercial and or industrial building pressure tests in the last 2 years.

d. Verification that the lead pressure test technician has been employed by a building pressure testing agency in the capacity of a lead pressure test technician for not less than 1 year.

1.10.2.3 Thermographer Qualifications

To perform an infrared diagnostic evaluation, use a lead thermographer who has at least an active Level II Certification that is based on the requirements in ANSI/ASNT CP-105 or ANSI/ASNT CP-189 and is in accordance with ASNT SNT-TC-1A. The course of study is to be specifically focused on infrared thermography for building science. The thermographer must have at least two years of building science thermography experience in IR testing commercial or industrial buildings. The thermographer must also have experience in building envelopes and building science in order to make effective recommendations to the Contractor should the envelope require additional sealing. Thermographic equipment operators, data analysts and report writers must comply with the requirements of ISO 6781-3. Submit the thermographer's certificate for approval. Submit a list of at least ten commercial/industrial buildings on which the thermographer has performed IR thermography in the past two years. The thermographer is to have a current active certification. Submit certification at least 60 days prior to thermography testing.

1.10.3 Test Reports

No later than 14 days after completion of the pressure test, submit electronic copies of an organized report and 3 bound paper copies in a durable 3-ring binder. The report is to contain a table of contents, an executive summary, an introduction, a results section and a discussion of the results. Submit the air leakage test report as described in paragraph AIR LEAKAGE TEST REPORT. Submit a diagnostic test report as described in paragraph LOCATING LEAKS BY DIAGNOSTIC TESTING. The diagnostic test report is to include the Thermographic Investigation Report and the Fog Test Report (if performed).

Submit field data and completed report forms found in the appendices. Use the sample forms, Test Agency Qualification Sheet, Air Leakage Test Form and Air Leakage Test Results Form to summarize the tests for the appropriate building envelope. Submit both electronically populated and field hand filled-in forms.

Report Data. Include in the report the following information for all tests:

a. Date of issue

b. Project title and number

c. Name, address, and telephone number of testing agency

d. Dates and locations of samples and tests or inspections

e. Names of individuals making the inspection or test

f. Designation of the work and test method

g. Identification of product and specification section

h. Complete inspection or test data

i. Test results and an interpretation of test results

j. Comments or professional opinion on whether inspected or tested work complies with Contract document requirements

k. Recommendations on retesting

1.11 CLIMATE CONDITIONS SUITABLE FOR A PRESSURE TEST

As the test date approaches, monitor the weather forecast for the test site. Avoid testing on days forecast to experience high winds, rain, or snow. Monitor weather forecasts prior to shipping pressure test equipment to the site. Based on current and forecast weather conditions, the Contracting Officer's representative is to grant final approval for testing to occur.

1.11.1 Rain

For safety reasons, avoid testing during rain or if rain is anticipated during testing. If pneumatic hoses are installed and exposed to rain inspect the hose to ensure rainwater has not migrated into the hose ends. Orient all exposed hose ends to keep them out of water puddles. Success

in temporarily sealing outdoor ventilation components such as louvers and exhaust fans may also be compromised by rain. Don't seal roof-mounted ventilation components during times of potential lightning.

1.11.2 Wind

Because wind can skew pressure test results, test only on days and at times when winds are anticipated to be the calmest. Avoid pressure testing during gusty or high wind conditions. Avoid installing test fans on the windward side of the building if wind gusts during the test are anticipated to be greater than 10 miles per hour.

1.12 CERTIFICATE OF READINESS

Prior to scheduling the Commissioning Tests as required by this Section, submit Certificate of Readiness documentation in accordance with Section 01 91 00.15 BUILDING COMMISSIONING for each enclosure-related system, certifying that inspections have been completed, open issues have been resolved, and the system is ready for the Commissioning Tests. Documentation would include Building Envelope Inspection Checklists as required within this Section, as well as any inspections or test reports required within each enclosure-related technical specification section. Additional Quality Control and testing requirements for specific components of the building enclosure are described in the Division 03 thru 08 UFGS Sections of the project specifications.

Submit the Certificate of Readiness for each system prior to Commissioning Tests of that system. Do not schedule Commissioning Tests for a system until the Certificate of Readiness is approved by the Government. Do not schedule air tightness testing of the building envelope system until Certificates of Readiness and supporting documentation for enclosure-related systems have been submitted, reviewed and approved by the Government.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

Provide all equipment required to perform testing for the systems and components to be commissioned. Provide all testing equipment of sufficient quality and accuracy to test and measure system performance with the tolerances specified. Provide a sufficient quantity of two-way radios for each subcontractor.

Submit a signed and dated list of instruments to be used for testing, their application, manufacture, model, serial number, range of operation accuracy, and date of most recent calibration. Calibration data applicable to fan systems must be in accordance with ASTM E1258. Also list special equipment and proprietary tools specific to a piece of equipment required for testing.

2.2 PRESSURE TEST EQUIPMENT

Depending on site conditions and size of the envelope, the test may be conducted using or the building's own supply air system. The testing agency is to supply sufficient quantity of blower equipment that will produce a minimum of 75 Pa differential pressure between the envelope and outdoors using the test methods described herein. Supplying additional blower test equipment to provide additional airflow capacity or to act as

a backup is highly recommended.

2.2.1 Blower Door Fans and Trailer Mounted Fans

Each air flow measuring system including blower door fans and trailer mounted fans are to be calibrated within the last 5 years. Calibrated blower door fans and trailer mounted fans must measure accurately to within plus or minus 5 percent of the flow reading. Blower door equipment and trailer mounted fans are to be specifically designed to pressurize building envelopes. Each set of blower door equipment is to include fan(s), digital gage(s), door frame, door fabric or hard panels.

2.2.2 Digital Gages as Test Instruments

Use only digital gages as measuring instruments in the pressure test; analog gages are not acceptable. The gauges must be accurate to within 1.0 percent of the pressure reading or 0.15 Pa, whichever is greater. Each gage is to have been calibrated within two years of the test. The calibration is to be checked against a National Institute of Standards and Technology (NIST, formerly National Bureau of Standards) traceable standard.

2.3 THERMAL IMAGING CAMERA REQUIREMENTS

The thermal imaging camera used in the thermography test must have a thermal sensitivity (Noise Equivalent Temperature Difference.) of +/- 0.18 degrees F at 86 degrees F or less. Ensure the camera's operating spectral range falls between 2 and 15 micrometers. Ensure the camera's IR image viewing screen resolution measures at least 320x240 pixels. Ensure the camera has a means of recording thermal images seen on the camera viewing screen. The camera is to display output as individual still frame images that also can be downloaded and inserted into an electronic Thermographic Investigation Report. All thermographic equipment must comply with the requirements of ISO 6781-2. Submit camera make and model, and catalog information that defines the camera thermal sensitivity for approval.

PART 3 EXECUTION

Conduct building enclosure commissioning in accordance with ASHRAE 202 and ASTM E2947 in addition to the requirements herein. Follow ASTM E2947 except where it references ASTM E2813. Commissioning must document in sufficient detail compliance of the building envelope with the design intent as defined in the Contract documents.

3.1 MEETINGS

Attend all meetings in accordance with Section 01 91 00.15 BUILDING COMMISSIONING.

Provide timely updates on construction schedule changes so Commissioning Provider has scheduling information needed to execute commissioning process efficiently. Notify Contracting Officer of anticipated construction delays to commissioning activities not yet performed or not yet scheduled.

3.2 PRELIMINARY BECx PLAN

Submit the Preliminary BECx Plan no later than 14 calendar days after the

Commissioning Kickoff Meeting. Submit the Preliminary BECx Plan for inclusion in the Interim Construction Phase Commissioning Plan as identified in Section 01 91 00.15 BUILDING COMMISSIONING. Coordinate the development of this plan with the commissioning plans required in Section 01 91 00.15 BUILDING COMMISSIONING. Outline the commissioning process, commissioning team members and responsibilities, lines of communication, inspections, and documentation requirements for BECx. Identify the Commissioning Standards chosen for the project. Establish appropriate and quantifiable enclosure related performance metrics, test standards, and test methodology in accordance with referenced standards for inclusion in the Contract documents. Provide a list of team members for systems to be commissioned with contact information, a list of tests as required to complete the scope of all commissioning and a copy of the project schedule as required by Section for inclusion in the Preliminary BECx Plan.

The Preliminary BECx Plan must include, at a minimum, the following:

1. Required performance of commissioned equipment, systems, and assemblies, and results of FPT and verification.

2. Summary of compliance of the building and its components, assemblies, controls, and systems with requirements.

3. Issues and resolution logs, including itemization of deficiencies found during verification, testing, and commissioning that have not been corrected at the time of report preparation.

4. Deferred tests that cannot be performed at the time of report preparation.

5. Documentation of the training of operation personnel and building occupants on commissioned systems, and a plan for the completion of any deferred trainings not completed at the time of report preparation.

6. A plan for the completion of commissioning and training, including climatic and other conditions required for performance of the deferred tests.

3.3 DESIGN REVIEW

The BECxP must review enclosure-related design documents. The review must occur prior to the 50 percent design submittal. The design review must include verifying that the design for the systems to be commissioned are prepared in accordance with the Contract documents

Provide a Design Review Report identifying discrepancies or deficiencies that would prevent the systems to be commissioned from operating or performing in accordance with the design requirements or being safely maintained. Submit the building enclosure-related Design Review Report for inclusion in the overall project Design Review Report as identified in Section 01 91 00.15 BUILDING COMMISSIONING. Report must include individual list of each deficiency and corresponding corrective action necessary for proper system performance. Identify any discrepancies between the design and the Owner's Project Requirements Document. The Owner's Project Requirements Document is provided for commissioning review purposes only and does not form a part of the contract documents for this project. Submit the Design Review Report no later than 14 calendar days after approval of the Commissioning Firm and Commissioning Specialists. The Contracting Officer, the BECxP, and the Designers of Record for the

associated systems must meet, discuss, and resolve any outstanding items contained in the report no later than 14 calendar days after submission of the report.

The BECxP is responsible for reviewing the design and preparing a Design Review Report identifying discrepancies or deficiencies that would prevent the systems to be commissioned from operating or performing in accordance with the design requirements or being safely maintained. The Contracting Officer, the CxC, the BECxP, and the Designers of Record for the associated systems must meet, discuss, and resolve any outstanding items contained in the report no later than 14 calendar days after submission of the report. The BECxP must verify that the review comments have been adequately addressed in subsequent design submittals.

Give particular attention to the continuity of the air barrier, vapor and moisture control within enclosure assembly, acoustic control of the enclosure assemblies to meet required Outdoor Indoor Transmission Class (OITC) values, flashing, thermal bridges, and resistance to water penetration or ponding.

3.4 FINAL BECx PLAN

Submit the Final BECx Plan for inclusion in the Interim Construction Phase Commissioning Plan as identified in Section 01 91 00.15 BUILDING COMMISSIONING. Outline the commissioning process, commissioning team members and responsibilities, lines of communication, and documentation requirements for BECx. Identify the Commissioning Standards chosen for the project. Identify enclosure related inspections, performance metrics, test standards, and test methodologies in accordance with referenced standards for inclusion in the commissioning process.

Provide a list of team members for systems to be commissioned with contact information, a list of tests as required by this Section as well as 07 27 10 BUILDING AIR BARRIER SYSTEM, and a copy of the project schedule as required by Section for inclusion in the Final BECx Plan. Final BECx plan must be submitted with the Interim Construction Phase Commissioning Plan, and must be updated and included with the Final Construction Phase Commissioning Plan as identified in Section 01 91 00.15 BUILDING COMMISSIONING.

3.5 CONSTRUCTION SUBMITTAL REVIEWS

Coordinate construction submittal document reviews for commissioned systems and assemblies with the CxC and BECxP. The commissioning submittal review does not replace the designer of record (DoR) or Government submittal review, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

The BECxP must identify construction submittals to be provided by the Contractor for the commissioned systems, and coordinate with the CxC. The BECxP must evaluate construction submittals related to BECx for compliance with the Contract documents. The BECxP is responsible for identifying construction submittals to be provided by the Contractor for the commissioned systems and coordinating with the CxC. The BECxP is responsible for evaluating construction submittals related to BECx for compliance with the Contract documents. Include a copy of the submittal document review transmittal and response in the Commissioning Report.

3.6 TEMPLATE BUILDING ENVELOPE INSPECTION CHECKLISTS

The Building Enclosure Commissioning Specialist must develop the Template Building Envelope Inspection Checklists to verify the building materials and construction maintain the required air tightness of the building envelope system.

Use the Template Building Envelope Inspection Checklists prepared by the CxC to verify the building materials and construction maintain the required air tightness of the building envelope system.

The Building Envelope Compliance Documentation Form from ASHRAE 90.1 - IP User's Manual may be used as an example. The submitted checklist is not required to match the format of the form; however, the checklist must contain the same level of detail as shown on the mandatory provisions of the sample form.

3.7 BUILDING ENVELOPE INSPECTION AND TESTING

Demonstrate that all system components have been installed, that each building enclosure component operates, and that the systems operate and perform in accordance with Contract documents and the Owner's Project Requirements. Provide all materials, services, and labor required to perform the Building Envelope Inspections.

Document building envelope inspections by the commissioning team using the approved Template Building Envelope Inspection Checklists. Indicate commissioning team member inspection and validation of each Building Envelope Inspection Checklist item by initials at the time they are inspected and found to be in conformance with Contract requirements. Inspect checklist items before they become hidden as construction progresses. Submit the initialed and completed Building Envelope Inspection Checklists no later than 14 calendar days after completion of inspection of all checklist items. The BECxP must conduct inspections at initial installation of each building envelope component and a minimum of monthly site visits to the site to observe construction of the building envelope in-progress, each time reviewing the in-progress checklists to ensure that the commissioning team is inspecting the building envelope as required. Coordinate inspection requirements with Section 07 27 10 BUILDING AIR BARRIER SYSTEM and other Division 7 Specifications. The BECxP must witness the building envelope pressure tests and diagnostic tests specified in this Section; review the resulting reports; and provide recommendations for correction of any deficiencies or further testing.

Participate in periodic building envelope inspections with the commissioning specialists using the approved Template Building Envelope Inspection Checklists to observe and document construction of the building envelope in-progress. Coordinate inspection requirements with Section 07 27 10 BUILDING AIR BARRIER SYSTEM and other Division 7 Specifications. Complete the checklists and indicate inspection and validation of each Building Envelope Inspection Checklist item by initials at the time they are inspected. Notify the Commissioning Specialist and Contracting Officer at least 21 calendar days before checklist items are concealed to ensure inspection items can be observed before construction progresses. Submit the initialed and Completed Building Envelope Inspection Checklists no later than 14 calendar days after completion of inspection of all checklist items. Notify the BECx at least 21 calendar days prior to the building envelope pressure tests and diagnostic tests specified in this Section.

3.8 BUILDING ENCLOSURE AIR BARRIER PRESSURE TESTING

3.8.1 Pressure Test Agency

Employ an independent agency to conduct the pressure test on the building envelope in accordance with ASTM E779 and this specification section. The test agency is to be an independent third-party subcontractor, not an affiliated or subsidiary of the prime Contractor, subcontractors, or A/E firm. The agency is to be regularly engaged in pressure testing of commercial/industrial building envelopes. If using blower door or trailer-mounted fans, the lead test technician must have at least two years of experience in using such equipment in building envelope pressurization tests. Formal training using pressure test equipment is highly recommended. Technicians using the building's air handling system for pressure testing are to have tested at least five commercial/industrial buildings within the past two years with each building having over 50,000 square feet of floor area. Submit the name, address, and floor areas of each of these five buildings for approval.

3.8.1.1 Field Work

The lead pressure test technician and thermographer are to be present at the project site while testing is performed and is to be responsible for conducting, supervising, and managing of their respective test work. Management includes health and safety of test agency employees.

3.8.1.2 Reporting Work

The lead pressure test technician is to prepare, sign, and date the test agenda, equipment list, and submit a certified Air Leakage Test Report. The thermographer is to prepare, sign, and date the test agenda, equipment list, and submit a certified Thermographic Investigation Report. The Contractor is to prepare a final report that identifies improvements that were made to the envelope to reduce air leaks , mitigate thermal bridging, eliminate moisture migration,, repair insulation voids discovered during diagnostic tests. The Verification & Testing (V&T) providers must certify completion of required verification and FPT and include a plan for the completion of any deferred FPT, including climatic and other conditions required for performance of the deferred tests; include the results of the FPT and verification activities in the completed verification and FPT (functional performance testing) documentation. Jointly submit all reports.

3.8.2 Envelope Surface Area Calculation

The architectural air barrier boundary includes the floor, walls, and ceiling. After construction of the air barrier envelope is complete, field measure the envelope to ensure the physical measurements match the design drawings and the air barrier envelope surface area calculations are generated. If the calculation result is not within 10 percent of the defined air barrier boundary calculation result as indicated, submit the envelope surface area calculation and results for review. If the air barrier was defined during design but the air barrier envelope surface area was not calculated, calculate it during construction and submit the envelope surface area calculations and result for review.

3.8.3 Preparing The Building Envelope For The Pressure Test

3.8.3.1 Testing During Construction

The pressure test cannot be conducted until all components of the air barrier system have been installed. After all sealing as described herein has been completed, inspect the envelope to ensure it has been adequately prepared. During the pressure test, stop all ongoing construction within and neighboring the envelope which may impact the test or the air barrier integrity. The pressure test may be conducted before finishes that are not part of the air barrier envelope have been installed. For example, if suspended ceiling tile, interior gypsum board or cladding systems are not part of the air barrier the test can be conducted before they are installed. Recommend testing prior to installing the finished ceilings and interior wall finishes within the envelope and immediately surrounding it. The absence of finishes allows for inspection and diagnostic testing of the roof/wall interface and for implementation of repairs to the air barrier, if necessary to comply with the maximum allowed leakage.

3.8.3.2 Sealing the Air Barrier Envelope

The Contractor is to seal all penetrations through the air barrier. Unavoidable penetrations due to electrical boxes or conduit, plumbing, and other assemblies that are not air-tight are to be made so by sealing the assembly and the interface between the assembly and the air barrier or by extending the air barrier over the assembly. Support the air barrier to withstand the maximum positive and negative air pressure to be placed on the building without displacement or damage, and transfer the load to the structure. Durably construct the air barrier to last the anticipated service life of the assembly and to withstand the maximum positive and negative pressures placed on it during pressure testing. Do not install lighting fixtures that are equipped with ventilation holes through the air barrier.

3.8.3.3 Sealing Plumbing

Prime all plumbing traps located within the envelope full of water.

3.8.3.4 Close and Lock Doors

Close and lock all doors and windows in the envelope perimeter. For doors not equipped with latching hardware, temporarily secure them in the closed position. Secure the doors in such a way that they remain fully closed even when the maximum anticipated differential air pressure produced during the test acts on them. Provide signage stating not to open the door and the time and duration of the test.

3.8.3.5 Hold Excluded Building Areas at the Outdoor Pressure Level

Keep building areas immediately surrounding but excluded from the test envelope at the outdoor pressure level during the pressure test. Maintain these areas at the outdoor pressure level by propping exterior doors open, opening windows and de-energizing all air moving devices in or serving these areas.

3.8.3.6 Maintain an Even Pressure within the Envelope

Ensure the pressure differences within the envelope are minimized by opening all internal air pathways including propping open all interior

doors. Distribute test fans throughout the envelope as necessary to ensure the internal pressures are uniform (within 10 percent of the average differential pressure). Ideally, do not install suspended ceilings until after all pressure tests have been completed. If, however the envelope includes finished suspended ceiling spaces, temporarily remove approximately 5 percent of all ceiling tiles or a minimum of 1 tile from each isolated suspended ceiling space, whichever comprises the greatest surface area. Temporarily remove additional ceiling tiles during testing to allow for inspection and diagnostic testing of the ceiling/wall interface. An alternative to removing ceiling tiles is to measure the differential pressure between each isolated suspended ceiling space and the outdoors when the area below the suspended ceiling is maintained at a differential pressure of 75 Pa with respect to the outdoors. If the suspended ceiling differential pressure measurement is within ten percent of the 75 Pa pressure below the suspended ceiling no ceiling tiles need to be removed.

3.8.3.7 Maintain Access to Mechanical and Electrical Rooms

Maintain access to mechanical rooms and electrical rooms associated with the envelope to allow for de-energizing ventilation equipment and resetting circuit breakers tripped by blower door equipment, if used.

3.8.3.8 Minimize Potential for Blowing Dust and Debris

Because high velocity air will be blown into and out of the envelope during the test, debris, including dust and litter, may become airborne. Airborne debris may become trapped or entangled in test equipment, thereby skewing test results. Ensure areas within and surrounding the envelope are free of dust, litter and construction materials that are easily airborne. If pressurizing existing, occupied areas, provide adequate notice to building occupants of blowing dust and debris, and general disruption of normal activities during the test.

3.8.3.9 De-energize Air Moving Devices

De-energize all air moving devices serving the envelope to keep air within the envelope as still as reasonably achievable. De-energize all fans that deliver air to, exhaust air from, or recirculate air within the envelope. Also, de-energize all fans serving areas adjacent to but excluded from the envelope.

3.8.4 Building Envelope Air Tightness Requirement

For each building envelope, perform the Architectural Only test and if noted below, the Architectural Plus HVAC System test. The purpose of the pressure (air leakage) test is to determine final compliance with the airtightness requirement by demonstrating the performance of the continuous air barrier. An effective air barrier envelope minimizes infiltration and exfiltration through unintended air paths (leaks). The tests may be performed in any desired order.

3.8.4.1 Architectural Only Test

The test envelope is the architectural air barrier boundary as defined on the Contract drawings. This boundary includes connecting walls, roof and floor which comprise a complete, whole, and continuous three-dimensional envelope. Perform both a positive pressure test and a negative pressure test on this envelope, unless otherwise directed.

3.8.4.1.1 Test Goal

Input data from the test into the Air Leakage Rate by Fan Pressurization spreadsheet as described in paragraph CALCULATION PROGRAM via the Air Leakage Test Form. Compare output from the spreadsheet against the maximum allowable leakage defined in Section 07 27 10 BUILDING AIR BARRIER SYSTEM. The envelope passes the test if the leakage rate, as calculated using the spreadsheet, is equal to or lower than the Architectural Only leakage rate goal.

3.8.4.1.2 Preparing the Envelope for the Pressure Test - Seal All Openings through the Air Barrier

Temporarily close all perimeter windows, roof hatches and doors in the envelope perimeter except for those doors that are to remain open to accommodate blower door or trailer mounted fan test equipment installation. Seal, or isolate all other intentional openings, pathways, and fenestrations through the architectural envelope prior to pressure testing. Follow the Recommended Test Envelope Conditions identified in ASTM E1827, Table 1, for the Closed Envelope condition. These openings may include boiler flues, fuel-burning water heater flues, fuel-burning kitchen equipment, clothes dryer vents, fireplaces, wall or ceiling grilles, diffusers, and other similar openings. Before sealing flues, close their associated fuel valves and verify the associated pilot lights are extinguished. Prime all plumbing traps located within the envelope full of water. In lieu of applying tape or plastic, typical temporary sealing materials include tape and sheet plastic or a self-adhesive grille wrap. Use and apply tape and plastic in a manner that does not deface or remove paint or mar the finish of permanent surfaces. Be especially aware of residue that remains from tape applied to stainless steel surfaces such as kitchen hoods or rollup doors. For painted surfaces, use tape types that do not remove finish paint when the tape is removed. If paint is removed from the finished surface, repaint to match existing surfaces. Secure dampers closed either manually or by using the building's HVAC system controls. Use the table below for further guidance in building preparation.

Building Component	Envelope Condition
Air handling units, duct fans	As found (open) or temporarily sealed as necessary
Dampers - intake, exhaust	Physically closed or closed using control power or temporarily sealed
Diffusers, registers, grilles within the envelope	Temporarily sealed
Doors, personnel type, at the envelope perimeter	Secured closed
Doors, personnel type, within the envelope	Secured (propped) open
Doors, roll-up type, at the envelope perimeter	Closed (no additional sealing)

Building Component	Envelope Condition
Windows	Secured closed
* If the building component has an associated manual or automatic damper, consider securing the damper closed in lieu of temporarily sealing.	

3.8.4.2 Architectural Plus HVAC System Test

This test envelope includes the architectural air barrier boundary as defined on the Contract drawings plus all HVAC supply, return and exhaust systems that penetrate and terminate within said architectural air barrier boundary and that extends outward from said boundary. All associated ductwork, intake and exhaust dampers, and air moving devices, including air handling units and fans, are included in this test envelope even if they are physically located outside of the architectural air barrier boundary. The boundary extends to and includes the low leakage intake and exhaust dampers. Perform both a positive pressure test and a negative pressure test on this envelope, unless otherwise indicated.

3.8.4.2.1 Test Goal

Data from the test is to be input into the Air Leakage Rate by Fan Pressurization spreadsheet as described in paragraph CALCULATION PROGRAM via the Air Leakage Test Form. If both positive and negative pressure tests were performed, both data sets are to be input in the spreadsheet. Compare output from the spreadsheet against the leakage rate goal. The envelope passes the test if the leakage rate, as calculated using the spreadsheet, is equal to or lower than the Architectural Plus HVAC System leakage rate goal.

3.8.4.2.2 Preparing the Building for the Pressure Test

In preparation for this test, de-energize all air moving devices within this envelope by putting their controls in the Unoccupied mode. This allows the building's HVAC controls to close all associated motorized intake, exhaust, and relief dampers. Make no other changes to the HVAC systems. Temporarily sealing diffusers, grilles, registers, kitchen hoods, exhaust hoods, fans, air handling units and all other HVAC system elements with tape or plastic sheeting or any other means is not allowed. If the envelope includes a fireplace hearth do not seal it with tape and plastic. Use the table below for further guidance in building preparation.

Building Component	Envelope Condition
Air handling units, duct fans	As found (open)
Dampers - intake, exhaust	As found (no preparation)
Diffusers, registers, grilles within the envelope	As found (open)
Doors, personnel type, at the envelope perimeter	Secured closed
Doors, personnel type, within the envelope	Secured (propped) open
Doors, roll-up type, at the envelope perimeter	Closed (no preparation)
Exhaust hoods	Closed
Windows	Secured closed

3.8.5 Conducting The Pressure Test

Notify the Contracting Officer at least ten(10) working days before conducting the pressure tests to provide the Government the opportunity to witness the tests and to monitor weather forecasts for conditions favorable for testing. Do not pressure test until verifying that the continuous air barrier is in place and installed without failures in accordance with installation instructions. During the pressure test periodically inspect temporarily sealed items to ensure they are still sealed. Seals on temporarily sealed items tend to release more readily at higher pressures. Test data obtained after temporarily sealed items become unsealed cannot be used as input into the calculation program. Follow the Envelope Pressure Test Procedures in the paragraphs below. Submit detailed pressure test procedures indicating the test apparatus, the test methods and procedures, and the analysis methods to be employed for the building envelope pressure (air tightness) test. Submit these procedures not later than 60 days after Notice to Proceed.

3.8.5.1 Extend Pneumatic Tubes and Establish a Reference Differential Pressure

Confirm the various zones within the envelope have a relatively uniform interior pressure distribution by establishing a representative differential pressure between the envelope and the outdoors with blower door or trailer-mounted fans operating. The number of indoor pressure difference measurements (pneumatic hoses) required depends on the number of interior zones separated by bottle necks that could create significant pressure drops (e.g., doorways and stairwells). Extend at least four pneumatic hoses (differential pressure monitoring ports) to locations within the envelope that are physically opposite of each other. In multiple story buildings, especially those over three stories, extend hoses to multiple floors. Locate the hose ends away from the effects of air discharge from blower test equipment. Select one of the four (or more) interior hoses, one judged by the test agency to be the most unaffected by air velocity produced by blower test equipment, to serve as the interior reference pressure port. Extend at least one additional pneumatic hose to the outdoors (outdoor pressure port). To the end of this hose manifold at least four hoses together and terminate each hose on a different side of the building. With the envelope sealed and the blowers energized, measure the differential pressure using the interior reference pressure port and the four outdoor pressure ports. Then measure and record the differential pressure by individually using each of the remaining three interior hoses. Ensure each reading is within plus or minus 10 percent of the reference reading. Thus, at an average 75 Pa maximum pressure difference across the envelope, the difference between the highest and lowest interior pressure difference measurements should be 15 Pa or less. If this condition cannot be met, attempt to create additional air pathways within the envelope to minimize pressure differences within the envelope. If necessary, move the interior hose ends. See step 2.13 of the Air Leakage Test Form in Appendix A.

3.8.5.2 Bias Pressure Readings

With the fan pressurization equipment de-energized and the envelope sealed, obtain the differential pressure between the outdoors and the envelope. Record 12 bias pressure readings before the pressure test and 12 bias pressure readings after the pressure test. Each reading is the average of ten or more 1-second measurements. Include positive and negative signs for each reading. To help dampen bias pressures that significantly contribute to test pressure, reduce temperature differences between indoor and outdoor air. Temperature differences can be reduced by operating test fan equipment for a few minutes to replace most of the indoor air with outdoor air.

3.8.5.3 Testing in Both Positive and Negative Directions

The preferred method for testing a building envelope is to test in both the pressurized and depressurized directions. Testing in one direction is only allowed if opposite direction testing cannot logistically be performed due to test equipment limitations or restrictions. After obtaining the pre-test bias differential pressure readings, conduct the pressure test. Record the envelope pressures (in units of Pascals) from one interior pneumatic hose (monitoring port) and the outdoor pneumatic hose(s), averaged or manifolded, with corresponding flows (in units of cfm) for each fan. Record the flow rates at least 10 to 12 positive and 10 to 12 negative building pressure readings. If conducting both positive and negative pressure tests the lowest allowable test pressure is 40 Pa

and the highest test pressure is 85 Pa. Keep at least 25 Pa difference between the lowest and highest test pressure readings. Include the 75 Pa pressure value between the lowest and highest readings. The 10 to 12 readings in each direction are to be roughly evenly spaced along the range of pressures and flows. After testing is complete de-energize the equipment used to provide pressurization and obtain an additional 10 to 12 post-test bias pressure readings. None of the bias pressure readings are allowed to exceed 30 percent of the minimum test pressure. If these limits are exceeded the test fails and must be repeated.

3.8.5.4 Using a Building's Own Air Handling System to Pressure Test an Envelope

3.8.5.4.1 Test Setup

Temporarily seal the envelope in a manner similar to that for testing with blower door or trailer-mounted fans. To positively pressurize the envelope, de-energize all ventilation equipment and close all associated dampers, except those outside air intake dampers associated with supply fans that will be used to pressurize the building envelope. Fully open these dampers. For the negative pressure test, de-energize all ventilation equipment except for those fans that will be used to de-pressurize the envelope. All dampers associated with de-energized fans are to be closed and all exhaust dampers associated with fans used to de-pressurize the envelope will be fully opened.

3.8.5.4.2 Measuring Airflows

When using the building's own air handling system to pressure test the envelope, air flows can generally be measured using one of the following methods:

a. When testing using the building's own air handling system, ensure flow readings obtained by anemometer comply with ASTM D3464. Pitot tube or hot wire anemometer traverse in accordance with ASTM D3464.

b. Pressure compensated shrouds (especially recommended for rooftop exhaust fans)

c. Tracer gas methods for measuring airflows in ducts in accordance with ASTM E2029. Do not use tracer gas decay, constant injection, and constant concentration methods for estimating the total ventilation rate of the envelope.

3.8.5.4.3 Outdoor Air Flow Measuring Stations

Air flow stations may be used to measure outdoor airflows if one of the above methods is used to check accuracy of at least one air flow reading for each station or if the design of the HVAC system specifically placed outdoor air flow stations in locations that will yield accurate results. Field verify the accuracy of readings at the air flow measuring stations before obtaining pressure test readings.

3.8.5.5 Pressure Testing - Special Cases

3.8.5.5.1 Pressure Testing a Tall or Large Building Envelope

Pressure testing the envelope of a tall or large building may be unworkable and unrealistic using blower door or trailer-mounted

equipment. In this case, the test agency may define and pressure test separate zones or floors within the envelope and sum the leakage all of the zones to create an overall envelope leakage rate. Using this method, the test agency is to comply with the requirements of ASHRAE RP-935.

3.8.5.5.2 Pressure Testing a Multiple Isolated Zoned Building

Pressure test each exterior corner zone plus at least an additional 20 percent (as measured by floor area) of remaining zones. The Contracting Officer is responsible for selecting which of these additional zones to test. If all zones pass the pressure test it is assumed that all untested zones also pass and no further testing is required. If, however, any zone fails to pass the test's leakage requirements, re-seal, and re-test until it passes in accordance with paragraph FAILED PRESSURE TEST. Test an additional 20 percent of previously untested zones. If all tested zones pass, no further testing is needed. If any zone in this group fails the test re-seal and re-test the zone until it passes. Continue this process until all the tested zones pass. When testing a zone, the doors to all adjacent zones that share a common surface with the tested zone are to have their doors opened to the outdoors. The resulting leakage from the test zoned is that through all six surfaces (4 walls, roof, and floor, for a rectangular shaped zone).

3.8.5.5.3 Pressure Testing a Building Addition

If the existing building is occupied, coordinate the pressure test with building representatives. In preparation of the test, de-energize the air handling system serving that portion of the existing building that shares surfaces with the new building addition. Pressure testing a new building addition may also require pressurizing that part of the existing building that shares surfaces in common with the new building addition. If an air barrier is applied to the common surfaces separating the existing building from the new addition, prior to the test prop open a sufficient quantity of doors and windows to keep the existing building at the same pressure as the outdoors. If an air barrier is not applied to the common surfaces separating the existing building from the new addition, pressurize that part of the existing building that shares surfaces in common with the building addition to the same level as the as the addition using separate test pressurization equipment.

3.8.5.6 Failed Pressure Test

If the pressure test fails to meet the established criteria, use diagnostic test methods described in paragraph LOCATING LEAKS BY DIAGNOSTIC TESTING to discover the leak locations. Provide additional permanent sealing measures to reduce or eliminate leak sources discovered during diagnostic testing. Retest (perform another pressure test) after sealing has been completed. Repeat this sequence of documenting test results in the test report, performing diagnostic tests, documenting recommendations for additional sealing measures in the test report, sealing leak locations per recommendations, and re-testing as necessary until the building envelope passes the pressure test and is in compliance with the performance requirements.

3.8.5.7 Air Leakage Test Report

Report volumetric flow rates and corresponding differential pressures in cubic feet per minute (cfm) and Pascals (Pa), respectively, on the Air Leakage Test Form sample form found in Appendix A. Populate the

accompanying spreadsheet file titled Pressure Test Data Analysis with information obtained during the test. The spreadsheet uses equations found in ASTM E779 as a basis for calculating the envelope leakage rate. Other similar leakage rate calculation programs cannot be used or submitted for review. Submit a printout of the data input and output in the report. Should any air tightness (pressure) test fail, the pressure test report is to include data and results from all previous failed tests along with the final successful test data and results. Indicate if the resulting leakage rate did or did not meet the goal leakage requirement. Identify and document deficiencies in the building construction upon failure of a test to meet the specified maximum leakage rate.

Test reports on leakage tests performed using fan pressurization must meet ASTM E779 requirements; reports on tests performed utilizing blower door testing must meet ASTM E1827 requirements. Include the Test Agency Qualification Sheet, Air Leakage Test Form and Air Leakage Test Results Form in the written report. Document every test set-up condition with diagrams and photos to ensure the tests can be made repeatable. Document all pneumatic hose termination locations. Record in detail how the building envelope was prepared for the tests. Also describe in detail which building items were temporarily sealed. Include photos of test equipment and sealing measures in the report. Include an electronic (pdf) version of all test reports on a CD. If the building envelope fails to meet the leakage rate goal, provide recommendations to further seal the envelope and document these recommendations in the test report.

3.8.6 Locating Leaks By Diagnostic Testing

Use diagnostic test methods described herein to discover obvious leaks through the envelope. Perform diagnostic tests on the building envelope regardless of the envelope meeting or failing to meet the designated leakage rate goal. Use diagnostic test methods in accordance with ASTM E1186 and in conjunction with pressurization equipment, as necessary. Use the thermography diagnostic test to establish a baseline for envelope leakage. Apply additional diagnostic tests (find, feel, fog or other tests) as necessary to further define leak locations and pathways discovered using thermography or to find additional leaks not readily detected by thermography. Using a variety of diagnostic tests may help locate leaks that would otherwise go undetected if only a single diagnostic test were used. Pay special attention to locating leaks at interfaces where there is a change in materials or a change in direction of like materials. These interfaces, at a minimum, include roof/wall, wall/wall, floor/wall, wall/window, wall/door, wall/louver, roof mounted equipment/roof curb interfaces and all utility penetrations (such as ducts, pipes, and conduit) through the envelope's architecture. Also use diagnostic tests to check for leakage between the air duct and duct damper, when the damper, under normal control power, is placed in the closed position.

3.8.6.1 Sealing and Re-Testing

Should leaks be discovered during diagnostic tests, thoroughly document the exact leak locations on a floor plan so that sealing can be later applied, if required or as directed. If the envelope passes the leakage test, use the diagnostic test procedure described above to identify obvious leakage locations. Seal the leaks at the discretion of the COR based on the magnitude, location, potential for liquid moisture penetration or retention, potential for condensation, presence of daylight through an architectural surface or if the leakage location could

potentially cause rapid deterioration or mold growth of, or in the building envelope materials and assemblies. Apply sealing measures after diagnostic testing is complete and all pressurization blowers are off. To verify that the applied sealing measures are effective, re-test for leaks using the same diagnostic methods that discovered the leak. Reseal and retest until the envelope meets the leakage rate goal and all obvious leaks through the envelope are sealed.

3.8.6.2 Find Test

Use visual observation to locate daylight or artificial light streaming from the opposite side of the envelope. Observe all interfaces identified above.

3.8.6.3 Feel Test

Use the building's air handling system or blower door equipment to negatively pressurize the building envelope, to at least 25 Pa but no greater than 85 Pa, with respect to the outdoors. The larger the pressure difference, the easier discovering leaks by feeling them becomes. While inside the envelope, hand feel roof/wall, wall/wall, and floor/wall interfaces and utility penetrations (such as ducts, pipes and conduit) for leaks and note the leak locations on a floor plan. The "Feel" test may also be used to check for leaks between the ductwork and ductwork damper. To do this, positively pressurize the envelope and check for air movement from the envelope exterior.

3.8.6.4 Infrared Thermography Test

Coordinate thermography examination with the pressure test agency and the test agency's pressurization equipment. The pressure test agency is to allow adequate time for the thermographer to perform a complete thermographic examination, as described hereinafter, of the envelope interior and exterior, including readings of the roof.

3.8.6.4.1 Thermography Test Methods

Before thermographic testing, remove furniture, construction equipment, and all other obstructions both inside and outside the building as necessary to gain a clear field of view. In the Thermographic Investigation Report, document all areas where obstructions remain. For exterior thermal examination of the envelope, including readings of the roof, verify that no direct solar radiation has heated the envelope surfaces to be examined for a period of approximately 3 hours for frame construction and for approximately 8 hours for masonry veneer construction. Conduct exterior investigations after sunset, before sunrise, or on an overcast day when the influence of solar radiation can be determined to be minimal. Limit exterior examinations to times when the influence of solar radiation is minimal, such as after sunset or before sunrise or during an overcast day. Conduct thermal imaging tests only when wind speeds are less than 8 mph at the time of analysis and at the end of analysis. Document any variations in wind during the test. Document all variations of test conditions in the Thermographic Investigation Report. Test only when exterior surfaces are dry. Monitor and document ongoing test parameters, such as the temperatures inside and outside the air barrier envelope, wind speed, and differential pressure.

3.8.6.4.1.1 Thermography Testing of the Air Barrier

Test the building envelope in accordance with ISO 6781, and ASTM E1186. Perform a complete thermographic inspection consisting of the full inspection of the interior and exterior of the complete air barrier envelope, to include readings of the roof. Document envelope areas that are inaccessible for testing. Use infrared thermography technology in concert with standard pressurization methods (blower doors, trailer mounted fans or the building's own air handling systems) to locate leaks through the air barrier. Adjust the HVAC system, if possible, to create or enhance the temperature difference between the envelope interior and exterior. The minimum allowable temperature difference is 9 degrees F. Maintain this temperature difference for at least 3 hours prior to the test. Use pressurization methods to establish a minimum of +20 Pa pressure difference with respect to the outdoors while using an infrared camera to view the envelope from outdoors. When viewing with the camera from inside the envelope, keep the envelope at a pressure differential of -20 Pa with respect to the outdoors using pressure testing equipment or the building's own air handling system.

3.8.6.4.2 Thermography Test Results

Document the location of all leaks, anomalies, and unusual thermal features on a floor plan or elevation view and catalog them with a visible light picture for locating the defect for correction. The thermographer is to recommend corrective actions to eliminate the leaks, anomalies, and unusual thermal features. Where leaks are found perform corrective sealing as necessary to achieve the whole envelope air leakage rate specified. After sealing, again use thermography in concert with standard pressurization methods to verify that the air leakage has been reduced. After these leaks have been permanently sealed, note all actions taken on the drawings or in the Thermographic Investigation Report. Submit the drawings for approval as part of the Thermographic Investigation Report. Also include thermographic photos that show where leaks were discovered. Include thermograms using an imaging palette that clearly shows the observed thermal patterns indicating air leakage. The Contracting Officer's Representative is to witness all testing.

3.8.6.5 Fog Test

Before using a theatrical fog generator, disable all building smoke detectors as they may alarm when fog is issued. Coordinate fog tests and the disabling of all smoke detectors with the Contracting Officer's representative and the local fire department as necessary. Use pressure test equipment or the buildings own air handling system to positively pressurize the building envelope to at least 25 Pa but not greater than 85 Pa over the outdoors. Using a theatrical fog generator within the envelope, direct fog at suspected leakage points such as at building interfaces. Test the following interfaces: roof/wall, wall/wall, floor/wall, wall/window, roof/mounted mechanical equipment. From the vantage point immediately outside the envelope and opposite that of the interface being tested, observe the effect as the fog is issued. Detection may also be further enhanced by using a scented fog liquid or a fog liquid that produces a colored fog. Look for fog and smell for associated odor percolating through the interface. Also use smoke puffers and smoke sticks as necessary to locate leaks at these and other interface locations. If the Architectural Plus HVAC System pressure test will be/was performed introduce fog into ductwork to check for leakage between ductwork and associated dampers. After fog testing has ended, reactivate

the building smoke detectors, and notify the Contracting Officer and local fire department that the test has ended. After sealing has been completed retest these areas using fog. Seal additional leaks that are found. (Note that theatrical fog may release quantities of the water vapor, glycol, mineral oil, or other media that could damage electronics and interior finishes or cause allergic reactions. Small scale smoke trace could be used as an alternative. See "Effects of Theatrical Smokes and Fogs on Respiratory Health in the Entertainment Industry" at www.nih.gov.)

3.8.6.6 Diagnostic Test Report

Once the diagnostic tests have been completed and the leakage locations identified and sealed, document these procedures, locations, and recommendations in the diagnostic test report. Submit plan and profile drawings that thoroughly identify leak locations. Describe in detail all leak locations so that the seal-up crew knows where to apply sealing measures. After sealing measures have been applied, describe the methods used along with applicable photos of the final sealed condition.

3.8.6.6.1 Thermographic Investigation Report

Submit a report of each thermographic investigation identifying the thermal discontinuities in the thermal control layer. Indicate in the final report locations to which improvements for both the air control layer and the thermal control layer were made to reduce air leaks and correct discontinuities in the thermal control layer. Include in the report some selected radiometric images of suspected failure points in the air barrier envelope that indicate before and after conditions. Devote a chapter(s) of the Thermographic Investigation Report to identifying suspected points of thermal bridging, moisture migration through roofs and walls, and insulation voids. Indicate in the final report improvements that were made to the envelope to reduce air leaks. Include the following items in the report:

a. Brief description of the building construction

b. Types of interior and exterior surface materials used in the building.

c. Geographical orientation of the building with a description of the exterior surroundings including other buildings, vegetation, landscaping, and surface water drainage.

d. Camera brand, model and serial number, and most recent calibration date; optional lenses with serial numbers (if applicable)

e. Thermographer's and Government Inspector's names

f. Date and time of tests

g. Air temperature and humidity inside the air barrier envelope

h. Outdoor air temperature and humidity

i. General information for the last 12 hours on the solar radiation conditions in the geographic area where the test is being performed.

j. Ambient conditions such as precipitation and wind direction and speed occurring with the last 24 hours, as applicable. Refer to specific requirements in each section of each thermographic inspection type for

requirements in each specific area.

k. Documentation of those portions of the building envelope which were not within test conditions when the scan was performed, and which portions were obstructed by adjacent structures, interior furnishings, intervening cavities, or reflective surfaces.

l. Other relevant information, which may have influenced test results.

m. Drawings, sketches, floor plans and photographs detailing the locations in the buildings where thermograms were taken detailing possible irregularities in the components being tested.

n. Thermal images taken during the inspection with their relative locations and written or voiced recorded explanations of the anomaly listed along with visual and reference images.

o. An identification of the aspects or components of the building being examined.

p. Explanations for the type and the extent of each construction defect observed during the inspection.

q. Any results from additional measurements and investigations. Identify additional equipment used and support with type, model number, serial number, and date of most recent calibrated.

3.8.6.6.2 Fog Test Report

Document all turbulent air flow and dead air spaces within the envelope. Report fog behavior as it exits from or is entrained within the building. Include a floor plan in the report that documents the locations where fog passed through the envelope.

3.8.7 Calculation Program

To calculate the envelope leakage rate and other required outputs, input the data obtained during the pressure tests as documented in the Air Leakage Test Form (Appendix A) into the Air Leakage Rate by Fan Pressurization Excel spreadsheet. This spreadsheet can be found at the following web site:
http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/forms-graphic

3.8.8 After Completion Of The Pressure And Diagnostic Test

After all pressure and diagnostic testing has been completed unseal all temporarily sealed items. Unless otherwise directed by the Contracting Officer, return all dampers, doors, and windows to their pre-test condition. Remove tape and plastic from all temporarily sealed openings, being careful not to deface painted surfaces. If paint is removed from finished surfaces, repaint to match existing surfaces. Unless otherwise directed by the Contracting Officer's representative, return fuel (gas) valves to their pre-test position and relight pilot lights. Return all fans and air handling units to pre-test conditions. Restore smoke/fire detectors to operating condition.

3.8.9 Repair And Protection

Repair and protection are the Contractor's responsibility, regardless of

the assignment of responsibility for testing, inspection, and similar services. Upon completion of inspection, testing, or sample taking and similar services, repair damaged construction and restore substrates and finishes, protect construction exposed by or for quality control service activities, and protect repaired construction.

3.9 TRAINING

The Building Enclosure Commissioning Specialist must review the training plan required by Section 01 78 00 OPERATION AND MAINTENANCE DATA and identify any deficiencies to the Contracting Officer's Representative and the Contractor's Quality Control Personnel.

The Commissioning Provider is responsible for overseeing and approving the training plan required by Section 01 78 00 OPERATION AND MAINTENANCE DATA and identifying any deficiencies to the Contracting Officer's Representative and the Contractor's Quality Control Personnel.

Coordinate, schedule, and document training of all commissioned systems as required by Section 01 91 00.15 BUILDING COMMISSIONING paragraph titled "Training Plan".

3.10 FINAL BECx REPORT

The BECx must provide a final BECx report that includes information generated by the BECx process including: BECx meeting minutes, design reports, test reports, the final OPR, BoD, final BECx Plan, issue and resolution log, site observations, as-built drawings (provided by the Contractor), submittals, record of training, and recommended preventive maintenance actions and intervals.

The BECxP must ensure the Final BECx Report is submitted as a portion of the Final Commissioning Report for the project, as defined in Section 01 91 00.15 BUILDING COMMISSIONING. Submit report within 14 calendar days of completion of all commissioning efforts.

3.11 APPENDICES

The following forms are available for download as a MS Word file at http://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs/forms-graphic

Appendix A - Air Leakage Test Form
Appendix B - Air Leakage Test Results Form
Appendix C - Test Agency Qualifications Sheet

-- End of Section --

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SECTION 02 41 00

DEMOLITION
08/22

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 145	(1991; R 2012) Standard Specification for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
AASHTO T 180	(2017) Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP A10.6	(2006) Safety & Health Program Requirements for Demolition Operations - American National Standard for Construction and Demolition Operations

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2014) Safety -- Safety and Health Requirements Manual

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 61	National Emission Standards for Hazardous Air Pollutants

1.2 PROJECT DESCRIPTION

1.2.1 Definitions

1.2.1.1 Demolition

Demolition is the process of tearing apart and removing any feature of a facility together with any related handling and disposal operations.

1.2.1.2 Deconstruction

Deconstruction is the process of taking apart a facility with the primary goal of preserving the value of all useful building materials.

1.2.1.3 Demolition Plan

Demolition Plan is the planned steps and processes for managing demolition activities and identifying the required sequencing activities and disposal mechanisms.

1.2.1.4 Deconstruction Plan

Deconstruction Plan is the planned steps and processes for dismantling all or portions of a structure or assembly, to include managing sequencing activities, storage, re-installation activities, salvage and disposal mechanisms.

1.2.2 Demolition/Deconstruction Plan

Prepare a Demolition Plan and submit proposed demolition, and removal procedures for approval before work is started. Include in the plan procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress. Coordinate with Waste Management Plan in accordance with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL. Provide procedures for safe conduct of the work in accordance with EM 385-1-1. Plan must be approved by Contracting Officer prior to work beginning.

1.2.3 General Requirements

Do not begin demolition or deconstruction until authorization is received from the Contracting Officer. Remove rubbish and debris from the project site; do not allow accumulations inside or outside the buildings . The work includes demolition, , salvage of identified items and materials, and removal of resulting rubbish and debris. Remove rubbish and debris from Government property daily, unless otherwise directed. Store materials that cannot be removed daily in areas specified by the Contracting Officer. In the interest of occupational safety and health, perform the work in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections.

1.3 ITEMS TO REMAIN IN PLACE

Comply with FAR 52.236-9 to protect existing vegetation, structures, equipment, utilities, and improvements. Coordinate the work of this section with all other work indicated. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract. Do not overload pavements to remain. Provide new supports and reinforcement for existing construction weakened by demolition, deconstruction, or removal work. Repairs, reinforcement, or structural replacement require approval by the Contracting Officer prior to performing such work.

1.3.1 Existing Construction Limits and Protection

Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction. Provide temporary shoring and bracing for support of building components to prevent settlement or other movement. Provide protective measures to control accumulation and migration of dust and dirt in all work areas. Remove snow, dust, dirt, and debris from work areas daily.

1.3.2 Trees

Protect trees within the project site which might be damaged during demolition or deconstruction, and which are indicated to be left in place, by a 6 foot high fence. Erect and secure fence a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Replace any tree designated to remain that is damaged during the work under this contract with like-kind or as approved by the Contracting Officer.

1.3.3 Utility Service

Maintain existing utilities indicated to stay in service and protect against damage during demolition and deconstruction operations. Prior to start of work, utilities serving each area of alteration or removal will be shut off by the utility provider and disconnected and sealed by the Contractor the utility provider will disconnect and seal utilities serving each area of alteration or removal upon written request from the Contractor.

1.3.4 Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities. Ensure that no elements determined to be unstable are left unsupported and place and secure bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract.

1.4 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted .

1.5 AVAILABILITY OF WORK AREAS

Areas in which the work is to be accomplished will be available at contract award.

1.6 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Demolition Plan; G

Existing Conditions

SD-07 Certificates

Notification; G

1.7 QUALITY ASSURANCE

Submit timely notification of demolition projects to Federal, State, regional, and local authorities in accordance with 40 CFR 61, Subpart M. Notify the Regional Office of the United States Environmental Protection Agency (USEPA), State's environmental protection agency, and local air pollution control district/agency and the Contracting Officer in writing 10 working days prior to the commencement of work in accordance with 40 CFR 61, Subpart M. Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," conform to the safety requirements contained in ASSP A10.6. Comply with the Environmental Protection Agency requirements specified. Use of explosives will not be permitted.

1.7.1 Dust and Debris Control

Prevent the spread of dust and debris and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution.

1.8 PROTECTION

1.8.1 Traffic Control Signs

a. Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights. Notify the Contracting Officer prior to beginning such work.

1.8.2 Protection of Personnel

Before, during and after the demolition and deconstruction work continuously evaluate the condition of the site specific features being demolished and take immediate action to protect all personnel working in and around the project site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.9 FOREIGN OBJECT DAMAGE (FOD)

Aircraft and aircraft engines are subject to FOD from debris and waste material lying on airfield pavements. Remove all such materials that may appear on operational aircraft pavements due to the Contractor's operations. If necessary, the Contracting Officer may require the Contractor to install a temporary barricade at the Contractor's expense to control the spread of FOD potential debris. Provide a barricade consisting of a fence covered with a fabric designed to stop the spread of debris. Anchor the fence and fabric to prevent displacement by winds or jet/prop blasts. Remove barricade when no longer required.

1.10 RELOCATIONS

Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Repair or replace items to be relocated which are damaged by the Contractor with new undamaged items as approved by the Contracting Officer.

1.11 EXISTING CONDITIONS

Before beginning any demolition or deconstruction work, survey the site and examine the drawings and specifications to determine the extent of the work. Record existing conditions in the presence of the Contracting Officer or the Contracting Officer's Representative showing the condition of structures and other facilities adjacent to areas of alteration or removal. Photographs or electronic images with a minimum resolution of 3072 x 2304 pixels, capable of a print resolution of 300 dpi, will be acceptable as a record of existing conditions. It is the Contractor's responsibility to verify and document all required outages which will be required during the course of work, and to note these outages on the record document. Submit survey results to the Contracting Officer or the Contracting Officer's Representative.

PART 2 PRODUCTS

2.1 FILL MATERIAL

a. Comply with excavating, backfilling, and compacting procedures for soils used as backfill material to fill basements, voids, depressions or excavations resulting from demolition or deconstruction of structures.

b. Provide fill material conforming to the definition of satisfactory soil material as defined in AASHTO M 145, Soil Classification Groups A-1, A-2-4, A-2-5 and A-3. In addition, fill material must be free from roots and other organic matter, trash, debris, frozen materials, and stones larger than 2 inches in any dimension.

c. Proposed fill material must be sampled and tested by an approved soil testing laboratory, as follows:

Soil classification	AASHTO M 145
Moisture-density relations	AASHTO T 180, Method B or D

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

Inspect and evaluate existing structures onsite for reuse. Disassemble existing construction scheduled to be removed for reuse. Dismantled and removed materials are to be separated, set aside, and prepared as specified, and stored or delivered to a collection point for reuse, remanufacture, recycling, or other disposal, as specified. Designate materials for reuse onsite whenever possible.

3.1.1 Utilities and Related Equipment

3.1.1.1 General Requirements

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Contracting Officer. Do not interrupt existing utilities serving facilities occupied and used by the Government except when approved in writing and then only after temporary utility services have been approved and provided. Do not begin demolition

or deconstruction work until all utility disconnections have been made. Shut off and cap utilities for future use, as indicated.

3.1.1.2 Disconnecting Existing Utilities

Remove existing utilities uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer. When utility lines are encountered but are not indicated on the drawings, notify the Contracting Officer prior to further work in that area. Remove meters and related equipment and deliver to a location on the station in accordance with instructions of the Contracting Officer.

3.1.2 Chain Link Fencing

Remove chain link fencing, gates and other related salvaged items scheduled for removal and transport to designated areas. Remove gates as whole units. Cut chain link fabric to 25 foot lengths and store in rolls off the ground.

3.1.3 Paving and Slabs

Remove concrete and asphaltic concrete paving and slabs including aggregate base to a depth of 12 inches below new finish grade. Provide neat sawcuts at limits of pavement removal as indicated. Move, grind and store pavement and slabs designated to be recycled and utilized in this project as directed by the Contracting Officer. Remove pavement and slabs not to be used in this project from the project site at Contractor's expense.

3.1.4 Concrete

Saw concrete along straight lines to a depth of a minimum 2 inch. Make each cut in walls perpendicular to the face and in alignment with the cut in the opposite face. Break out the remainder of the concrete provided that the broken area is concealed in the finished work, and the remaining concrete is sound. At locations where the broken face cannot be concealed, grind smooth or saw cut entirely through the concrete. Sawcuts in existing concrete sidewalk and concrete pads must be at the nearest existing expansion joint or weakened plane joint and at full depth.

3.1.5 Mechanical Equipment and Fixtures

3.1.5.1 Preparation for Storage

Remove water, dirt, dust, and foreign matter from units; drain tanks, piping and fixtures; if previously used to store flammable, explosive, or other dangerous liquids, steam clean interiors. Seal openings with caps, plates, or plugs. Secure motors attached by flexible connections to the unit. Change lubricating systems with the proper oil or grease.

3.1.6 Electrical Equipment and Fixtures

3.1.6.1 Electrical Devices

Remove and salvage switches, switchgear, transformers, conductors including wire and nonmetallic sheathed and flexible armored cable, regulators, meters, instruments, plates, circuit breakers, panelboards, outlet boxes, and similar items. Box and tag these items for

identification according to type and size.

3.2 CONCURRENT EARTH-MOVING OPERATIONS

Do not begin excavation, filling, and other earth-moving operations that are sequential to demolition or deconstruction work in areas occupied by structures to be demolished or deconstructed until all demolition and deconstruction in the area has been completed and debris removed. Fill holes, open basements and other hazardous openings.

3.3 DISPOSITION OF MATERIAL

3.3.1 Title to Materials

Except for salvaged items specified in related Sections, and for materials or equipment scheduled for salvage, all materials and equipment removed and not reused or salvaged, become the property of the Contractor and must be removed from Government property. Materials approved for storage by the Contracting Officer must be removed before completion of the contract. Title to materials resulting from demolition and deconstruction, and materials and equipment to be removed, is vested in the Contractor upon approval by the Contracting Officer. The Government will not be responsible for the condition or loss of, or damage to, such property after contract award. Showing for sale or selling materials and equipment on site is prohibited.

3.3.2 Reuse of Materials and Equipment

Remove and store materials and equipment listed in the Demolition Plan to be reused or relocated to prevent damage, and reinstall as the work progresses. Coordinate the re-use of materials and equipment with the re-use requirements in accordance with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL. Capture re-use of materials in the diversion calculations for the project.

3.3.3 Disposal of Ozone Depleting Substance (ODS)

3.3.3.1 Special Instructions

No more than one type of ODS is permitted in each container. Apply a warning/hazardous label to the containers in accordance with Department of Transportation regulations. Provide a tag with the following information on all cylinders including but not limited to fire extinguishers, spheres, or canisters containing an ODS:

a. Activity name and unit identification code

b. Activity point of contact and phone number

c. Type of ODS and pounds of ODS contained

d. Date of shipment

e. National stock number (for information, call (804) 279-4525).

3.4 CLEANUP

Remove debris and rubbish from project site and similar excavations. Remove and transport the debris in a manner that prevents spillage on

streets or adjacent areas. Apply local regulations regarding hauling and disposal.

3.5 DISPOSAL OF REMOVED MATERIALS

3.5.1 Regulation of Removed Materials

Dispose of debris, rubbish, scrap, and other nonsalvageable materials resulting from removal operations with all applicable federal, state and local regulations as contractually specified in the Waste Management Plan.

3.5.2 Burning on Government Property

Burning of materials removed from demolished and deconstructed structures will not be permitted on Government property.

3.5.3 Removal to Spoil Areas on Government Property

Transport noncombustible materials removed from demolition and deconstruction structures to designated spoil areas on Government property.

3.5.4 Removal from Government Property

Transport waste materials removed from demolished and deconstructed structures, except waste soil, from Government property for legal disposal. Dispose of waste soil as directed.

3.6 REUSE OF SALVAGED ITEMS

Recondition salvaged materials and equipment designated for reuse before installation. Replace items damaged during removal and salvage operations or restore them as necessary to usable condition.

-- End of Section --

SECTION 03 30 00

CAST-IN-PLACE CONCRETE
02/19, CHG 6: 11/23

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 117	(2010; R 2015) Specifications for Tolerances for Concrete Construction and Materials and Commentary
ACI 121R	(2008) Guide for Concrete Construction Quality Systems in Conformance with ISO 9001
ACI 301	(2020) Specifications for Structural Concrete
ACI 302.1R	(2015) Guide for Concrete Floor and Slab Construction
ACI 304.2R	(2017) Guide to Placing Concrete by Pumping Methods
ACI 304R	(2000; R 2009) Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI 305R	(2020) Guide to Hot Weather Concreting
ACI 306.1	(1990; R 2002) Standard Specification for Cold Weather Concreting
ACI 306R	(2016) Guide to Cold Weather Concreting
ACI 308.1	(2011) Specification for Curing Concrete
ACI SP-2	(2007; Abstract: 10th Edition) ACI Manual of Concrete Inspection
ACI SP-15	(2011) Field Reference Manual: Standard Specifications for Structural Concrete ACI 301-05 with Selected ACI References

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4	(1995; R 2004) Basic Hardboard

AMERICAN WELDING SOCIETY (AWS)

AWS D1.4/D1.4M	(2018) Structural Welding Code -

Reinforcing Steel

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A53/A53M	(2022) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A184/A184M	(2019) Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615/A615M	(2022) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A706/A706M	(2022a) Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A780/A780M	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A884/A884M	(2019) Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
ASTM A934/A934M	(2022) Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A970/A970M	(2018) Standard Specification for Headed Steel Bars for Concrete Reinforcement
ASTM A996/A996M	(2016) Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
ASTM A1022/A1022M	(2016b) Standard Specification for Deformed and Plain Stainless Steel Wire and Welded Wire for Concrete Reinforcement
ASTM A1044/A1044M	(2016a) Standard Specification for Steel Stud Assemblies for Shear Reinforcement of Concrete
ASTM A1060/A1060M	(2016b) Standard Specification for Zinc-Coated (Galvanized) Steel Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A1064/A1064M	(2022) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

ASTM C31/C31M	(2023) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33/C33M	(2023) Standard Specification for Concrete Aggregates
ASTM C39/C39M	(2023) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C42/C42M	(2020) Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C78/C78M	(2022) Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C94/C94M	(2023) Standard Specification for Ready-Mixed Concrete
ASTM C136/C136M	(2019) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C143/C143M	(2020) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150/C150M	(2022) Standard Specification for Portland Cement
ASTM C172/C172M	(2017) Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173/C173M	(2016) Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C231/C231M	(2022) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260/C260M	(2010a; R 2016) Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C311/C311M	(2022) Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
ASTM C330/C330M	(2017a) Standard Specification for Lightweight Aggregates for Structural Concrete
ASTM C494/C494M	(2019; E 2022) Standard Specification for Chemical Admixtures for Concrete
ASTM C595/C595M	(2023) Standard Specification for Blended Hydraulic Cements

ASTM C618	(2023; E 2023) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C845/C845M	(2018) Standard Specification for Expansive Hydraulic Cement
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C989/C989M	(2022) Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1012/C1012M	(2018b) Standard Test Method for Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate Solution
ASTM C1017/C1017M	(2013; E 2015) Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1077	(2017) Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1107/C1107M	(2020) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C1157/C1157M	(2023) Standard Performance Specification for Hydraulic Cement
ASTM C1218/C1218M	(2020c) Standard Test Method for Water-Soluble Chloride in Mortar and Concrete
ASTM C1240	(2020) Standard Specification for Silica Fume Used in Cementitious Mixtures
ASTM C1260	(2021) Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1293	(2008; R 2015) Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction
ASTM C1567	(2023) Standard Test Method for Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
ASTM C1602/C1602M	(2022) Standard Specification for Mixing Water Used in Production of Hydraulic Cement Concrete
ASTM C1778	(2016) Standard Guide for Reducing the Risk of Deleterious Alkali-Aggregate Reaction in Concrete

ASTM D412	(2016; R 2021) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D471	(2016a) Standard Test Method for Rubber Property - Effect of Liquids
ASTM D1751	(2018) Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D1752	(2018) Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D2628	(1991; R 2016) Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements
ASTM D2835	(1989; R 2017) Standard Specification for Lubricant for Installation of Preformed Compression Seals in Concrete Pavements
ASTM D5759	(2012; R 2020) Characterization of Coal Fly Ash and Clean Coal Combustion Fly Ash for Potential Uses
ASTM D6690	(2015) Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM E96/E96M	(2022a; E 2023) Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
ASTM E329	(2023) Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
ASTM E1155	(2020) Standard Test Method for Determining Floor Flatness and Floor Levelness Numbers
ASTM E1643	(2018a) Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
ASTM E1745	(2017; R 2023) Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

CRSI 10MSP	(2018; Errata 2019) Manual of Standard

	Practice
CRSI RB4.1	(2016) Supports for Reinforcement Used in Concrete

FOREST STEWARDSHIP COUNCIL (FSC)

FSC STD 01 001	(2015) Principles and Criteria for Forest Stewardship

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST PS 1	(2009) DOC Voluntary Product Standard PS 1-07, Structural Plywood

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 104	(1980) Method of Calculation of the Fineness Modulus of Aggregate
COE CRD-C 513	(1974) Corps of Engineers Specifications for Rubber Waterstops
COE CRD-C 572	(1974) Corps of Engineers Specifications for Polyvinylchloride Waterstops

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC	(2013) Leadership in Energy and Environmental Design(tm) New Construction Rating System

1.2 DEFINITIONS

a. "Cementitious material" as used herein must include all portland cement, pozzolan, fly ash, slag cement, and silica fume.

b. "Exposed to public view" means situated so that it can be seen from eye level from a public location after completion of the building. A public location is accessible to persons not responsible for operation or maintenance of the building.

c. "Chemical admixtures" are materials in the form of powder or fluids that are added to the concrete to give it certain characteristics not obtainable with plain concrete mixes.

d. "Supplementary cementing materials" (SCM) include coal fly ash, silica fume, slag cement, natural or calcined pozzolans, and ultra-fine coal ash when used in such proportions to replace the portland cement that result in improvement to sustainability and durability and reduced cost.

e. "Design strength" (f'c) is the specified compressive strength of concrete at time(s) specified in this section to meet structural design criteria.

f. "Mass Concrete" is any concrete system that approaches a maximum temperature of 158 degrees F within the first 72 hours of placement. In addition, it includes all concrete elements with a section

thickness of 3 feet or more regardless of temperature.

g. "Mixture proportioning" is the process of designing concrete mixture proportions to enable it to meet the strength, service life and constructability requirements of the project while minimizing the initial and life-cycle cost.

h. "Mixture proportions" are the masses or volumes of individual ingredients used to make a unit measure (cubic meter or cubic yard) of concrete.

i. "Pozzolan" is a siliceous or siliceous and aluminous material, which in itself possesses little or no cementitious value but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties.

j. "Workability (or consistence)" is the ability of a fresh (plastic) concrete mix to fill the form/mould properly with the desired work (vibration) and without reducing the concrete's quality. Workability depends on water content, chemical admixtures, aggregate (shape and size distribution), cementitious content and age (level of hydration).

1.3 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Concrete Curing Plan

Quality Control Program; G

Quality Control Personnel Certifications; G

Quality Control Organizational Chart

Laboratory Accreditation; G

SD-02 Shop Drawings

Formwork

Reinforcing Steel; G

SD-03 Product Data

Joint Sealants

Joint Filler

Formwork Materials

Cementitious Materials

Vapor Retarder

Concrete Curing Materials

Reinforcement; (LEED NC)

Liquid Chemical Floor Hardeners and Sealers

Admixtures

Mechanical Reinforcing Bar Connectors

Waterstops

Local/Regional Materials; (LEED NC)

Biodegradable Form Release Agent

Pumping Concrete

Finishing Plan

Nonshrink Grout

SD-04 Samples

SD-05 Design Data

Concrete Mix Design; G

SD-06 Test Reports

Concrete Mix Design; G

Fly Ash

Pozzolan

Slag Cement

Aggregates

Tolerance Report

Compressive Strength Tests; G

Air Content

Slump Tests

Water

SD-07 Certificates

Reinforcing Bars

Welder Qualifications

VOC Content for Form Release Agents, Curing Compounds, and Concrete Penetrating Sealers

Safety Data Sheets

Forest Stewardship Council (FSC) Certification

Field Testing Technician and Testing Agency

Report for ASTM C1567, ASR Testing for Potential Alkali Silika Reactivity

SD-08 Manufacturer's Instructions

Liquid Chemical Floor Hardeners and Sealers

Joint Sealants

Curing Compound

1.4 MODIFICATION OF REFERENCES

Accomplish work in accordance with ACI publications except as modified herein. Consider the advisory or recommended provisions to be mandatory. Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Contracting Officer.

1.5 DELIVERY, STORAGE, AND HANDLING

Follow ACI 301, ACI 304R and ASTM A934/A934M requirements and recommendations. Do not deliver concrete until vapor retarder, forms, reinforcement, embedded items, and chamfer strips are in place and ready for concrete placement. Do not store concrete curing compounds or sealers with materials that have a high capacity to adsorb volatile organic compound (VOC) emissions.. Do not store concrete curing compounds or sealers in occupied spaces.

1.5.1 Reinforcement

Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground to avoid excessive rusting. Protect from contaminants such as grease, oil, and dirt. Ensure bar sizes can be accurately identified after bundles are broken and tags removed.

1.6 QUALITY ASSURANCE

1.6.1 Design Data

1.6.1.1 Concrete Mix Design

Sixty days minimum prior to concrete placement, submit a mix design for each strength and type of concrete. Submit all documentation required in ACI 301 Section 4 and as specified in this section. Submit a complete list of materials including type; brand; source and amount of cement, supplementary cementitious materials, fibers, and admixtures; and applicable reference specifications. Submit mill test and all other test for cement, supplementary cementitious materials, aggregates, and admixtures. Provide documentation of maximum nominal aggregate size, gradation analysis, percentage retained and passing sieve, and a graph of percentage retained verses sieve size. Provide mix proportion data using at least three different water-cementitious material ratios for each type of mixture, which produce a range of strength encompassing those required

for each type of concrete required. If source material changes, resubmit mix proportion data using revised source material. Provide only materials that have been proven by trial mix studies to meet the requirements of this specification, unless otherwise approved in writing by the Contracting Officer. Indicate clearly in the submittal where each mix design is used when more than one mix design is submitted. Resubmit data on concrete components if the qualities or source of components changes. Required average strength can be documented by field experience if field strength test data are available and represent a single group of at least 10 consecutive strength tests for one mixture, using materials and conditions similar to those expected for work, and encompassing a period of not less than 45 days. The average of field strength tests shall equal or exceed fcr'. Changes in materials, conditions, and proportions within the test record shall not have been more closely restricted than those for the proposed work. Test records shall not be more than 24 months old. Obtain mix design approval from the contracting officer prior to concrete placement.

1.6.2 Shop Drawings

1.6.2.1 Reinforcing Steel

Indicate bending diagrams, assembly diagrams, splicing and laps of bars, shapes, dimensions, and details of bar reinforcing, accessories, and concrete cover. Do not scale dimensions from structural drawings to determine lengths of reinforcing bars. Reproductions of contract drawings are unacceptable.

1.6.3 Control Submittals

1.6.3.1 Concrete Curing Plan

Submit proposed materials, methods and duration for curing concrete elements in accordance with ACI 308.1.

1.6.3.2 Pumping Concrete

Submit proposed materials and methods for pumping concrete. Submittal must include mix designs, pumping equipment including type of pump and size and material for pipe, and maximum length and height concrete is to be pumped.

1.6.3.3 Finishing Plan

Submit proposed material and procedures to be used in obtaining the finish for the floors. Include qualification of person to be used for obtaining floor tolerance measurement, description of measuring equipment to be used, and a sketch showing lines and locations the measuring equipment will follow.

1.6.3.4 VOC Content for form release agents, curing compounds, and concrete penetrating sealers

Submit certification for the form release agent, curing compounds, and concrete penetrating sealers that indicate the VOC content of each product.

1.6.3.5 Safety Data Sheets

Submit Safety Data Sheets (SDS) for all materials that are regulated for

hazardous health effects. SDS must be readily accessible during each work shift to employees when they are at the construction site.

1.6.4 Test Reports

1.6.4.1 Fly Ash and Pozzolan

Submit test results in accordance with ASTM C618 for fly ash and pozzolan. Submit test results performed within 6 months of submittal date.

1.6.4.2 Slag Cement

Submit test results in accordance with ASTM C989/C989M for slag cement. Submit test results performed within 6 months of submittal date.

1.6.4.3 Aggregates

Submit test results in accordance with ASTM C33/C33M, or ASTM C330/C330M for lightweight aggregate, and ASTM C1293 or ASTM C1567 as required in the paragraph titled ALKALI-AGGREGATE REACTION.

1.6.5 Field Samples

1.6.6 Quality Control Program

Develop and submit for approval a concrete quality control program in accordance with the guidelines of ACI 121R and as specified herein. The plan must include approved laboratories. Provide direct oversight for the concrete qualification program inclusive of associated sampling and testing. All quality control reports must be provided to the Contracting Officer, Quality Manager and Concrete Supplier. Maintain a copy of ACI SP-15 and CRSI 10MSP at project site.

1.6.7 Quality Control Personnel Certifications

The Contractor must submit for approval the responsibilities of the various quality control personnel, including the names and qualifications of the individuals in those positions and a quality control organizational chart defining the quality control hierarchy and the responsibility of the various positions. Quality control personnel must be employed by the Contractor.

Submit American Concrete Institute certification for the following:

a. CQC personnel responsible for inspection of concrete operations.

b. Lead Foreman or Journeyman of the Concrete Placing, Finishing, and Curing Crews.

c. Field Testing Technicians: ACI Concrete Field Testing Technician, Grade I.

1.6.7.1 Quality Manager Qualifications

The quality manager must hold a current license as a professional engineer in a U.S. state or territory with experience on at least five similar projects. Evidence of extraordinary proven experience may be considered by the Contracting Officer as sufficient to act as the Quality Manager.

1.6.7.2 Field Testing Technician and Testing Agency

Submit data on qualifications of proposed testing agency and technicians for approval by the Contracting Officer prior to performing testing on concrete.

a. Work on concrete under this contract must be performed by an ACI Concrete Field Testing Technician Grade 1 qualified in accordance with ACI SP-2 or equivalent. Equivalent certification programs must include requirements for written and performance examinations as stipulated in ACI SP-2.

b. Testing agencies that perform testing services on reinforcing steel must meet the requirements of ASTM E329.

c. Testing agencies that perform testing services on concrete materials must meet the requirements of ASTM C1077.

1.6.8 Laboratory Qualifications for Concrete Qualification Testing

The concrete testing laboratory must have the necessary equipment and experience to accomplish required testing. The laboratory must meet the requirements of ASTM C1077 and be Cement and Concrete Reference Laboratory (CCRL) inspected.

1.6.9 Laboratory Accreditation

Laboratory and testing facilities must be provided by and at the expense of the Contractor. The laboratories performing the tests must be accredited in accordance with ASTM C1077, including ASTM C78/C78M and ASTM C1260. The accreditation must be current and must include the required test methods, as specified. Furthermore, the testing must comply with the following requirements:

a. Aggregate Testing and Mix Proportioning: Aggregate testing and mixture proportioning studies must be performed by an accredited laboratory and under the direction of a registered professional engineer in a U.S. state or territory competent in concrete materials who is competent in concrete materials and must sign all reports and designs.

b. Acceptance Testing: Furnish all materials, labor, and facilities required for molding, curing, testing, and protecting test specimens at the site and in the laboratory. Furnish and maintain boxes or other facilities suitable for storing and curing the specimens at the site while in the mold within the temperature range stipulated by ASTM C31/C31M.

c. Contractor Quality Control: All sampling and testing must be performed by an approved, onsite, independent, accredited laboratory.

1.7 ENVIRONMENTAL REQUIREMENTS

Provide space ventilation according to material manufacturer recommendations, at a minimum, during and following installation of concrete curing compound and sealer. Maintain one of the following ventilation conditions during the curing period or for 72 hours after installation:

a. Supply 100 percent outside air 24 hours a day.

b. Supply airflow at a rate of 6 air changes per hour, when outside temperatures are between 55 degrees F and 84 degrees F and humidity is between 30 percent and 60 percent.

c. Supply airflow at a rate of 1.5 air changes per hour, when outside air conditions are not within the range stipulated above.

1.7.1 Submittals for Environmental Performance

a. Provide data indication the percentage of post-industrial pozzolan (fly ash, slag cement) cement substitution as a percentage of the full product composite by weight.

b. Provide data indicating the percentage of post-industrial and post-consumer recycled content aggregate.

c. Provide product data indicating the percentage of post-consumer recycled steel content in each type of steel reinforcement as a percentage of the full product composite by weight.

d. Provide product data stating the location where all products were manufactured

e. For projects using FSC certified formwork, provide chain-of-custody documentation for all certified wood products.

f. For projects using reusable formwork, provide data showing how formwork is reused.

g. Provide SDS product information data showing that form release agents meet any environmental performance goals such as using vegetable and soy based products.

h. Provide SDS product information data showing that concrete adhesives meet any environmental performance goals including low emitting, low volatile organic compound products.

1.8 SUSTAINABLE DESIGN REQUIREMENTS

1.8.1 Local/Regional Materials

Use materials or products extracted, harvested, or recovered, as well as manufactured, within a 500 mile radius from the project site, if available from a minimum of three sources.See Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING for cumulative total local material requirements. Concrete materials may be locally available. Submit documentation indicating distance between manufacturing facility and the project site. Indicate distance of raw material origin from the project site. Indicate relative dollar value of local/regional materials to total dollar value of products included in project.

1.8.2 Forest Stewardship Council (FSC) Certification

Use FSC-certified wood where specified. Provide letter of certification signed by lumber supplier. Indicate compliance with FSC STD 01 001 and identify certifying organization. Submit FSC certification numbers; identify each certified product on a line-item basis. Submit copies of invoices bearing the FSC certification numbers.

1.9 QUALIFICATIONS FOR WELDING WORK

Welding procedures must be in accordance with AWS D1.4/D1.4M.

Verify that Welder qualifications are in accordance with AWS D1.4/D1.4M for welding of reinforcement or under an equivalent qualification test approved in advance. Welders are permitted to do only the type of welding for which each is specifically qualified.

PART 2 PRODUCTS

2.1 FORMWORK MATERIALS

a. Form-facing material in contact with concrete must be plywood,. Submit product information on proposed form-facing materials if different from that specified herein.

b. Design formwork, shores, reshores, and backshores to support loads transmitted to them and to comply with applicable building code requirements.

c. Design formwork and shoring for load redistribution resulting from stressing of post-tensioned reinforcement. Ensure that formwork allows movement resulting from application of prestressing force.

d. Design formwork to withstand pressure resulting from placement and vibration of concrete and to maintain specified tolerances.

e. Design formwork to accommodate waterstop materials in joints at locations indicated in Contract Documents.

f. Provide temporary openings in formwork if needed to facilitate cleaning and inspection.

g. Design formwork joints to inhibit leakage of mortar.

h. Limit deflection of facing materials for concrete surfaces exposed to view to 1/240 of center-to-center spacing of facing supports.

i. Do not use earth cuts as forms for vertical or sloping surfaces.

j. Submit product information on proposed form-facing materials if different from that specified herein.

m. Submit procedure for reshoring and backshoring, including drawings signed and sealed by a licensed design engineer. Include on shop drawings the formwork removal procedure and magnitude of construction loads used for design of reshoring or backshoring system. Indicate in procedure the magnitude of live and dead loads assumed for required capacity of the structure at time of reshoring or backshoring.

n. Submit manufacturer's product data on form liner proposed for use with each formed surface.

2.1.1 Wood Forms

Use lumber as specified in Section 06 10 00 ROUGH CARPENTRY and as follows. Provide lumber that is square edged or tongue-and-groove boards,

free of raised grain, knotholes, or other surface defects. Provide plywood that complies with NIST PS 1, B-B concrete form panels or better or AHA A135.4, hardboard for smooth form lining.

2.1.1.1 Concrete Form Plywood (Standard Rough)

Provide plywood that conforms to NIST PS 1, B-B, concrete form, not less than 5/8-inch thick.

2.1.1.2 Overlaid Concrete Form Plywood (Standard Smooth)

Provide plywood that conforms to NIST PS 1, B-B, high density form overlay, not less than 5/8-inch thick.

2.1.2 Plastic Forms

Plastic lumber as specified in Section 06 10 00 ROUGH CARPENTRY. Provide plastic forms that contain a minimum of 50 percent post-consumer recycled content, or a minimum of 50 percent post-industrial recycled content.

2.1.3 Carton Forms

Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete until initial set. Provide carton forms that contain a minimum of 10 percent post-consumer recycled content, or a minimum of 20 percent post-industrial recycled content.

2.1.4 Steel Forms

Provide steel form surfaces that do not contain irregularities, dents, or sags.

2.2 FORMWORK ACCESSORIES

a. Use commercially manufactured formwork accessories, including ties and hangers.

b. Form ties and accessories must not reduce the effective cover of the reinforcement.

2.2.1 Form Ties

a. Use form ties with ends or end fasteners that can be removed without damage to concrete.

b. Where indicated in Contract Documents, use form ties with integral water barrier plates or other acceptable positive water barriers in walls.

c. The breakback distance for ferrous ties must be at least 2 in. for Surface Finish-2.0 or Surface Finish-3.0, as defined in ACI 301.

d. If the breakback distance is less than 3/4 in., use coated or corrosion-resistant ties.

e. Submit manufacturer's data sheet on form ties.

2.2.2 Waterstops

Submit manufacturer's data sheet on waterstop materials and splices.

2.2.2.1 PVC Waterstop

Polyvinylchloride waterstops must conform to COE CRD-C 572.

2.2.2.2 Rubber Waterstop

Rubber waterstops must conform to COE CRD-C 513.

2.2.2.3 Thermoplastic Elastomeric Rubber Waterstop

Thermoplastic elastomeric rubber waterstops must conform to ASTM D471.

2.2.2.4 Hydrophilic Waterstop

Swellable strip type compound of polymer modified chloroprene rubber that swells upon contact with water must conform to the following requirements when tested in accordance to ASTM D412: Tensile strength 420 psi minimum; ultimate elongation 600 percent minimum. Hardness must be 50 minimum on the type A durometer and the volumetric expansion ratio in distilled water at 70 degrees F must be 3 to 1 minimum.

2.2.3 Biodegradable Form Release Agent

a. Provide form release agent that is colorless, biodegradable, and rapeseed oil-based soy oil-based water-based, with a zero VOC content.

b. Provide product that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

c. Provide form release agent that reduces formwork moisture absorption, and does not contain diesel fuel, petroleum-based lubricating oils, waxes, or kerosene. Submit documentation indicating type of biobased material in product and biobased content. Indicate relative dollar value of biobased content products to total dollar value of products included in project.

d. Submit manufacturer's product data on formwork release agent for use on each form-facing material.

2.2.4 Chamfer Materials

Use lumber materials with dimensions of 3/4 x 3/4 in.

2.2.5 Construction and movement joints

a. Submit details and locations of construction joints in accordance with the requirements herein.

b. Locate construction joints within middle one-third of spans of slabs, beams, and girders. If a beam intersects a girder within the middle one-third of girder span, the distance between the construction joint in the girder and the edge of the beam must be at least twice the width of the larger member.

c. For members with post-tensioning tendons, locate construction joints where tendons pass through centroid of concrete section.

d. Locate construction joints in walls and columns at underside of slabs, beams, or girders and at tops of footings or slabs.

e. Make construction joints perpendicular to main reinforcement.

f. Provide movement joints where indicated in Contract Documents or in accepted alternate locations.

g. Submit location and detail of movement joints if different from those indicated in Contract Documents.

h. Submit manufacturer's data sheet on expansion joint materials.

i. Provide keyways where indicated in Contract Documents. Longitudinal keyways indicated in Contract Documents must be at least 1-1/2 in. deep, measured perpendicular to the plane of the joint.

2.2.6 Other Embedded items

Use sleeves, inserts, anchors, and other embedded items of material and design indicated in Contract Documents.

2.3 CONCRETE MATERIALS

2.3.1 Cementitious Materials

2.3.1.1 Portland Cement

a. Unless otherwise specified, provide cement that conforms to ASTM C150/C150M Type II .

b. Use one brand and type of cement for formed concrete having exposed-to-view finished surfaces.

c. For portland cement manufactured in a kiln fueled by hazardous waste, maintain a record of source for each batch. Supplier must certify that no hazardous waste is used in the fuel mix or raw materials. Supplier must certify that the hazardous waste is neutralized by the manufacturing process and that no additional pollutants are discharged.

d. Submit information along with evidence demonstrating compliance with referenced standards. Submittals must include types of cementitious materials, manufacturing locations, shipping locations, and certificates showing compliance.

e. Cementitious materials must be stored and kept dry and free from contaminants.

2.3.1.2 Fly Ash

a. ASTM C618, Class F , except that the maximum allowable loss on ignition must not exceed 6 percent.

b. If fly ash is used it shall range from 15 to 30 percent by weight of cementitious material, provided the fly ash does not reduce the amount

of cement in the concrete mix below the minimum requirements of local building codes. Where the use of fly ash cannot meet the minimum level,it shall not be used. Report the chemical analysis of the fly ash in accordance with ASTM C311/C311M. Evaluate and classify fly ash in accordance with ASTM D5759.

2.3.1.3 Slag Cement

ASTM C989/C989M, Grade 100.

2.3.1.4 Silica Fume

Silica fume must conform to ASTM C1240, including the optional limits on reactivity with cement alkalis. Silica fume may be furnished as a dry, densified material or as slurry. Proper mixing is essential to accomplish proper distribution of the silica fume and avoid agglomerated silica fume which can react with the alkali in the cement resulting in premature and extensive concrete damage. Supervision at the batch plant, finishing, and curing is essential. Provide at the Contractor's expense the services of a manufacturer's technical representative, experienced in mixing, proportioning, placement procedures, and curing of concrete containing silica fume. This representative must be present on the project prior to and during at least the first 4 days of concrete production and placement using silica fume. A High Range Water Reducing admixture (HRWRA) must be used with silica fume.

2.3.1.5 Other Supplementary Cementitious Materials

Natural pozzolan must be raw or calcined and conform to ASTM C618, Class N, including the optional requirement for uniformity.

Ultra Fine Fly Ash (UFFA) and Ultra Fine Pozzolan (UFP) must conform to ASTM C618, Class F or N, and the following additional requirements:

a. The strength activity index at 28 days of age must be at least 95 percent of the control specimens.

b. The average particle size must not exceed 6 microns.

c. The sum of SiO_2 plus Al_2O_3 plus Fe_2O_3 must be greater than 77 percent.

2.3.2 Water

a. Water or ice must comply with the requirements of ASTM C1602/C1602M.

b. Minimize the amount of water in the mix. Improve workability by adjusting the grading of the aggregate and using admixture rather than by adding water.

c. Water must be potable; free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances deleterious to concrete.

d. Protect mixing water and ice from contamination during storage and delivery.

e. Submit test report showing water complies with ASTM C1602/C1602M.

2.3.3 Aggregate

2.3.3.1 Normal-Weight Aggregate

a. Aggregates must conform to ASTM C33/C33M .

b. Aggregates used in concrete must be obtained from the same sources and have the same size range as aggregates used in concrete represented by submitted field test records or used in trial mixtures.

c. Store and handle aggregate in a manner that will avoid segregation and prevents contamination by other materials or other sizes of aggregates. Store aggregates in locations that will permit them to drain freely. Do not use aggregates that contain frozen lumps.

d. Submit types, pit or quarry locations, producers' names, aggregate supplier statement of compliance with ASTM C33/C33M, and ASTM C1293 expansion data not more than 18 months old.

2.3.3.2 Lightweight Aggregate

Lightweight aggregate in accordance with ASTM C330/C330M.

2.3.4 Admixtures

a. Chemical admixtures must conform to ASTM C494/C494M.

b. Air-entraining admixtures must conform to ASTM C260/C260M.

c. Chemical admixtures for use in producing flowing concrete must conform to ASTM C1017/C1017M.

d. Do not use calcium chloride admixtures.

e. Use a corrosion-inhibiting admixture for concrete classified under exposure category C1. Use an ASR-inhibiting admixture for concrete containing aggregate susceptible to ASR.

f. Admixtures used in concrete must be the same as those used in the concrete represented by submitted field test records or used in trial mixtures.

g. Protect stored admixtures against contamination, evaporation, or damage.

h. To ensure uniform distribution of constituents, provide agitating equipment for admixtures used in the form of suspensions or unstable solutions. Protect liquid admixtures from freezing and from temperature changes that would adversely affect their characteristics.

i. Submit types, brand names, producers' names, manufacturer's technical data sheets, and certificates showing compliance with standards required herein.

2.4 MISCELLANEOUS MATERIALS

2.4.1 Concrete Curing Materials

Provide concrete curing material in accordance with ACI 301 Section 5 and

ACI 308.1 Section 2. Submit product data for concrete curing compounds. Submit manufactures instructions for placement of curing compound.

2.4.2 Nonshrink Grout

Nonshrink grout in accordance with ASTM C1107/C1107M.

2.4.3 Floor Finish Materials

2.4.3.1 Liquid Chemical Floor Hardeners and Sealers

a. Hardener must be a colorless aqueous solution containing a blend of inorganic silicate or siliconate material and proprietary components combined with a wetting agent; that penetrates, hardens, and densifies concrete surfaces. Submit manufactures instructions for placement of liquid chemical floor hardener.

b. Use concrete penetrating sealers with a low (maximum 100 grams/liter, less water and less exempt compounds) VOC content. Submit manufactures instructions for placement of sealers.

2.4.3.2 Abrasive Aggregate for Nonslip Aggregate Finish

Aggregate must be packaged, factory-graded fused aluminum oxide grits, or it may be crushed emery containing not less than 40-percent aluminum oxide and not less than 25-percent ferric oxide. Aggregate must be rust proof and nonglazing and must be unaffected by freezing, moisture, and cleaning materials.

2.4.4 Expansion/Contraction Joint Filler

ASTM D1751 or ASTM D1752 Type I or Type II. Material must be 1/2 inch thick, unless otherwise indicated.

2.4.5 Joint Sealants

Submit manufacturer's product data, indicating VOC content.

2.4.5.1 Horizontal Surfaces, 3 Percent Slope, Maximum

ASTM D6690 or ASTM C920, Type M, Class 25, Use T.

2.4.5.2 Vertical Surfaces Greater Than 3 Percent Slope

ASTM C920, Type M, Grade NS, Class 25, Use T ..

2.4.5.3 Preformed Polychloroprene Elastomeric Type

ASTM D2628.

2.4.5.4 Lubricant for Preformed Compression Seals

ASTM D2835.

2.4.6 Vapor Retarder

ASTM E1745 Class C A polyethylene sheeting, minimum15 mil thickness or other equivalent material with a maximum permeance rating of 0.04 perms per ASTM E96/E96M.

Consider plastic vapor retarders and adhesives with a high recycled content, low toxicity low VOC (Volatile Organic Compounds) levels.

2.5 CONCRETE MIX DESIGN

2.5.1 Properties and Requirements

a. Use materials and material combinations listed in this section and the contract documents.

b. Cementitious material content must be adequate for concrete to satisfy the specified requirements for strength, w/cm, durability, and finishability described in this section and the contract documents.

The minimum cementitious material content for concrete used in floors must meet the following requirements:

Nominal maximum size of aggregate, in.	**Minimum cementitious material content, pounds per cubic yard**
1-1/2	470
1	520
3/4	540
3/8	610

c. Selected target slump must meet the requirements this section, the contract documents, and must not exceed 9 in. Concrete must not show visible signs of segregation.

d. The target slump must be enforced for the duration of the project. Determine the slump by ASTM C143/C143M. Slump tolerances must meet the requirements of ACI 117.

e. The nominal maximum size of coarse aggregate for a mixture must not exceed three-fourths of the minimum clear spacing between reinforcement, one-fifth of the narrowest dimension between sides of forms, or one-third of the thickness of slabs or toppings.

f. Concrete must be air entrained for members assigned to Exposure Class F1, F2, or F3. The total air content must be in accordance with the requirements of the paragraph titled DURABILITY.

g. Measure air content at the point of delivery in accordance with ASTM C173/C173M or ASTM C231/C231M.

h. Concrete for slabs to receive a hard-troweled finish must not contain an air-entraining admixture or have a total air content greater than 3 percent.

i. Concrete properties and requirements for each portion of the structure are specified in the table below. Refer to the paragraph titled DURABILITY for more details on exposure categories and their requirements.

	Minimum *f'c* psi	Exposure Categories^	Miscellaneous Requirements
Footings	4000 at 28 days	S0C1W1F1	Max. slump: 6 in. Nominal maximum aggregate size must be1 in.
Columns and walls	4000 at 28 days	S0C1W1F0	Nominal maximum aggregate size must be1 in.
Slabs-on-ground	4000 at 28 days	S0C1W1F0	
Concrete Topping Slab at Hangar Door and Trenches	5000 at 28 days	S0C1W1F2	Max. slump: 6 in.

2.5.2 Durability

2.5.2.1 Alkali-Aggregate Reaction

Do not use any aggregate susceptible to alkali-carbonate reaction (ACR). Use one of the three options below for qualifying concrete mixtures to reduce the potential of alkali-silica reaction (ASR):

a. For each aggregate used in concrete, the expansion result determined in accordance with ASTM C1293 must not exceed 0.04 percent at one year.

b. For each aggregate used in concrete, the expansion result of the aggregate and cementitious materials combination determined in accordance with ASTM C1567 must not exceed 0.10 percent at an age of 16 days.

c. Alkali content in concrete (LBA) must not exceed 4 pounds per cubic yard for moderately reactive aggregate or 3 pounds per cubic yard for highly reactive aggregate. Reactivity must be determined by testing in accordance with ASTM C1293 and categorized in accordance with ASTM C1778. Alkali content is calculated as follows:
LBA = (cement content, pounds per cubic yard) × (equivalent alkali content of portland cement in percent/100 percent)

2.5.2.2 Freezing and Thawing Resistance

a. Provide concrete meeting the following requirements based on exposure

class assigned to members for freezing-and-thawing exposure in Contract Documents:

Exposure class	**Maximum *w/cm****	**Minimum *f'c*, psi**	**Air content**	**Additional Requirements**
F0	N/A	2500	N/A	
F1	0.55	3500	Depends on	N/A
F2	0.45	4500	Depends on	See limits on maximum
F3	0.40	5000	Depends on aggregate	See limits on maximum cementitious
F3 plain concrete	0.45	4500	Depends on aggregate	See limits on maximum cementitious

*The maximum *w/cm* limits do not apply to lightweight concrete.

b. Concrete must be air entrained for members assigned to Exposure Class F1, F2, or F3. The total air content must meet the requirements of the following table:

Nominal maximum aggregate size, in.	**Total air content, percent*^**	
	Exposure Class F2 and F3	**Exposure Class F1**
3/8	7.5	6.0
1/2	7.0	5.5
3/4	6.0	5.0
1	6.0	4.5
1-1/2	5.5	4.5
2	5.0	4.0
3	5.5	3.5

*Tolerance on air content as delivered must be plus/minus 1.5 percent.

^For f'c greater than 5000 psi, reducing air content by 1.0 percentage point is acceptable.

c. Submit documentation verifying compliance with specified requirements.

d. For sections of the structure that are assigned Exposure Class F3, submit certification on cement composition verifying that concrete mixture meets the requirements of the following table:

Cementitious material	**Maximum percent of total cementitious material by mass***
Fly ash or other pozzolans conforming to ASTM C618	25
Slag cement conforming to ASTM C989/C989M	50
Silica fume conforming to ASTM C1240	10
Total of fly ash or other pozzolans, slag cement, and silica fume	50^
Total of fly ash or other pozzolans and silica fume	35^

*Total cementitious material also includes ASTM C150/C150M, ASTM C595/C595M, ASTM C845/C845M, and ASTM C1157/C1157M cement. The maximum percentages above must include:

i. Fly ash or other pozzolans present in ASTM C1157/C1157M or ASTM C595/C595M Type IP blended cement.

ii. Slag cement present in ASTM C1157/C1157M or ASTM C595/C595M Type IS blended cement.

iii. Silica fume conforming to ASTM C1240 present in ASTM C1157/C1157M or ASTM C595/C595M Type IP blended cement.

^Fly ash or other pozzolans and silica fume must constitute no more than 25 percent and 10 percent, respectively, of the total mass of the cementitious materials.

2.5.2.3 Corrosion and Chloride Content

a. Provide concrete meeting the requirements of the following table based on the exposure class assigned to members requiring protection against reinforcement corrosion in Contract Documents.

b. Submit documentation verifying compliance with specified requirements.

c. Water-soluble chloride ion content contributed from constituents including water, aggregates, cementitious materials, and admixtures must be determined for the concrete mixture by ASTM C1218/C1218M at age between 28 and 42 days.

d. The maximum water-soluble chloride ion (Cl-) content in concrete, percent by mass of cement is as follows:

Exposure class	**Maximum *w/cm****	**Minimum f'c, psi**	**Maximum water-soluble chloride ion (CL-) content in concrete, percent by mass of cement**
Reinforced concrete			
C0	N/A	2500	1.00
C1	N/A	2500	0.30

Exposure class	Maximum *w/cm**	Minimum f'c, psi	Maximum water-soluble chloride ion (CL-) content in concrete, percent by mass of cement
C2	0.4	5000	0.15
Prestressed concrete			
C0	N/A	2500	0.06
C1	N/A	2500	0.06
C2	0.4	5000	0.06

*The maximum w/cm limits do not apply to lightweight concrete.

2.5.2.4 Sulfate Resistance

a. Provide concrete meeting the requirements of the following table based on the exposure class assigned to members for sulfate exposure.

Exposure class	Maximum w/cm	Minimum f'c, psi	Required cementitious materials-types			Calcium chloride admixture
			ASTM C150/C150M	ASTM C595/C595M	ASTM C1157/C1157M	
S0	N/A	2500	N/A	N/A	N/A	No restrictions
S1	0.50	4000	II*^	Types with (MS) designation	MS	No restrictions
S2	0.45	4500	V^	Types with (HS) designation	HS	Not permitted
S3	0.45	4500	V + pozzolan or slag cement**	Types with (HS) designation plus	HS + pozzolan or slag cement**	Not permitted
S3	0.40	5000	V***	Types with (HS) designation	HS	Not permitted

* For seawater exposure, other types of portland cements with tricalcium aluminate (C3A) contents up to 10 percent are acceptable if the w/cm does not exceed 0.40.

** The amount of the specific source of the pozzolan or slag cement to be used shall be at least the amount determined by test or service record to improve sulfate resistance when used in concrete containing Type V cement. Alternatively, the amount of the specific source of the pozzolan or slag used shall not be less than the amount tested in accordance with ASTM C1012/C1012M and meeting the requirements maximum expansion requirements listed herein.

*** If Type V cement is used as the sole cementitious material, the optional sulfate requirement of 0.040 percent maximum expansion in ASTM C150/C150M shall be required.

^ Other available types of cement, such as Type III or Type I, are acceptable in exposure classes S1 or S2 if the C3A contents are less than 8 or 5 percent, respectively.

b. The maximum w/cm limits for sulfate exposure do not apply to lightweight concrete.

c. Alternative combinations of cementitious materials of those listed in this paragraph are acceptable if they meet the maximum expansion requirements listed in the following table:

S3	N/A	N/A	0.10 percent

^The 12-month expansion limit applies only when the measured expansion exceeds the 6-month maximum expansion limit.

2.5.2.5 Concrete Temperature

The temperature of concrete as delivered must not exceed 95°F .

2.5.2.6 Concrete permeability

a. Provide concrete meeting the requirements of the following table based on exposure class assigned to members requiring low permeability in the Contract Documents.

Exposure class	**Maximum *w/cm****	**Minimum f'c, psi**	**Additional minimum requirements**
W0	N/A	2500	None
W1	0.5	4000	None

*The maximum w/cm limits do not apply to lightweight concrete.

b. Submit documentation verifying compliance with specified requirements.

2.5.3 Trial Mixtures

Trial mixtures must be in accordance to ACI 301.

2.5.4 Ready-Mix Concrete

Provide concrete that meets the requirements of ASTM C94/C94M.

Ready-mixed concrete manufacturer must provide duplicate delivery tickets with each load of concrete delivered. Provide delivery tickets with the following information in addition to that required by ASTM C94/C94M:

a. Type and brand cement

b. Cement and supplementary cementitious materials content in 94-pound bags per cubic yard of concrete

c. Maximum size of aggregate

d. Amount and brand name of admixtures

e. Total water content expressed by water cementitious material ratio

2.6 REINFORCEMENT

a. Bend reinforcement cold. Fabricate reinforcement in accordance with fabricating tolerances of ACI 117.

b. Submit manufacturer's certified test report for reinforcement.

c. Submit placing drawings showing fabrication dimensions and placement locations of reinforcement and reinforcement supports. Placing drawings must indicate locations of splices, lengths of lap splices, and details of mechanical and welded splices.

d. Submit request with locations and details of splices not indicated in Contract Documents.

e. Submit request to place column dowels without using templates.

f. Submit request and procedure to field-bend or straighten reinforcing bars partially embedded in concrete at locations not indicated in Contract Documents. Field bending or straightening of reinforcing bars is permitted where indicated in the Contract Documents

g. Submit request for field cutting, including location and type of bar to be cut and reason field cutting is required.

2.6.1 Reinforcing Bars

a. Reinforcing bars must be deformed, except spirals, load-transfer dowels, and welded wire reinforcement, which may be plain.

b. ASTM A615/A615M with the bars marked S, Grade 60; or ASTM A996/A996M with the bars marked R, Grade 60, or marked A, Grade 60. Cold drawn wire used for spiral reinforcement must conform to ASTM A1064/A1064M. See Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING for cumulative total recycled content requirements.

c.

d. Submit mill certificates for reinforcing bars.

2.6.1.1 Headed Reinforcing Bars

Headed reinforcing bars must conform to ASTM A970/A970M including Annex A1, and other specified requirements.

2.6.1.2 Bar Mats

a. Bar mats must conform to ASTM A184/A184M.

b. If coated bar mats are required, repair damaged coating as required in the paragraph titled GALVANIZED REINFORCING BARS EPOXY-COATED REINFORCING BARS and DUAL-COATED REINFORCING BARS.

2.6.1.3 Headed Shear Stud Reinforcement

Headed studs and headed stud assemblies must conform to ASTM A1044/A1044M.

2.6.2 Mechanical Reinforcing Bar Connectors

a. Provide 125 percent minimum yield strength of the reinforcement bar.

b. Mechanical splices for galvanized reinforcing bars must be galvanized or coated with dielectric material.

c. Mechanical splices used with epoxy-coated or dual-coated reinforcing bars must be coated with dielectric material.

d. Submit data on mechanical splices demonstrating compliance with this paragraph.

2.6.3 Wire

a. See Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING for cumulative total recycled content requirements. Wire reinforcement may contain post-consumer or post-industrial recycled content. Provide flat sheets of welded wire reinforcement for slabs and toppings.

b. Plain or deformed steel wire must conform to ASTM A1064/A1064M.

c. Stainless steel wire must conform to ASTM A1022/A1022M.

d. Epoxy-coated wire must conform to ASTM A884/A884M. Coating damage incurred during shipment, storage, handling, and placing of epoxy-coated wires must be repaired. Repair damaged coating areas with patching material in accordance with material manufacturer's written recommendations. If damaged area exceeds 2 percent of surface area in each linear foot of each wire, wire must not be used. The 2 percent limit on damaged coating area must include repaired areas damaged before shipment as required by ASTM A884/A884M. Fading of coating color shall not be cause for rejection of epoxy-coated wire reinforcement.

2.6.4 Welded wire reinforcement

a. Use welded wire reinforcement specified in Contract Documents and conforming to one or more of the specifications given herein.

b. Plain welded wire reinforcement must conform to ASTM A1064/A1064M, with welded intersections spaced no greater than 12 in. apart in direction of principal reinforcement.

c. Deformed welded wire reinforcement must conform to ASTM A1064/A1064M, with welded intersections spaced no greater than 16 in. apart in direction of principal reinforcement.

d. Epoxy-coated welded wire reinforcement must conform to ASTM A884/A884M. Coating damage incurred during shipment, storage, handling, and placing of epoxy-coated welded wire reinforcement must be repaired in accordance with ASTM A884/A884M. Repair damaged coating areas with patching material in accordance with material manufacturer's written recommendations. If damaged area exceeds 2 percent of surface area in

each linear foot of each wire or welded wire reinforcement, the sheet containing the damaged area must not be used. The 2 percent limit on damaged coating area must include repaired areas damaged before shipment as required by ASTM A884/A884M. Fading of coating color shall not be cause for rejection of epoxy-coated welded wire reinforcement.

e. Stainless steel welded wire reinforcement must conform to ASTM A1022/A1022M.

f. Zinc-coated (galvanized) welded wire reinforcement must conform to ASTM A1060/A1060M. Coating damage incurred during shipment, storage, handling, and placing of zinc-coated (galvanized) welded wire reinforcement must be repaired in accordance with ASTM A780/A780M. If damaged area exceeds 2 percent of surface area in each linear foot of each wire or welded wire reinforcement, the sheet containing the damaged area must not be used. The 2 percent limit on damaged coating area shall include repaired areas damaged before shipment as required by ASTM A1060/A1060M.

2.6.5 Reinforcing Bar Supports

a. Provide reinforcement support types within structure as required by Contract Documents. Reinforcement supports must conform to CRSI RB4.1. Submit description of reinforcement supports and materials for fastening coated reinforcement if not in conformance with CRSI RB4.1.

b.

c. Legs of supports in contact with formwork must be hot-dip galvanized, or plastic coated after fabrication, or stainless-steel bar supports.

d.

2.6.6 Dowels for Load Transfer in Floors

Provide greased dowels for load transfer in floors of the type, design, weight, and dimensions indicated. Provide dowel bars that are plain-billet steel conforming to ASTM A615/A615M, Grade 40. Provide dowel pipe that is steel conforming to ASTM A53/A53M.

Plate dowels must conform to ASTM A36/A36M, and must be of size and spacing indicated. Plate dowel system must minimize shrinkage restraint by using a tapered shape AND formed void

2.6.7 Welding

a. Provide weldable reinforcing bars that conform to ASTM A706/A706M and ASTM A615/A615M and Supplement S1, Grade 60, except that the maximum carbon content must be 0.55 percent.

b. Comply with AWS D1.4/D1.4M unless otherwise specified. Do not tack weld reinforcing bars.

c. Welded assemblies of steel reinforcement produced under factory conditions, such as welded wire reinforcement, bar mats, and deformed bar anchors, are allowed.

d. After completing welds on zinc-coated (galvanized), epoxy-coated, or

zinc and epoxy dual-coated reinforcement, coat welds and repair coating damage as previously specified.

PART 3 EXECUTION

3.1 EXAMINATION

a. Do not begin installation until substrates have been properly constructed; verify that substrates are level.

b. If substrate preparation is the responsibility of another installer, notify Contracting Officer of unsatisfactory preparation before processing.

c. Check field dimensions before beginning installation. If dimensions vary too much from design dimensions for proper installation, notify Contracting Officer and wait for instructions before beginning installation.

3.2 PREPARATION

Determine quantity of concrete needed and minimize the production of excess concrete. Designate locations or uses for potential excess concrete before the concrete is poured.

3.2.1 General

a. Surfaces against which concrete is to be placed must be free of debris, loose material, standing water, snow, ice, and other deleterious substances before start of concrete placing.

b. Remove standing water without washing over freshly deposited concrete. Divert flow of water through side drains provided for such purpose.

3.2.2 Subgrade Under Foundations and Footings

a. When subgrade material is semi-porous and dry, sprinkle subgrade surface with water as required to eliminate suction at the time concrete is deposited, or seal subgrade surface by covering surface with specified vapor retarder.

b. When subgrade material is porous, seal subgrade surface by covering surface with specified vapor retarder.

3.2.3 Subgrade Under Slabs on Ground

a. Before construction of slabs on ground, have underground work on pipes and conduits completed and approved.

b. Previously constructed subgrade or fill must be cleaned of foreign materials

c. Finish surface of capillary water barrier under interior slabs on ground must not show deviation in excess of 1/4 inch when tested with a 10-foot straightedge parallel with and at right angles to building lines.

d. Finished surface of subgrade or fill under exterior slabs on ground must not be more than 0.02-foot above or 0.10-foot below elevation

indicated.

3.2.4 Edge Forms and Screed Strips for Slabs

a. Set edge forms or bulkheads and intermediate screed strips for slabs to obtain indicated elevations and contours in finished slab surface and must be strong enough to support vibrating bridge screeds or roller pipe screeds if nature of specified slab finish requires use of such equipment.

b. Align concrete surface to elevation of screed strips by use of strike-off templates or approved compacting-type screeds.

3.2.5 Reinforcement and Other Embedded Items

a. Secure reinforcement, joint materials, and other embedded materials in position, inspected, and approved before start of concrete placing.

b. When concrete is placed, reinforcement must be free of materials deleterious to bond. Reinforcement with rust, mill scale, or a combination of both will be considered satisfactory, provided minimum nominal dimensions, nominal weight, and minimum average height of deformations of a hand-wire-brushed test specimen are not less than applicable ASTM specification requirements.

3.3 FORMS

a. Provide forms, shoring, and scaffolding for concrete placement. Set forms mortar-tight and true to line and grade.

b. Chamfer above grade exposed joints, edges, and external corners of concrete 0.75 inch. Place chamfer strips in corners of formwork to produce beveled edges on permanently exposed surfaces.

c. Provide formwork with clean-out openings to permit inspection and removal of debris.

d. Inspect formwork and remove foreign material before concrete is placed.

e. At construction joints, lap form-facing materials over the concrete of previous placement. Ensure formwork is placed against hardened concrete so offsets at construction joints conform to specified tolerances.

f. Provide positive means of adjustment (such as wedges or jacks) of shores and struts. Do not make adjustments in formwork after concrete has reached initial setting. Brace formwork to resist lateral deflection and lateral instability.

g. Fasten form wedges in place after final adjustment of forms and before concrete placement.

h. Provide anchoring and bracing to control upward and lateral movement of formwork system.

i. Construct formwork for openings to facilitate removal and to produce opening dimensions as specified and within tolerances.

j. Provide runways for moving equipment. Support runways directly on

formwork or structural members. Do not support runways on reinforcement. Loading applied by runways must not exceed capacity of formwork or structural members.

k. Position and support expansion joint materials, waterstops, and other embedded items to prevent displacement. Fill voids in sleeves, inserts, and anchor slots temporarily with removable material to prevent concrete entry into voids.

l. Clean surfaces of formwork and embedded materials of mortar, grout, and foreign materials before concrete placement.

3.3.1 Coating

a. Cover formwork surfaces with an acceptable material that inhibits bond with concrete.

b. If formwork release agent is used, apply to formwork surfaces in accordance with manufacturer's recommendations before placing reinforcement. Remove excess release agent on formwork prior to concrete placement.

c. Do not allow formwork release agent to contact reinforcement or hardened concrete against which fresh concrete is to be placed.

3.3.2 Reuse

a. Reuse forms providing the structural integrity of concrete and the aesthetics of exposed concrete are not compromised.

b. Wood forms must not be clogged with paste and must be capable of absorbing high water-cementitious material ratio paste.

c. Remove leaked mortar from formwork joints before reuse.

3.3.3 Forms for Standard Rough Form Finish

Provide formwork in accordance with ACI 301 Section 5 with a surface finish, SF-1.0, for formed surfaces that are to be concealed by other construction.

3.3.4 Forms for Standard Smooth Form Finish

Provide formwork in accordance with ACI 301 Section 5 with a surface finish, SF-3.0, for formed surfaces that are exposed to view.

3.3.5 Form Ties

a. For post-tensioned structures, do not remove formwork supports until stressing records have been accepted by the Contracting Officer.

b. After ends or end fasteners of form ties have been removed, repair tie holes in accordance with ACI 301 Section 5 requirements.

3.3.6 Tolerances for Form Construction

a. Construct formwork so concrete surfaces conform to tolerances in ACI 117.

b. Position and secure sleeves, inserts, anchors, and other embedded items such that embedded items are positioned within ACI 117 tolerances.

c. To maintain specified elevation and thickness within tolerances, install formwork to compensate for deflection and anticipated settlement in formwork during concrete placement. Set formwork and intermediate screed strips for slabs to produce designated elevation, camber, and contour of finished surface before formwork removal. If specified finish requires use of vibrating screeds or roller pipe screeds, ensure that edge forms and screed strips are strong enough to support such equipment.

3.3.7 Removal of Forms and Supports

a. If vertical formed surfaces require finishing, remove forms as soon as removal operations will not damage concrete.

b. Remove top forms on sloping surfaces of concrete as soon as removal will not allow concrete to sag. Perform repairs and finishing operations required. If forms are removed before end of specified curing period, provide curing and protection.

c. Do not damage concrete during removal of vertical formwork for columns, walls, and sides of beams. Perform needed repair and finishing operations required on vertical surfaces. If forms are removed before end of specified curing period, provide curing and protection.

e. Form-facing material and horizontal facing support members may be removed before in-place concrete reaches specified compressive strength if shores and other supports are designed to allow facing removal without deflection of supported slab or member.

3.4 WATERSTOP INSTALLATION AND SPLICES

a. Provide waterstops in construction joints as indicated.

b. Install formwork to accommodate waterstop materials. Locate waterstops in joints where indicated in Contract Documents. Minimize number of splices in waterstop. Splice waterstops in accordance with manufacturer's written instructions. Install factory-manufactured premolded mitered corners.

c. Install waterstops to form a continuous diaphragm in each joint. Make adequate provisions to support and protect waterstops during progress of work. Protect waterstops protruding from joints from damage.

3.4.1 PVC Waterstop

Make splices by heat sealing the adjacent waterstop edges together using a thermoplastic splicing iron utilizing a non-stick surface specifically designed for waterstop welding. Reform waterstops at splices with a remolding iron with ribs or corrugations to match the pattern of the waterstop. The spliced area, when cooled, must show no signs of separation, holes, or other imperfections when bent by hand in as sharp an angle as possible.

3.4.2 Rubber Waterstop

Rubber waterstops must be spliced using cold bond adhesive as recommended by the manufacturer.

3.4.3 Thermoplastic Elastomeric Rubber Waterstop

Fittings must be shop made using a machine specifically designed to mechanically weld the waterstop. A portable power saw must be used to miter or straight cut the ends to be joined to ensure good alignment and contact between joined surfaces. Maintain continuity of the characteristic features of the cross section of the waterstop (for example ribs, tabular center axis, and protrusions) across the splice.

3.4.4 Hydrophilic Waterstop

Miter cut ends to be joined with sharp knife or shears. The ends must be adhered with adhesive.

3.5 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS

a. Unless otherwise specified, placing reinforcement and miscellaneous materials must be in accordance to ACI 301. Provide bars, welded wire reinforcement, wire ties, supports, and other devices necessary to install and secure reinforcement.

b. Reinforcement must not have rust, scale, oil, grease, clay, or foreign substances that would reduce the bond. Rusting of reinforcement is a basis of rejection if the effective cross-sectional area or the nominal weight per unit length has been reduced. Remove loose rust prior to placing steel. Tack welding is prohibited.

c. Nonprestressed cast-in-place concrete members must have concrete cover for reinforcement given in the following table:

Concrete Exposure	**Member**	**Reinforcement**	**Specified cover, in.**
Cast against and permanently in contact with ground	All	All	3
Exposed to weather or in contact with ground	All	No. 6 through No. 18 bars	2
		No. 5 bar, W31 or D31 wire, and smaller	1-1/2

Concrete Exposure	Member	Reinforcement	Specified cover, in.
Not exposed to weather or in contact with ground	Slabs, joists, and walls	No. 14 and No. 18 bars	1-1/2
		No. 11 bar and smaller	3/4
	Beams, columns, pedestals, and tension ties	Primary reinforcement, stirrups, ties, spirals, and hoops	1-1/2

d. Cast-in-place prestressed concrete members must have concrete cover for reinforcement, ducts, and end fittings given in the following table:

Concrete	Member	Reinforcement	Specified
Cast against and permanently in contact with ground	All	All	3
Exposed to weather or in contact with ground	Slabs, joists, and walls	All	1
	All other	All	1-1/2
Not exposed to weather or in contact with ground	Slabs, joists, and walls	All	3/4
	Beams, columns, and tension ties	Primary reinforcement	1-1/2
		Stirrups, ties, spirals, and hoops	1

e. Precast nonprestressed or prestressed concrete members manufactured under plant conditions must have concrete cover for reinforcement, ducts, and end fittings given in the following table:

Concrete Exposure	**Member**	**Reinforcement**	**Specified cover, in.**
Exposed to weather or in contact with ground	Walls	No. 14 and No. 18 bars; tendons larger than 1-1/2 in. diameter	1-1/2
		No. 11 bars and smaller; W31 and D31 wire, and smaller; tendons and strands 1-1/2 in.	3/4
	All other	No. 14 and No. 18 bars; tendons larger than 1-1/2 in.	2
		No. 6 through No. 11 bars; tendons and strands larger than 5/8 in. diameter through 1-1/2 in.	1-1/2
		No. 5 bar, W31 or D31 wire, and smaller; tendons and strands 5/8 in. diameter and smaller	1-1/4

Concrete Exposure	Member	Reinforcement	Specified cover, in.
Not exposed to weather or in contact with ground	Slabs, joists, and walls	No. 14 and No. 18 bars; tendons larger than 1-1/2 in. diameter	1-1/4
		Tendons and strands 1-1/2 in. diameter and smaller	3/4
		No. 11 bar, W31 or D31	5/8
	Beams, columns, pedestals, and tension ties	Primary reinforcement	Greater of bar diameter and 5/8 and need not exceed 1-1/2
		Stirrups, ties, spirals, and hoops	3/8

3.5.1 General

Provide details of reinforcement that are in accordance with the Contract Documents.

3.5.2 Vapor Retarder

a. Install in accordance with ASTM E1643. Provide beneath the on-grade concrete floor slab. Use the greatest widths and lengths practicable to eliminate joints wherever possible. Lap joints a minimum of 12 inches and tape.

b. Remove torn, punctured, or damaged vapor retarder material and provide with new vapor retarder prior to placing concrete. Concrete placement must not damage vapor retarder. Place vapor barrier directly on underlying subgrade, base course, or capillary water barrier, unless it consists of crushed material or large granular material which could puncture the vapor barrier. In this case, a thin layer of approximately 1/2 inch of fine graded material should be rolled or compacted over the fill before installation of the vapor barrier to reduce the possibility of puncture. Control concrete placement so as to prevent damage to the vapor barrier.

3.5.3 Perimeter Insulation

Install perimeter insulation at locations indicated. Adhesive must be

used where insulation is applied to the interior surface of foundation walls and may be used for exterior application.

3.5.4 Reinforcement Supports

Provide reinforcement support in accordance with CRSI RB4.1 and ACI 301 Section 3 requirements. Supports for coated or galvanized bars must also be coated with electrically compatible material for a distance of at least 2 inches beyond the point of contact with the bars.

3.5.5 Splicing

As indicated in the Contract Documents. For splices not indicated follow ACI 301. Do not splice at points of maximum stress. Overlap welded wire reinforcement the spacing of the cross wires, plus 2 inches.
AWS D1.4/D1.4M. Approve welded splices prior to use. Repair the cut ends of hot-dipped galvanized reinforcement steel to completely coat exposed steel, ASTM A780/A780M.

3.5.6 Future Bonding

Plug exposed, threaded, mechanical reinforcement bar connectors with a greased bolt. Provide bolt threads that match the connector. Countersink the connector in the concrete. Caulk the depression after the bolt is installed.

3.5.7 Setting Miscellaneous Material

Place and secure anchors and bolts, pipe sleeves, conduits, and other such items in position before concrete placement and support against displacement. Plumb anchor bolts and check location and elevation. Temporarily fill voids in sleeves with readily removable material to prevent the entry of concrete.

3.5.8 Fabrication

Shop fabricate reinforcing bars to conform to shapes and dimensions indicated for reinforcement, and as follows:

a. Provide fabrication tolerances that are in accordance with ACI 117.

b. Provide hooks and bends that are in accordance with the Contract Documents.

Reinforcement must be bent cold to shapes as indicated. Bending must be done in the shop. Rebending of a reinforcing bar that has been bent incorrectly is not be permitted. Bending must be in accordance with standard approved practice and by approved machine methods.

Deliver reinforcing bars bundled, tagged, and marked. Tags must be metal with bar size, length, mark, and other information pressed in by machine. Marks must correspond with those used on the placing drawings.

Do not use reinforcement that has any of the following defects:

a. Bar lengths, depths, and bends beyond specified fabrication tolerances

b. Bends or kinks not indicated on drawings or approved shop drawings

c. Bars with reduced cross-section due to rusting or other cause

Replace defective reinforcement with new reinforcement having required shape, form, and cross-section area.

3.5.9 Placing Reinforcement

Place reinforcement in accordance with ACI 301.

For slabs on grade (over earth or over capillary water barrier) and for footing reinforcement, support bars or welded wire reinforcement on precast concrete blocks, spaced at intervals required by size of reinforcement, to keep reinforcement the minimum height specified above the underside of slab or footing.

For slabs other than on grade, supports for which any portion is less than 1 inch from concrete surfaces that are exposed to view or to be painted must be of precast concrete units, plastic-coated steel, or stainless steel protected bar supports. Precast concrete units must be wedge shaped, not larger than 3-1/2 by 3-1/2 inches, and of thickness equal to that indicated for concrete protection of reinforcement. Provide precast units that have cast-in galvanized tie wire hooked for anchorage and blend with concrete surfaces after finishing is completed.

Provide reinforcement that is supported and secured together to prevent displacement by construction loads or by placing of wet concrete, and as follows:

a. Provide supports for reinforcing bars that are sufficient in number and have sufficient strength to carry the reinforcement they support, and in accordance with ACI 301 and CRSI 10MSP. Do not use supports to support runways for concrete conveying equipment and similar construction loads.

b. Equip supports on ground and similar surfaces with sand-plates.

c. Support welded wire reinforcement as required for reinforcing bars.

d. Secure reinforcements to supports by means of tie wire. Wire must be black, soft iron wire, not less than 16 gage.

e. Reinforcement must be accurately placed, securely tied at intersections, and held in position during placing of concrete by spacers, chairs, or other approved supports. Point wire-tie ends away from the form. Unless otherwise indicated, numbers, type, and spacing of supports must conform to the Contract Documents.

f. Bending of reinforcing bars partially embedded in concrete is permitted only as specified in the Contract Documents.

3.5.10 Spacing of Reinforcing Bars

a. Spacing must be as indicated in the Contract Documents.

b. Reinforcing bars may be relocated to avoid interference with other reinforcement, or with conduit, pipe, or other embedded items. If any reinforcing bar is moved a distance exceeding one bar diameter or specified placing tolerance, resulting rearrangement of reinforcement is subject to preapproval by the Contracting Officer.

3.5.11 Concrete Protection for Reinforcement

Additional concrete protection must be in accordance with the Contract Documents.

3.5.12 Welding

Welding must be in accordance with AWS D1.4/D1.4M.

3.6 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE

In accordance with ASTM C94/C94M, ACI 301, ACI 302.1R and ACI 304R, except as modified herein. Batching equipment must be such that the concrete ingredients are consistently measured within the following tolerances: 1 percent for cement and water, 2 percent for aggregate, and 3 percent for admixtures. Furnish mandatory batch ticket information for each load of ready mix concrete.

3.6.1 Measuring

Make measurements at intervals as specified in paragraphs SAMPLING and TESTING.

3.6.2 Mixing

a. Mix concrete in accordance with ASTM C94/C94M, ACI 301 and ACI 304R.

b. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Place concrete within 90 minutes of either addition of mixing water to cement and aggregates or addition of cement to aggregates. A retarder shall be used to facilitate placing and finishing when concrete temperature is 85 degrees F or greater.

c. If the entrained air content falls below the specified limit, add a sufficient quantity of admixture, within the manufacturer's recommended dosage, to bring the entrained air content within the specified limits. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixture throughout the batch. Do not reconstitute concrete that has begun to solidify.

d. When fibers are used, add fibers together with the aggregates and never as the first component in the mixer. Fibers must be dispensed into the mixing system using appropriate dispensing equipment and procedure as recommended by the manufacturer.

3.6.3 Transporting

Transport concrete from the mixer to the forms as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete which has segregated in transporting and dispose of as directed.

3.7 PLACING CONCRETE

Place concrete in accordance with ACI 301 Section 5. Concrete shall be placed within 15 minutes of discharge into non-agitating equipment.

3.7.1 Footing Placement

Concrete for footings may be placed in excavations without forms upon inspection and approval by the Contracting Officer. Excavation width must be a minimum of 4 inches greater than indicated.

3.7.2 Pumping

ACI 304R and ACI 304.2R. Pumping must not result in separation or loss of materials nor cause interruptions sufficient to permit loss of plasticity between successive increments. Loss of slump in pumping equipment must not exceed 2 inches at discharge/placement. Do not convey concrete through pipe made of aluminum or aluminum alloy. Avoid rapid changes in pipe sizes. Limit maximum size of course aggregate to 33 percent of the diameter of the pipe. Limit maximum size of well-rounded aggregate to 40 percent of the pipe diameter. Take samples for testing at both the point of delivery to the pump and at the discharge end.

3.7.3 Cold Weather

Cold weather concrete must meet the requirements of ACI 306.1 unless otherwise specified. Do not allow concrete temperature to decrease below 50 degrees F. Obtain approval prior to placing concrete when the ambient temperature is below 40 degrees F or when concrete is likely to be subjected to freezing temperatures within 24 hours. Cover concrete and provide sufficient heat to maintain 50 degrees F minimum adjacent to both the formwork and the structure while curing. Limit the rate of cooling to 37 degrees F in any one hour and 50 degrees F per 24 hours after heat application.

3.7.4 Hot Weather

Maintain required concrete temperature using Figure 4.2 in ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where job site is remote to water source, to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of either liquid membrane curing compound or impervious sheets. For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete is set.

3.7.5 Bonding

Surfaces of set concrete at joints, must be roughened and cleaned of laitance, coatings, loose particles, and foreign matter. Roughen surfaces in a manner that exposes the aggregate uniformly and does not leave laitance, loosened particles of aggregate, nor damaged concrete at the surface.

Obtain bonding of fresh concrete that has set as follows:

a. At joints between footings and walls or columns, between walls or columns and the beams or slabs they support, and elsewhere unless

otherwise specified; roughened and cleaned surface of set concrete must be dampened, but not saturated, immediately prior to placing of fresh concrete.

b. At joints in exposed-to-view work; at vertical joints in walls; at joints near midpoint of span in girders, beams, supported slabs, other structural members; in work designed to contain liquids; the roughened and cleaned surface of set concrete must be dampened but not saturated and covered with a cement grout coating.

c. Provide cement grout that consists of equal parts of portland cement and fine aggregate by weight with not more than 6 gallons of water per sack of cement. Apply cement grout with a stiff broom or brush to a minimum thickness of 1/16 inch. Deposit fresh concrete before cement grout has attained its initial set.

3.8 WASTE MANAGEMENT

Provide as specified in the Waste Management Plan and as follows.

3.8.1 Mixing Equipment

Before concrete pours, designate Contractor-owned site meeting environmental standards for cleaning out concrete mixing trucks. Minimize water used to wash equipment.

3.8.2 Hardened, Cured Waste Concrete

Use hardened, cured waste concrete as aggregate in concrete mix if approved by Contracting Officer.

3.8.3 Reinforcing Steel

Collect reinforcing steel and place in designated area for recycling.

3.8.4 Other Waste

Identify concrete manufacturer's or supplier's policy for collection or return of construction waste, unused material, deconstruction waste, and/or packaging material.

3.9 SURFACE FINISHES EXCEPT FLOOR, SLAB, AND PAVEMENT FINISHES

3.9.1 Defects

Repair surface defects in accordance with ACI 301 Section 5.

3.9.2 Not Against Forms (Top of Walls)

Surfaces not otherwise specified must be finished with wood floats to even surfaces. Finish must match adjacent finishes.

3.9.3 Formed Surfaces

3.9.3.1 Tolerances

Tolerances in accordance with ACI 117 and as indicated.

3.9.3.2 As-Cast Rough Form

Provide for surfaces not exposed to public view a surface finish SF-1.0. Patch holes and defects in accordance with ACI 301.

3.9.3.3 Standard Smooth Finish

Provide for surfaces exposed to public view a surface finish SF-3.0. Patch holes and defects in accordance with ACI 301.

3.9.4 Grout-Cleaned Rubbed Finish

Provide a grout-cleaned rubbed finish per ACI 301 Section 5 in the locations indicated.Provide an exposed aggregate finish per ACI 301 Section 5 in the locations indicated.

3.10 FLOOR, SLAB, AND PAVEMENT FINISHES AND MISCELLANEOUS CONSTRUCTION

In accordance with ACI 301 and ACI 302.1R, unless otherwise specified. Slope floors uniformly to drains where drains are provided. Depress the concrete base slab where quarry tile, ceramic tile, are indicated. Steel trowel and fine-broom finish concrete slabs that are to receive quarry tile, ceramic tile, or paver tile . Where straightedge measurements are specified, Contractor must provide straightedge.

3.10.1 Finish

Place, consolidate, and immediately strike off concrete to obtain proper contour, grade, and elevation before bleedwater appears. Permit concrete to attain a set sufficient for floating and supporting the weight of the finisher and equipment. If bleedwater is present prior to floating the surface, drag the excess water off or remove by absorption with porous materials. Do not use dry cement to absorb bleedwater. Grate tampers ("jitterbugs") shall not be used.

3.10.1.1 Scratched

Use for surfaces intended to receive bonded applied cementitious applications. Finish concrete in accordance with ACI 301 Section 5 for a scratched finish.

3.10.1.2 Floated

Use for exterior slabs where not otherwise specified. Finish concrete in accordance with ACI 301 Section 5 for a floated finish.

3.10.1.3 Steel Troweled

Use for floors intended as walking surfaces and for reception of floor coverings, unless noted otherwise.. Finish concrete in accordance with ACI 301 Section 5 for a steel troweled finish.

3.10.1.4 Nonslip Finish

Use on surfaces of exterior platforms, steps, and landings; and on exterior and interior pedestrian ramps. Finish concrete in accordance with ACI 301 Section 5 for a dry-shake finish. After the selected material has been embedded by the two floatings, complete the operation with a broomed finish.

3.10.1.5 Broomed

Use on surfaces of exterior walks, platforms, patios, and ramps, unless otherwise indicated. Finish concrete in accordance with ACI 301 Section 5 for a broomed finish.

3.10.1.6 Pavement

Screed the concrete with a template advanced with a combined longitudinal and crosswise motion. Maintain a slight surplus of concrete ahead of the template. After screeding, float the concrete longitudinally. Use a straightedge to check slope and flatness; correct and refloat as necessary. Obtain final finish by Round edges and joints with an edger having a radius of 1/8 inch.

3.10.1.7 Concrete Toppings Placement

The following requirements apply to the placement of toppings of concrete on base slabs that are either freshly placed and still plastic, or on hardened base slabs.

a. Placing on a Fresh Base: Screed and bull float the base slab. As soon as the water sheen has disappeared, lightly rake the surface of the base slab with a stiff bristle broom to produce a bonding surface for the topping. Immediately spread the topping mixture evenly over the roughened base before final set takes place. Give the topping the finish indicated on the drawings .

b. Bonding to a Hardened Base: When the topping is to be bonded to a floated or troweled hardened base, roughen the base by scarifying, grit-blasting, scabbling, planing, flame cleaning, or acid-etching to lightly expose aggregate and provide a bonding surface. Remove dirt, laitance, and loose aggregate by means of a stiff wire broom. Keep the clean base wet for a period of 12 hours preceding the application of the topping. Remove excess water and apply a 1:1:1/2 cement-sand-water grout, and brush into the surface of the base slab. Do not allow the cement grout to dry, and spread it only short distances ahead of the topping placement. Do not allow the temperature differential between the completed base and the topping mixture to exceed 41 degrees F at the time of placing. Place the topping and finish as indicated.

3.10.1.8 Chemical-Hardener Treatment

Apply liquid-chemical floor hardener where indicated after curing and drying concrete surface. Dilute liquid hardener with water and apply in three coats. First coat must be one-third strength, second coat one-half strength, and third coat two-thirds strength. Apply each coat evenly and allow to dry 24 hours between coats.

Approved proprietary chemical hardeners must be applied in accordance with manufacturer's printed directions.

3.10.1.9 Colored Wear-Resistant Finish

a. Give finish to monolithic slab surfaces where indicated.

b. Apply dry shake materials for colored wear-resistant finish at the

rate of 60 pounds per 100 square feet of surface.

c. Immediately following first floating operation, approximately two-thirds of specified weight of dry shake material must be uniformly distributed over surface and embedded by means of power floating. After first dry-shake application has been embedded, uniformly distribute remainder of dry-shake material over surface at right angles to first dry-shake application and embed by means of power floating. Trueness of surface and other requirements for floating operations not specified in this paragraph must be as specified for float finish.

d. After completion of float finish, apply a trowel finish as specified.

3.10.1.10 Heavy-Duty Wear-Resistant Finish

a. Give finish to slab surfaces where indicated.

b. Apply dry shake materials for colored wear-resistant finish at the rate of 60 pounds per 100 square fett of surface.

c. Apply blended dry-shake material as follows:

Maximum type of aggregate in dry shake	**Amount per 100 square feet of Surface**
Traprock	160 pounds
Emery	130 pounds
Iron	130 pounds

d. Immediately following the first floating operation, approximately one-half the specified weight of blended, uniformly distribute dry-shake materials over the surface and embedded by means of power floating. After the first dry-shake application has been embedded, uniformly distribute the remaining one-half of the blended dry-shake material over the surface at right angles to the first dry-shake application and embedded by means of power floating. Trueness of surface and other requirements for floating operations not specified in this paragraph must be as specified for float finish.

e. After completion of the float finish, trowel finish the surface as specified.

3.10.2 Flat Floor Finishes

ACI 302.1R. Construct in accordance with one of the methods recommended in Table 10.15.3a, "Slab-on-ground flatness/levelness construction guide" or Table 10.15.3b, "Suspended slab flatness/levelness construction guide" appropriate for the type of construction. ACI 117 for tolerance tested by ASTM E1155.

a. Specified Conventional Value:

Floor Flatness (Ff) 2013 minimum

Floor Levelness (FL) 15 10 minimum

3.10.2.1 Measurement of Floor Tolerances

Test slab within 24 hours of the final troweling. Provide tests to Contracting Officer within 12 hours after collecting the data. Floor flatness inspector is required to provide a tolerance report which must include:

a. Key plan showing location of data collected.

b. Results required by ASTM E1155.

3.10.2.2 Remedies for Out of Tolerance Work

Contractor is required to repair and retest any floors not meeting specified tolerances. Prior to repair, Contractor must submit and receive approval for the proposed repair, including product data from any materials proposed. Repairs must not result in damage to structural integrity of the floor. For floors exposed to public view, repairs must prevent any uneven or unusual coloring of the surface.

3.10.3 Concrete Walks

Provide 4 inches thick minimum. Provide contraction joints spaced every 5 linear feet unless otherwise indicated. Cut contraction joints 1 inch deep, or one fourth the slab thickness whichever is deeper, with a jointing tool after the surface has been finished. Provide 0.5 inch thick transverse expansion joints at changes in direction where sidewalk abuts curb, steps, rigid pavement, or other similar structures; space expansion joints every 50 feet maximum. Give walks a broomed finish. Unless indicated otherwise, provide a transverse slope of 1/48. Limit variation in cross section to 1/4 inch in 5 feet.

3.10.4 Pits and Trenches

Place bottoms and walls monolithically or provide waterstops and keys.

3.10.5 Curbs

Provide contraction joints spaced every 10 feet maximum unless otherwise indicated. Cut contraction joints 3/4 inch deep with a jointing tool after the surface has been finished. Provide expansion joints 1/2 inch thick and spaced every 100 feet maximum unless otherwise indicated. Perform pavement finish.

3.10.6 Splash Blocks

Provide at outlets of downspouts emptying at grade. Splash blocks may be precast concrete, and must be 24 inches long, 12 inches wide and 4 inches thick, unless otherwise indicated, with smooth-finished countersunk dishes sloped to drain away from the building.

3.11 JOINTS

3.11.1 Construction Joints

Make and locate joints not indicated so as not to impair strength and appearance of the structure, as approved. Joints must be perpendicular to main reinforcement. Reinforcement must be continued and developed across construction joints. Locate construction joints as follows:

3.11.1.1 Construction Joints for Constructability Purposes

a. In walls, at top of footing; at top of slabs on ground; at top and bottom of door and window openings or where required to conform to architectural details; and at underside of deepest beam or girder framing into wall.

b. In columns or piers, at top of footing; at top of slabs on ground; and at underside of deepest beam or girder framing into column or pier.

c. Near midpoint of spans for supported slabs, beams, and girders unless a beam intersects a girder at the center, in which case construction joints in girder must offset a distance equal to twice the width of the beam. Make transfer of shear through construction joint by use of inclined reinforcement.

Provide keyways at least 1-1/2-inches deep in construction joints in walls and slabs and between walls and footings; approved bulkheads may be used for slabs.

3.11.2 Isolation Joints in Slabs on Ground

a. Provide joints at points of contact between slabs on ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.

b. Fill joints with premolded joint filler strips 1/2 inch thick, extending full slab depth. Install filler strips at proper level below finish floor elevation with a slightly tapered, dress-and-oiled wood strip temporarily secured to top of filler strip to form a groove not less than 3/4 inch in depth where joint is sealed with sealing compound and not less than 1/4 inch in depth where joint sealing is not required. Remove wood strip after concrete has set. Contractor must clean groove of foreign matter and loose particles after surface has dried.

3.11.3 Contraction Joints in Slabs on Ground

a. Provide joints to form panels as indicated.

b. Under and on exact line of each control joint, cut 50 percent of welded wire reinforcement before placing concrete.

c. Sawcut contraction joints into slab on ground in accordance with ACI 301 Section 5.

e. Sawcutting will be limited to within 12 hours after set and at 1/4 slab depth.

3.11.4 Sealing Joints in Slabs on Ground

a. Contraction and control joints which are to receive finish flooring material must be sealed with joint sealing compound after concrete curing period. Slightly underfill groove with joint sealing compound to prevent extrusion of compound. Remove excess material as soon after sealing as possible.

b. Sealed groove must be left ready to receive filling material that is provided as part of finish floor covering work.

3.12 CONCRETE FLOOR TOPPING

3.12.1 Standard Floor Topping

Provide topping for treads and platforms of metal steel stairs and elsewhere as indicated.

3.12.1.1 Preparations Prior to Placing

a. When topping is placed on a green concrete base slab, screed surface of base slab to a level not more than 1-1/2 inches nor less than 1 inch below required finish surface. Remove water and laitance from surface of base slab before placing topping mixture. As soon as water ceases to rise to surface of base slab, place topping.

b. When topping is placed on a hardened concrete base slab, remove dirt, loose material, oil, grease, asphalt, paint, and other contaminants from base slab surface, leaving a clean surface. Prior to placing topping mixture, 2-1/2-inches minimum, slab surface must be dampened and left free of standing water. Immediately before topping mixture is placed, broom a coat of neat cement grout onto surface of slab. Do not allow cement grout to set or dry before topping is placed.

c. When topping is placed on a metal surface, such as metal pans for steel stairs, remove dirt, loose material, oil, grease, asphalt, paint, and other contaminants from metal surface.

3.12.1.2 Placing

Spread standard topping mixture evenly on previously prepared base slab or metal surface, brought to correct level with a straightedge, and struck off. Topping must be consolidated, floated, checked for trueness of surface, and refloated as specified for float finish.

3.12.1.3 Finishing

Give trowel finish standard floor topping surfaces.

Give other finishes standard floor topping surfaces as indicated.

3.13 CURING AND PROTECTION

Curing and protection in accordance with ACI 301 Section 5, unless otherwise specified. Begin curing immediately following form removal. Avoid damage to concrete from vibration created by blasting, pile driving, movement of equipment in the vicinity, disturbance of formwork or protruding reinforcement, and any other activity resulting in ground

vibrations. Protect concrete from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until the expiration of the specified curing period. Do not use membrane-forming compound on surfaces where appearance would be objectionable, on any surface to be painted, where coverings are to be bonded to the concrete, or on concrete to which other concrete is to be bonded. If forms are removed prior to the expiration of the curing period, provide another curing procedure specified herein for the remaining portion of the curing period. Provide moist curing for those areas receiving liquid chemical sealer, hardener, or epoxy coating. Allow curing compound/sealer installations to cure prior to the installation of materials that adsorb VOCs.

3.13.1 Requirements for Type III, High-Early-Strength Portland Cement

The curing periods are required to be not less than one-fourth of those specified for portland cement, but in no case less than 72 hours.

3.13.2 Curing Periods

ACI 301 Section 5, except 10 days for retaining walls, pavement or chimneys. Begin curing immediately after placement. Protect concrete from premature drying, excessively hot temperatures, and mechanical injury; and maintain minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing are subject to approval by the Contracting Officer.

3.13.3 Curing Formed Surfaces

Accomplish curing of formed surfaces, including undersurfaces of girders, beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed before end of curing period, accomplish final curing of formed surfaces by any of the curing methods specified above, as applicable.

3.13.4 Curing Unformed Surfaces

a. Accomplish initial curing of unformed surfaces, such as monolithic slabs, floor topping, and other flat surfaces, by membrane curing.

c. Accomplish final curing of concrete surfaces to receive liquid floor hardener of finish flooring by moisture-retaining cover curing.

3.13.5 Temperature of Concrete During Curing

When temperature of atmosphere is 41 degrees F and below, maintain temperature of concrete at not less than 55 degrees F throughout concrete curing period or 45 degrees F when the curing period is measured by maturity. When necessary, make arrangements before start of concrete placing for heating, covering, insulation, or housing as required to maintain specified temperature and moisture conditions for concrete during curing period.

When the temperature of atmosphere is 80 degrees F and above or during other climatic conditions which cause too rapid drying of concrete, make

arrangements before start of concrete placing for installation of wind breaks, of shading, and for fog spraying, wet sprinkling, or moisture-retaining covering of light color as required to protect concrete during curing period.

Changes in temperature of concrete must be uniform and not exceed 37 degrees F in any one hour nor 80 degrees F in any 24-hour period.

3.13.6 Protection from Mechanical Injury

During curing period, protect concrete from damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration and from damage caused by rain or running water.

3.13.7 Protection After Curing

Protect finished concrete surfaces from damage by construction operations.

3.14 FIELD QUALITY CONTROL

3.14.1 Aggregate Testing

3.14.1.1 Fine Aggregate

At least once during each shift when the concrete plant is operating, there shall be one sieve analysis and fineness modulus determination in accordance with ASTM C136/C136M and COE CRD-C 104 for the fine aggregate or for each fine aggregate if it is batched in more than one size or classification. The location at which samples are taken may be selected by the Contractor as the most advantageous for control. However, the Contractor is responsible for delivering fine aggregate to the mixer within specification limits. When the amount passing on any sieve is outside the specification limits, the fine aggregate shall be immediately resampled and retested. If there is another failure on any sieve, the fact shall be immediately reported to the Contracting Officer, concreting shall be stopped, and immediate steps taken to correct the grading.

3.14.1.2 Coarse Aggregate

At least once during each shift in which the concrete plant is operating, there shall be a sieve analysis in accordance with ASTM C136/C136M for each size of coarse aggregate. The location at which samples are taken may be selected by the Contractor as the most advantageous for production control. However, the Contractor shall be responsible for delivering the aggregate to the mixer within specification limits. A test record of samples of aggregate taken at the same locations shall show the results of the current test as well as the average results of the five most recent tests including the current test. The Contractor may adopt limits for control coarser than the specification limits for samples taken other than as delivered to the mixer to allow for degradation during handling. When the amount passing any sieve is outside the specification limits, the coarse aggregate shall be immediately resampled and retested. If the second sample fails on any sieve, that fact shall be reported to the Contracting Officer. Where two consecutive averages of 5 tests are outside specification limits, the operation shall be considered out of control and reported to the Contracting Officer. Concreting shall be stopped and immediate steps shall be taken to correct the grading.

3.14.2 Concrete Sampling

ASTM C172/C172M. Collect samples of fresh concrete to perform tests specified. ASTM C31/C31M for making test specimens.

3.14.3 Concrete Testing

3.14.3.1 Slump Tests

ASTM C143/C143M. Take concrete samples during concrete placement/discharge. The maximum slump may be increased as specified with the addition of an approved admixture provided that the water-cementitious material ratio is not exceeded. Perform tests at commencement of concrete placement, when test cylinders are made, and for each 50 cubic yards (maximum) of concrete.

3.14.3.2 Temperature Tests

Test the concrete delivered and the concrete in the forms. Perform tests in hot or cold weather conditions (below 50 degrees F and above 80 degrees F) for each batch (minimum) or every 20 cubic yards (maximum) of concrete, until the specified temperature is obtained, and whenever test cylinders and slump tests are made.

3.14.3.3 Compressive Strength Tests

ASTM C39/C39M. Make six 6 inch by 12 inch or nine 4 inch by 8 inch test cylinders for each set of tests in accordance with ASTM C31/C31M, ASTM C172/C172M and applicable requirements of ACI 305R and ACI 306R. Take precautions to prevent evaporation and loss of water from the specimen. Test two 6 inch by 12 inch or three 4 inch by 8 inch cylinders at 7 days, two 6 inch by 12 inch or three 4 inch by 8 inch cylinders at 28 days, and hold two 6 inch by 12 inch or three 4 inch by 8 inch cylinders in reserve. Take samples for strength tests for each concrete mixture placed each day not less than once a day, nor less than once for each 150 cubic yards of concrete, nor less than once for each 5000 square feet of surface area for slabs or walls. For the entire project, take no less than five sets of samples and perform strength tests for each mix design of concrete placed. Each strength test result must be the average of two 6 inch by 12 inch or three 4 inch by 8 inch cylinders from the same concrete sample tested at 28. Concrete compressive tests must meet the requirements of this section, the Contract Document, and ACI 301.

3.14.3.4 Air Content

ASTM C173/C173M or ASTM C231/C231M for normal weight concrete.3.14.3.5 Strength of Concrete Structure

The strength of the concrete structure will be considered to be deficient if any of the following conditions are identified:

a. Failure to meet compressive strength tests as evaluated.

b. Reinforcement not conforming to requirements specified.

c. Concrete which differs from required dimensions or location in such a manner as to reduce strength.

d. Concrete curing and protection of concrete against extremes of

temperature during curing, not conforming to requirements specified.

e. Concrete subjected to damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration.

f. Poor workmanship likely to result in deficient strength.

Where the strength of the concrete structure is considered deficient submit a mitigation or remediation plan for review and approval by the contracting officer.

3.14.3.6 Non-Conforming Materials

Factors that indicate that there are non-conforming materials include (but not limited to) excessive compressive strength, inadequate compressive strength, excessive slump, excessive voids and honeycombing, concrete delivery records that indicate excessive time between mixing and placement, or excessive water was added to the mixture during delivery and placement. Any of these indicators alone are sufficient reason for the Contracting Officer to request additional sampling and testing.

Investigations into non-conforming materials must be conducted at the Contractor's expense. The Contractor must be responsible for the investigation and must make written recommendations to adequately mitigate or remediate the non-conforming material. The Contracting Officer may accept, accept with reduced payment, require mitigation, or require removal and replacement of non-conforming material at no additional cost to the Government.

3.14.3.7 Testing Concrete Structure for Strength

When there is evidence that strength of concrete structure in place does not meet specification requirements or there are non-conforming materials, make cores drilled from hardened concrete for compressive strength determination in accordance with ASTM C42/C42M, and as follows:

a. Take at least three representative cores from each member or area of concrete-in-place that is considered potentially deficient. Location of cores will be determined by the Contracting Officer.

b. Test cores after moisture conditioning in accordance with ASTM C42/C42M if concrete they represent is more than superficially wet under service.

c. Air dry cores, (60 to 80 degrees F with relative humidity less than 60 percent) for 7 days before test and test dry if concrete they represent is dry under service conditions.

d. Strength of cores from each member or area are considered satisfactory if their average compressive strength is equal to or greater than 85 percent of the design compressive strength, and if no single core strength is less than 75 percent of the design compressive strength. Additional testing of cores extracted from locations represented by erratic core strength results will be permitted only when approved by the Contracting Officer.

Fill core holes solid with patching mortar and finished to match adjacent concrete surfaces.

Correct concrete work that is found inadequate by core tests in a manner approved by the Contracting Officer.

3.15 REPAIR, REHABILITATION AND REMOVAL

Before the Contracting Officer accepts the structure the Contractor must inspect the structure for cracks, damage and substandard concrete placements that may adversely affect the service life of the structure. A report documenting these defects must be prepared which includes recommendations for repair, removal or remediation must be submitted to the Contracting Officer for approval before any corrective work is accomplished.

3.15.1 Crack Repair

Prior to final acceptance, all cracks in excess of 0.02 inches wide must be documented and repaired. The proposed method and materials to repair the cracks must be submitted to the Contracting Officer for approval. The proposal must address the amount of movement expected in the crack due to temperature changes and loading.

3.15.2 Repair of Weak Surfaces

Weak surfaces are defined as mortar-rich, rain-damaged, uncured, or containing exposed voids or deleterious materials. Concrete surfaces with weak surfaces less than 1/4 inch thick must be diamond ground to remove the weak surface. Surfaces containing weak surfaces greater than 1/4 inch thick must be removed and replaced or mitigated in a manner acceptable to the Contracting Officer.

3.15.3 Failure of Quality Assurance Test Results

Proposed mitigation efforts by the Contractor must be approved by the Contracting Officer prior to proceeding.

-- End of Section --

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SECTION 04 20 00

UNIT MASONRY
11/15, CHG 2: 05/19

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 216.1	(2014) Code Requirements for Determining Fire Resistance of Concrete and Masonry Construction Assemblies
ACI SP-66	(2004) ACI Detailing Manual

ASTM INTERNATIONAL (ASTM)

ASTM A153/A153M	(2023) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A167	(2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A185/A185M	(2007) Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM A615/A615M	(2022) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A641/A641M	(2019) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A951/A951M	(2011) Standard Specification for Steel Wire for Masonry Joint Reinforcement
ASTM A996/A996M	(2016) Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
ASTM A1008/A1008M	(2023) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength

	Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
ASTM A1064/A1064M	(2022) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM B370	(2022) Standard Specification for Copper Sheet and Strip for Building Construction
ASTM C67/C67M	(2023a) Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile
ASTM C90	(2023) Standard Specification for Loadbearing Concrete Masonry Units
ASTM C129	(2023) Standard Specification for Nonloadbearing Concrete Masonry Units
ASTM C207	(2018) Standard Specification for Hydrated Lime for Masonry Purposes
ASTM C270	(2019a; E 2019) Standard Specification for Mortar for Unit Masonry
ASTM C476	(2023) Standard Specification for Grout for Masonry
ASTM C494/C494M	(2019; E 2022) Standard Specification for Chemical Admixtures for Concrete
ASTM C641	(2023) Standard Test Method for Iron Staining Materials in Lightweight Concrete Aggregates
ASTM C780	(2023) Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
ASTM C1019	(2019) Standard Test Method for Sampling and Testing Grout
ASTM C1384	(2012a) Standard Specification for Admixtures for Masonry Mortars
ASTM D2000	(2018) Standard Classification System for Rubber Products in Automotive Applications
ASTM D2287	(2019) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
ASTM E514/E514M	(2020) Standard Test Method for Water Penetration and Leakage Through Masonry

THE MASONRY SOCIETY (TMS)

TMS MSJC	(2016) Masonry Standard Joint Committee's

(MSJC) Book - Building Code Requirements and Specification for Masonry Structures, Containing TMS 402/ACI 530/ASCE 5, TMS 602/ACI 530.1/ASCE 6, and Companion Commentaries

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Cut CMU Drawings; G

Reinforcement Detail Drawings; G

SD-03 Product Data

Hot Weather Procedures; G

Cold Weather Procedures; G

Cement; G

Cementitious Materials; G

Insulation; G

Clay Or Shale Brick

SD-04 Samples

Mock-Up Panel; G

Concrete Masonry Units (CMU); G

Admixtures for Masonry Mortar; G

Anchors, Ties, and Bar Positioners; G

Joint Reinforcement; G

Clay Masonry Expansion-Joint Materials; G

Insulation; G

SD-05 Design Data

Masonry Compressive Strength; G

Fire-Rated Concrete Masonry Units

Bracing Calculations; G

SD-06 Test Reports

Efflorescence Test

Fire-Rated Concrete Masonry Units

Field Testing of Mortar

Single-Wythe Masonry Wall Water Penetration Test

SD-07 Certificates

Special Masonry Inspector Qualifications

Concrete Masonry Units (CMU)

Cementitious Materials

Admixtures for Masonry Mortar

Admixtures for Grout

Anchors, Ties, and Bar Positioners

Joint Reinforcement

Insulation

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1.3 QUALITY ASSURANCE

1.3.1 Masonry Mock-Up Panels

1.3.1.1 Mock-Up Panel Location

After material samples are approved and prior to starting masonry work, construct a mock-up panel for each type and color of masonry required. At least 48 hours prior to constructing the panel or panels, submit written notification to the Contracting Officer. Do not build-in mock-up panels as part of the structure; locate mock-up panels where directed. Construct portable mock-up panels or locate in an area where they will not be disrupted during construction.

1.3.1.2 Mock-Up Panel Configuration

Construct mock-up panels L-shaped or otherwise configured to represent all of the wall elements. Construct panels of the size necessary to demonstrate the acceptable level of workmanship for each type of masonry represented on the project. Provide a straight panel or a leg of an L-shaped panel of minimum size 8 feet long by 6 feet high.

1.3.1.3 Mock-Up Panel Composition

Show full color range, texture, and bond pattern of the masonry work. Demonstrate mortar joint tooling; grouting of reinforced vertical cores, collar joints, bond beams, and lintels; positioning, securing, and lapping of reinforcing steel; positioning and lapping of joint reinforcement (including prefabricated corners); and cleaning of masonry work during the construction of the panels. Also include installation or application procedures for anchors, wall ties, CMU control joints, brick expansion joints, insulation, flashing, brick soldier, row lock courses and weeps. Include a a masonry bonded corner a stacked bond corner a bond beam corner and parging and installation of electrical boxes and conduit. When the panel represents reinforced masonry, include a 2 by 2 foot opening placed at least 2 feet above the panel base and 2 feet away from all free edges, corners, and control joints. Provide required reinforcing around this opening as well as at wall corners and control joints.

1.3.1.4 Mock-Up Panel Construction Method

Where anchored veneer walls or cavity walls are required, demonstrate and receive approval for the method of construction; i.e., either bring up the two wythes together or separately, with the insulation and appropriate ties placed within the specified tolerances across the cavity. Demonstrate provisions to preclude mortar or grout droppings in the cavity and to provide a clear open air space of the dimensions shown on the drawings. Where masonry is to be grouted, demonstrate and receive approval on the method that will be used to bring up the masonry wythes; support the reinforcing bars; and grout cells, bond beams, lintels, and collar joints using the requirements specified herein. When water-repellent is specified to be applied to the masonry, apply the approved product to the mock-up panel. Construct panels on a properly designed concrete foundation.

1.3.1.5 Mock-Up Panel Purpose

The completed panels is used as the standard of workmanship for the type of masonry represented. Do not commence masonry work until the mock-up panel for that type of masonry construction has been completed and approved. Protect panels from the weather and construction operations until the masonry work has been completed and approved. Perform cleaning procedures on the mockup and obtain approval of the Contracting Officer prior to cleaning the building. After completion of the work, completely remove the mock-up panels, including all foundation concrete, from the construction site.

1.3.2 Special Masonry Inspector Qualifications

Refer to Section 01 45 35 SPECIAL INSPECTIONS for qualifications and responsibilities of the masonry special inspector.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver, store, handle, and protect material to avoid chipping, breakage, and contact with soil or contaminating material. Store and prepare materials in already disturbed areas to minimize project site disturbance and size of project site.

1.4.1 Masonry Units

Cover and protect masonry units from precipitation. Conform to handling and storage requirements of TMS MSJC.

a. Pack glazed brick, glazed structural clay tile, and prefaced concrete masonry units in the manufacturer's standard paper cartons, trays, or shrink wrapped pallets with a divider between each unit. Do not stack pallets. Do not remove units from cartons until cartons are placed on scaffolds or in the location where units are to be laid.

b. Mark prefabricated lintels on top sides to show either the lintel schedule number or the number and size of top and bottom bars.

1.4.2 Reinforcement, Anchors, and Ties

Store steel reinforcing bars, coated anchors, ties, and joint reinforcement above the ground. Maintain steel reinforcing bars and uncoated ties free of loose mill scale and loose rust.

1.4.3 Cementitious Materials, Sand and Aggregates

Deliver cementitious and other packaged materials in unopened containers, plainly marked and labeled with manufacturers' names and brands. Store cementitious material in dry, weathertight enclosures or completely cover. Handle cementitious materials in a manner that will prevent the inclusion of foreign materials and damage by water or dampness. Store sand and aggregates in a manner to prevent contamination and segregation.

1.5 PROJECT/SITE CONDITIONS

Conform to TMS MSJC for hot and cold weather masonry erection.

1.5.1 Hot Weather Procedures

When ambient air temperature exceeds 100 degrees F, or exceeds 90 degrees F and the wind velocity is greater than 8 mph, comply with TMS MSJC Article 1.8 D for: preparation prior to conducting masonry work; construction while masonry work is in progress; and protection for newly completed masonry.

1.5.2 Cold Weather Procedures

When ambient temperature is below 40 degrees F, comply with TMS MSJC Article 1.8 C for: preparation prior to conducting masonry work; construction while masonry work is in progress; and protection for newly completed masonry.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

2.1.1 Design - Specified Compressive Strength of Masonry

The specified compressive strength of masonry, f'm, is as indicated for each type of masonry .

2.1.2 Performance - Verify Masonry Compressive Strength

Verify specified compressive strength of masonry using the "Unit Strength Method" of TMS MSJC. Submit calculations and certifications of unit and mortar strength.

Verify specified compressive strength of masonry using the "Prism Test Method" of TMS MSJC when the "Unit Strength Method" cannot be used. Submit test results.

2.2 MANUFACTURED UNITS

2.2.1 General Requirements

Do not change the source of materials, which will affect the appearance of the finished work, after the work has started except with Contracting Officer's approval. Submit test reports from an approved independent laboratory. Certify test reports on a previously tested material as the same materials as that proposed for use in this project. Submit certificates of compliance stating that the materials meet the specified requirements.

2.2.2 Clay or Shale Brick

2.2.2.1 General

2.2.2.1.1 Sample Submittal

Submit brick samples as specified, showing the color range and texture of clay or shale brick. Limit units used on the project to those that conform to the approved sample. Submit sample of colored mortar with applicable masonry unit and color samples of three stretcher units and one unit for each type of special shape.

2.2.2.1.2 Uniformity

Deliver clay or shale brick units factory-blended to provide a uniform appearance and color range in the completed wall.

2.2.2.1.3 Efflorescence Test

Test clay brick that will be exposed to weathering for efflorescence in accordance with ASTM C67/C67M. Schedule tests far enough in advance of starting masonry work to permit retesting if necessary. Units meeting the definition of "effloresced" are subject to rejection.

2.2.2.2 Solid Clay or Shale Brick

Provide solid clay or shale brick that conforms to ASTM C216, Type FBS FBA FBX ASTM C62. Where brick cores, recesses, or deformation would be

exposed to view, provide 100 percent solid units. Provide brick with texture and color tange to match the brick indicated on section 09 06 00 SCHEDULES FOR FINISHES.

Provide brick with specified sizes.

a. Modular size, 3-5/8 inches thick, 2-1/4 inches high, and 7-5/8 inches long.

2.2.3 Concrete Units

2.2.3.1 Aggregates

Test lightweight aggregates, and blends of lightweight and heavier aggregates in proportions used in producing the units, for stain-producing iron compounds in accordance with ASTM C641,visual classification method. Do not incorporate aggregates for which the iron stain deposited on the filter paper exceeds the "light stain" classification.

2.2.3.2 Concrete Masonry Units (CMU)

2.2.3.2.1 Cement

Use only cement that has a low alkali content and is of one brand.

2.2.3.2.2 Recycled Content

Units may contain post-consumer or post-industrial recycled content.

2.2.3.2.3 Size

2.2.3.2.4 Surfaces

For units that are to be plastered or stuccoed, provide surfaces that are sufficiently rough to provide bond. Elsewhere, provide units with exposed surfaces that are smooth and of uniform texture.

2.2.3.2.5 Weather Exposure

Provide concrete masonry units with water-repellant admixture added during manufacture where units will be exposed to weather.

2.2.3.2.6 Unit Types

a. Hollow Load-Bearing Units: ASTM C90, lightweight . Provide load-bearing units for exterior walls, foundation walls, load-bearing walls, and shear walls.

b. Hollow Non-Load-Bearing Units: ASTM C129, lightweight . Load-bearing units may be provided in lieu of non-load-bearing units.

c. Solid Load-Bearing Units: ASTM C90, lightweight units. Provide solid units as indicated.

2.2.3.2.7 Jamb Units

Provide jamb units of the shapes and sizes to conform with wall units. Solid units may be incorporated in the masonry work where necessary to fill out at corners, gable slopes, and elsewhere as approved.

Provide sash jamb units with a 3/4 by 3/4 inch groove near the center at end of each unit.

2.2.3.3 Fire-Rated Concrete Masonry Units

For indicated fire-rated construction, provide concrete masonry units of minimum equivalent thickness for the fire rating indicated and the corresponding type of aggregates indicated in TABLE I. Units containing more than one of the aggregates listed in TABLE I will be rated by linear interpolation based on the percent by dry-rodded volume of each aggregate used in manufacturing the units.

TABLE I
FIRE-RATED CONCRETE MASONRY UNITS

Aggregate Type	Minimum Equivalent Thickness for Fire-Resistance Rating, inch						
	1/2 hour	3/4 hour	1 hour	1-1/2 hour	2 hours	3 hours	4 hours
Calcareous or siliceous gravel (other than limestone)	2.0	2.4	2.8	3.6	4.2	5.3	6.2
Limestone, cinders, or air-cooled slag	1.9	2.3	2.7	3.4	4.0	5.0	5.9
Expanded clay, expanded shale, or expanded slate	1.8	2.2	2.6	3.3	3.6	4.4	5.1
Expanded slag or pumice	1.5	1.9	2.1	2.7	3.2	4.0	4.7

Determine equivalent thickness in accordance with ACI 216.1. Where walls are to receive plaster or be faced with brick, or otherwise form an assembly; include the thickness of plaster or brick or other material in the assembly in determining the equivalent thickness. Submit calculation results.

2.3 EQUIPMENT

2.3.1 Vibrators

Maintain at least one spare vibrator on site at all times.

2.3.2 Grout Pumps

Pumping through aluminum tubes is not permitted.

2.4 MATERIALS

2.4.1 Mortar Materials

2.4.1.1 Cementitious Materials

Provide cementitious materials that conform to those permitted by ASTM C270.

2.4.1.2 Hydrated Lime and Alternates

Provide lime that conforms to one of the materials permitted by ASTM C207 for use in combination with portland cement, hydraulic cement, and blended hydraulic cement. Do not use lime in combination with masonry cement or mortar cement.

2.4.1.3 Admixtures for Masonry Mortar

In cold weather, use a non-chloride based accelerating admixture that conforms to ASTM C1384, unless Type III portland cement is used in the mortar.

In showers and kitchens, use mortar that contains a water-repellent admixture that conforms to ASTM C1384. Provide a water-repellent admixture, conforming to ASTM C1384 and of the same brand and manufacturer as the block's integral water-repellent, in the mortar used to place concrete masonry units that have an integral water-repellent admixture.

2.4.1.4 Aggregate and Water

Provide aggregate (sand) and water that conform to materials permitted by ASTM C270.

2.4.2 Grout and Ready-Mix Grout Materials

2.4.2.1 Cementitious Materials for Grout

Provide cementitious materials that conform to those permitted by ASTM C476.

2.4.2.2 Admixtures for Grout

Water-reducing admixtures that conform to ASTM C494/C494M Type F or G and viscosity-modifying admixtures that conform to ASTM C494/C494M Type S are permitted for use in grout. Other admixtures require approval by the Contracting Officer.

In cold weather, a non-chloride based accelerating admixture may be used subject to approval by the Contracting Officer; use accelerating admixture that is non-corrosive and conforms to ASTM C494/C494M, Type C.

2.4.2.3 Aggregate and Water

Provide fine and coarse aggregates and water that conform to materials permitted by ASTM C476.

2.5 MORTAR AND GROUT MIXES

2.5.1 Mortar Mix

a. Provide mortar Type N S unless specified otherwise herein.

. For field-batched mortar, measure component materials by volume. Use measuring boxes for materials that do not come in packages, such as sand, for consistent batching. Mix cementitious materials and aggregates between 3 and 5 minutes in a mechanical batch mixer with a sufficient amount of water to produce a workable consistency. Do not hand mix mortar unless approved by the Contracting Officer. Maintain workability of mortar by remixing or retempering. Discard mortar that has begun to stiffen or is not used within 2-1/2 hours after initial mixing.

. For preblended mortar, follow manufacturer's mixing instructions.

2.5.2 Grout and Ready Mix Grout Mix

Use grout that conforms to ASTM C476, fine . Use conventional grout with a slump between 8 and 11 inches. Use self-consolidating grout with slump flow of 24 to 30 inches and a visual stability index (VSI) not greater than 1. Provide minimum grout strength of psi in 28 days, as tested in accordance with ASTM C1019. Do not change proportions and do not use materials with different physical or chemical characteristics in grout for the work unless additional evidence is furnished that grout meets the specified requirements. Use ready-mixed grout that conforms to ASTM C476.

2.6 ACCESSORIES

2.6.1 Grout Barriers

Grout barriers for vertical cores that consist of fine mesh wire, fiberglass, or expanded metal.

2.6.2 Anchors, Ties, and Bar Positioners

2.6.2.1 General

a. Fabricate anchors and ties without drips or crimps. Size anchors and ties to provide a minimum of 5/8 inch mortar cover from each face of masonry.

b. Fabricate steel wire anchors and ties from wire conforming to ASTM A1064/A1064M and hot-dip galvanize in accordance with ASTM A153/A153M.

c. Fabricate joint reinforcement in conformance with ASTM A951/A951M. Hot dip galvanize joint reinforcement in exterior walls and in interior walls exposed to moist environment in conformance with ASTM A153/A153M. Galvanize joint reinforcement in other interior walls in conformance with ASTM A641/A641M; coordinate with paragraph JOINT REINFORCEMENT below.

d. Fabricate sheet metal anchors and ties in conformance with ASTM A1008/A1008M. Hot dip galvanize sheet metal anchors and ties in exterior walls and in interior walls exposed to moist environment in compliance with ASTM A153/A153M Class B. Galvanize sheet metal anchors and ties in other interior walls in compliance with ASTM A653/A653M, Coating Designation G60.

e. Submit two anchors, ties and bar positioners of each type used, as samples.

2.6.2.2 Wire Mesh Anchors

Provide wire mesh anchors of 1/4 inch mesh galvanized hardware cloth, conforming to ASTM A185/A185M, with length not less than 12 inches, at intersections of interior non-bearing masonry walls.

2.6.2.3 Wall Ties for Multi-Wythe Masonry Construction

Provide rectangular-shaped wall ties, fabricated of hot-dipped galvanized W1.7 diameter steel wire. Provide rectangular wall ties no less than 4 inches wide.

Provide adjustable type wall ties, if approved for use, that consist of two essentially U-shaped elements fabricated of minimum W2.8 diameter steel wire or pintle type ties that are inserted to eyes of horizontal joint reinforcement, hot-dip galvanized. Provide adjustable ties with double pintle legs and allows a maximum offset of 1-1/4 inch between each element of the tie and maximum distance between connecting parts no more than 1/16 inch. Form the pintle and eye elements so that both can be in the same plane. Wall ties may also be of a continuous type conforming to paragraph JOINT REINFORCEMENT.

2.6.2.4 Dovetail Anchors

Provide dovetail anchors of 3/16 inch diameter steel wire, triangular shaped, and attached to a 12 gauge or heavier steel dovetail section. Use these anchors to connect the exterior masonry wythe as it passes over the face of concrete columns, beams, or walls. Fill cells immediately above and below these anchors unless solid units are used. Furnish dovetail slots, which are specified to be installed by others, in accordance with Section 03 30 00 CAST-IN-PLACE CONCRETE.

2.6.2.5 Adjustable Anchors

2.6.2.5.1 Anchorage to Structural Steel

Provide adjustable anchors for connecting masonry walls to the structural steel frame that have 500 pounds capacity in both tension and compression for the span indicated when placed at 60 inches on center; submit test data to verify compliance. Provide zinc-rich paint for touching up paint after welding galvanized anchors to structural steel.

2.6.2.5.2 Anchorage of Veneer to Light Gauge Steel or Concrete Backing

Use one of the following types of adjustable anchors to connect veneer to light gauge steel or concrete backing:

a. sheet metal at least 7/8 inch wide, 0.06 inch thick, and with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch or bent, notched or punched to provide equivalent performance;

b. wire anchors of minimum size W1.7 with ends bent to form a minimum 2 inches extension and without drips;

c. or wire pintle anchors used in conjunction with joint reinforcement.

Do not exceed 1/16 inch clearance between connecting parts of the tie. Assemble adjustable anchors to prevent disengagement. Provide pintle anchors with one or more pintle legs of wire size W2.8 and an offset not exceeding 1-1/4 inch.

2.6.2.6 Veneer Anchor Screws

Provide screws for attachment of veneer anchors to cold-formed steel framing members of size as indicated . Provide length of screws such that the screws penetrate the holding member by not less than 5/8 inch.

2.6.2.7 Bar Positioners

Factory-fabricate bar positioners, used to prevent displacement of reinforcing bars during the course of construction, from 9 gauge steel wire or equivalent, and hot-dip galvanized. Bar positioners must be suitable for intended use and be corrosion resistant steel. Bar positioners not fully contained within the wythe must be hot-dip galvanized.

2.6.3 Joint Reinforcement

Factory fabricate joint reinforcement in conformance with ASTM A951/A951M, welded construction. Provide ladder type joint reinforcement, having one longitudinal wire in the mortar bed of each face shell for hollow units and one wire for solid units and with all wires a minimum of 9 gauge. Size joint reinforcement to provide a minimum of 5/8 inch cover from each face. Space crosswires not more than 16 inches. Provide joint reinforcement for straight runs in flat sections not less than 10 feet long. Provide joint reinforcement with factory formed corners and intersections. If approved for use, joint reinforcement may be furnished with adjustable wall tie features. Submit one piece of each type used, including corner and wall intersection pieces, showing at least two cross wires.

2.6.4 Reinforcing Steel Bars

Provide reinforcing steel bars and rods conforming to ASTM A615/A615M or ASTM A996/A996M, Grade 60.

2.6.5 Concrete Masonry Control Joint Keys

Provide control joint keys of a factory fabricated solid section of natural or synthetic rubber (or combination thereof) conforming to ASTM D2000 M2AA-805 with a minimum durometer hardness of 80 or polyvinyl chloride conforming to ASTM D2287 Type PVC 654-4 with a minimum durometer hardness of 85. Form the control joint key with a solid shear section not less than 5/8 inch thick and 3/8 inch thick flanges, with a tolerance of plus or minus 1/16 inch, to fit neatly, but without forcing, in masonry unit jamb sash grooves.

2.6.6 Clay Masonry Expansion-Joint Materials

Provide backer rod and sealant, adequate to accommodate joint compression and extension equal to 50 percent of the width of the joint. Provide the backer rod of compressible rod stock of closed cell polyethylene foam,

polyurethane foam, butyl rubber foam, or other flexible, nonabsorptive material as recommended by the sealant manufacturer. Provide sealant in conformance with Section 07 92 00 JOINT SEALANTS.

Submit one piece of each type of material used.

2.6.7 Through Wall Flashing and Weeps

2.6.7.1 General

Provide coated copper, copper or stainless steel sheet, self-adhesive rubberized sheet, or reinforced membrane sheet flashing

2.6.7.2 Coated-Copper Flashing

Provide 7 ounce, electrolytic copper sheet, uniformly coated on both sides with acidproof, alkaliproof, asphalt impregnated kraft paper or polyethylene sheets.

2.6.7.3 Copper or Stainless Steel Flashing

Provide copper sheet, complying with ASTM B370, minimum 16 ounce weight; or stainless steel, ASTM A167, Type 304 or 316, 0.015 inch thick, No. 2D finish.

2.6.7.4 Reinforced Membrane Flashing

Provide polyester film core with a reinforcing fiberglass scrim bonded to one side. Provide membrane that is impervious to moisture, flexible, is not affected by caustic alkalis, and after being exposed for not less than 1/2 hour to a temperature of 32 degrees F, shows no cracking when, at that temperature, it is bent 180 degrees over a 1/16 inch diameter mandrel and then bent at the same point over the same size mandrel in the opposite direction 360 degrees.

2.6.7.5 Rubberized Flashing

Provide self-adhesive rubberized asphalt sheet flashing consisting of 32-mil thick pliable and highly adhesive rubberized asphalt compound bonded completely and integrally to 8-mil thick, high density, cross-laminated polyethylene film to produce an overall thickness of 40 mils. Provide rubberized, asphalt-based mastic and surface conditioner that are each approved by flashing manufacturer for use with flashing material.

2.6.7.6 Weep Ventilators

Provide weep ventilators that are prefabricated from stainless steel or plastic. Provide inserts with grill or louver-type openings designed to allow the passage of moisture from cavities and to prevent the entrance of insects, and with a rectangular closure strip to prevent mortar droppings from clogging the opening. Provide ventilators with compressible flanges to fit in a standard 3/8 inch wide mortar joint and with height equal to the nominal height of the unit.

2.6.7.7 Single-Wythe Exterior Wall CMU Flashing System

In single-wythe exterior CMU walls, provide a system of CMU cell flashing pans and interlocking CMU web covers made from UV-resistant, high-density

polyethylene. For exterior CMU walls, provide a flashing/weep system in open cores that do not receive grout. Cell flashing pans are to have integral weep spouts built into mortar bed joints that extend into the cell to prevent clogging with mortar.

2.6.7.8 Metal Drip Edge

Provide stainless steel drip edge, 15-mil thick, hemmed edges, with down-turned drip at the outside edge and upturned dam at the inside edge for use with membrane flashings.

2.6.8 RIGID BOARD-TYPE INSULATION

Provide rigid board-type insulation as specified in Section 07 21 13 BOARD AND BLOCK INSULATION.

PART 3 EXECUTION

3.1 EXAMINATION

Prior to start of work, verify the applicable conditions as set forth in TMS MSJC, inspection.

3.2 PREPARATION

3.2.1 Stains

Protect exposed surfaces from mortar and other stains. When mortar joints are tooled, remove mortar from exposed surfaces with fiber brushes and wooden paddles. Protect base of walls from splash stains by covering adjacent ground with sand, sawdust, or polyethylene.

3.2.2 Loads

Do not apply uniform loads for at least 12 hours or concentrated loads for at least 72 hours after masonry is constructed. Provide temporary bracing as required.

3.2.3 Concrete Surfaces

Where masonry is to be placed, clean concrete of laitance, dust, dirt, oil, organic matter, or other foreign materials and slightly roughen to provide a surface texture with a depth of at least 1/8 inch. Sandblast, if necessary, to remove laitance from pores and to expose the aggregate.

3.2.4 Shelf Angles

Adjust shelf angles as required to keep the masonry level and at the proper elevation.

3.2.5 Bracing

Provide bracing and scaffolding necessary for masonry work. Design bracing to resist wind pressure as required by OSHA and local codes and submit bracing calculations, sealed by a registered professional engineer. Do not remove bracing in less than 10 days.

3.3 ERECTION

3.3.1 General

a. Coordinate masonry work with the work of other trades to accommodate built-in items and to avoid cutting and patching. Lay masonry units in the indicated bond pattern. Lay facing courses level with back-up courses, unless the use of adjustable ties has been approved in which case the tolerances is plus or minus 1/2 inch. Adjust each unit to its final position while mortar is still soft and has plastic consistency.

b. Remove and clean units that have been disturbed after the mortar has stiffened, and relay with fresh mortar. Keep air spaces, cavities, chases, expansion joints, and spaces to be grouted free from mortar and other debris. Select units to be used in exposed masonry surfaces from those having the least amount of chipped edges or other imperfections detracting from the appearance of the finished work.

c. When necessary to temporarily discontinue the work, step (rack) back the masonry for joining when work resumes. Toothing may be used only when specifically approved by the Contracting Officer. Before resuming work, remove loose mortar and thoroughly clean the exposed joint. Cover the top of walls subjected to rain or snow with nonstaining waterproof covering or membrane when work is not in process. Extend the covering a minimum of 610 mm 2 feet down on each side of the wall and hold securely in place.

d. Ensure that units being laid and surfaces to receive units are free of water film and frost. Lay solid units in a nonfurrowed full bed of mortar. Bevel mortar for veneer wythes and slope down toward the cavity side. Shove units into place so that the vertical joints are tight. Completely fill vertical joints between solid units with mortar, except where indicated at control, expansion, and isolation joints. Place hollow units so that mortar extends to the depth of the face shell at heads and beds, unless otherwise indicated. Mortar will be permitted to protrude up to 1/2 inch into the space or cells to be grouted. Provide means to prevent mortar from dropping into the space below or clean grout spaces prior to grouting.

e. In multi-wythe construction with collar joints no more than 3/4 inch wide, bring up the inner wythe not more than 16 inches ahead of the outer wythe. Fill collar joints with mortar during the laying of the facing wythe, and do not lag the laying of the facing wythe by back-buttering each unit as it is laid.

3.3.1.1 Jointing

Tool mortar joints when the mortar is thumbprint hard. Tool horizontal joints after tooling vertical joints. Brush mortar joints to remove loose and excess mortar.

3.3.1.1.1 Tooled Joints

Tool mortar joints in exposed exterior and interior masonry surfaces concave , using a jointer that is slightly larger than the joint width so that complete contact is made along the edges of the unit. Perform tooling so that the mortar is compressed and the joint surface is sealed. Use a jointer of sufficient length to obtain a straight and true mortar

joint. No exterior joints are to be left un-tooled.

3.3.1.1.2 Flush Joints

Flush cut mortar joints in concealed masonry surfaces and joints at electrical outlet boxes in wet areas. Finish flush cut joints by cutting off the mortar flush with the face of the wall. Point joints in unparged masonry walls below grade tight. For architectural units, such as fluted units, completely fill both the head and bed joints and flush cut.

3.3.1.1.3 Door and Window Frame Joints

On the exposed interior side of exterior frames, rake joints between frames and abutting masonry walls to a depth of 3/8 inch. On the exterior side of exterior frames,rake joints between frames and abutting masonry walls to a depth of 3/8 inch.

3.3.1.1.4 Joint Widths

a. Construct brick masonry with mortar joint widths equal to the difference between the specified and nominal dimensions of the unit, within tolerances permitted by TMS MSJC.

b. Provide 3/8 inch wide mortar joints in concrete masonry, except for prefaced concrete masonry units.

c. Provide 3/8 inch wide mortar joints on unfaced side of prefaced concrete masonry units and not less than 3/16 inch nor more than 1/4 inch wide on prefaced side.

d. Maintain mortar joint widths within tolerances permitted by TMS MSJC

3.3.1.2 Cutting and Fitting

Use full units of the proper size wherever possible, in lieu of cut units. Locate cut units where they would have the least impact on the architectural aesthetic goals of the facility. Perform cutting and fitting, including that required to accommodate the work of others, by masonry mechanics using power masonry saws. Concrete masonry units may be wet or dry cut. Before being placed in the work, dry wet-cut units to the same surface-dry appearance as uncut units being laid in the wall. Provide cut edges that are clean, true and sharp.

a. Carefully make openings in the masonry so that wall plates, cover plates or escutcheons required by the installation will completely conceal the openings and will have bottoms parallel with the masonry bed joints. Provide reinforced masonry lintels above openings over 12 inches wide for pipes, ducts, cable trays, and other wall penetrations, unless steel sleeves are used.

b. Do not reduce masonry units in size by more than one-third in height and one-half in length. Do not locate cut products at ends of walls, corners, and other openings.

3.3.1.3 Unfinished Work

Rack back unfinished work for joining with new work. Toothing may be resorted to only when specifically approved by the Contracting Officer. Remove loose mortar and thoroughly clean the exposed joints before laying

new work.

3.3.1.4 Clay Masonry Expansion Joints

Provide clay masonry expansion joints as indicated. Construct by leaving a gap . Ensure that no mortar or other noncompressible materials are within the joint. Install backer rod and sealant in accordance with Section 07 92 00 JOINT SEALANTS.

3.3.1.5 Control Joints

Provide control joints in concrete masonry as indicated. Construct by using open end stretcher units placed with the closed end at the joint in accordance with the details shown on the Drawings. Form a continuous vertical joint at control joint locations, including through bond beams, by utilizing half blocks in alternating courses on each side of the joint. Interrupt the control joint key in courses containing continuous bond beam reinforcement. Interrupt the horizontal reinforcement and grout in bond beams at the control joint except in bond beams at the floor and roof diaphragms.

Where mortar was placed in the joint, rake both faces of the control joints to a depth of 3/4 inch. Install backer rod and sealant on both faces in accordance with Section 07 92 00 JOINT SEALANTS.

3.3.1.6 Decorative Architectural Units

Place decorative masonry units with the patterned face shell properly aligned in the completed wall.

3.3.2 Anchored Veneer Construction

a. Construct exterior masonry wythes to the thickness indicated on the drawings. Provide a minimum 3 1/2" inch air space behind the masonry veneer. Provide means to ensure that the cavity space and flashings are kept clean of mortar droppings and other loose debris. Maintain chases and raked-out joints free from mortar and debris.

b. Place masonry in running bond pattern.

c. For veneer over stud framing, do not install veneer until the exterior sheathing, moisture barrier, veneer anchors and flashing have been installed on the backing. Take extreme care to avoid damage to the moisture barrier and flashing during construction of the masonry veneer. Repair or replace portions of the moisture barrier and flashing that are damaged prior to completion of the veneer. Provide a continuous cavity as indicated.

f. With solid units, embed anchors in mortar joint and extend into the veneer a minimum of 1-1/2 inch, with at least 5/8 inch mortar cover to the outside face.

g. With hollow units, embed anchors in mortar or grout and extend into the veneer a minimum of 1-1/2 inch, with at least 5/8 inch mortar or grout cover to outside face.

3.3.3 Composite Walls

Tie masonry wythes together with joint reinforcement or with unit wall ties. Embed wall ties at least 1-1/2 inch into mortar of solid units and at least 1/2 inch into the mortar of the outer face shell of hollow units. Provide at least one tie every 2.67 square feet for wire size W1.7 and at least one tie every 4.50 square feet for wire size W2.8. Space ties at a maximum of 36 inches horizontally and 24 inches vertically. Do not cross expansion joints or control joints with ties. Fill collar joints between masonry facing and masonry backup solidly with grout.

3.3.4 Reinforced, Single Wythe Concrete Masonry Units Walls

3.3.4.1 Concrete Masonry Unit Placement

a. Fully bed units used to form piers, pilasters, columns, starting courses on footings, solid foundation walls, lintels, and beams, and where cells are to be filled with grout in mortar under both face shells and webs. Provide mortar beds under both face shells for other units. Mortar head joints for a distance in from the face of the unit not less than the thickness of the face shell.

b. Solidly grout foundation walls below grade.

c. Stiffen double walls at wall-mounted plumbing fixtures by use of strap anchors, two above each fixture and two below each fixture, located to avoid pipe runs, and extending from center to center of each wall within the double wall. Adequately reinforce walls and partitions for support of wall-hung plumbing fixtures when chair carriers are not specified.

d. Submit drawings showing elevations of walls exposed to view and indicating the location of all cut CMU products.

3.3.4.2 Preparation for Reinforcement

Lay units in such a manner as to preserve the unobstructed vertical continuity of cores to be grouted. Remove mortar protrusions extending 1/2 inch or more into cells before placing grout. Position reinforcing bars accurately as indicated before placing grout. Where vertical reinforcement occurs, fill cores solid with grout in accordance with paragraph PLACING GROUT in this Section.

3.3.5 ANCHORAGE

3.3.5.1 Anchorage to Concrete

Anchor masonry to the face of concrete columns, beams, or walls with dovetail anchors spaced not over 16 inches on centers vertically and 24 inches on center horizontally.

3.3.5.2 Anchorage to Structural Steel

Anchor masonry to vertical structural steel framing with adjustable steel wire anchors spaced not over 16 inches on centers vertically, and if applicable, not over 24 inches on centers horizontally.

3.3.6 Lintels

3.3.6.1 Masonry Lintels

Construct masonry lintels with lintel units filled solid with grout in all courses and reinforced with a minimum of two No. 4 bars in the bottom course unless otherwise indicated. Extend lintel reinforcement beyond each side of masonry opening 40 bar diameters or 24 inches, whichever is greater. Support reinforcing bars in place prior to grouting and locate 1/2 inch above the bottom inside surface of the lintel unit.

3.3.6.2 Precast Concrete and Steel Lintels

Provide precast concrete and steel lintels as shown on the Drawings. Set lintels in a full bed of mortar with faces plumb and true. Provide steel and precast lintels with a minimum bearing length of 8 inches unless otherwise indicated. In partially grouted masonry, provide fully grouted units under the full lintel bearing length, unless otherwise indicated.

3.3.7 Sills and Copings

Set sills and copings in a full bed of mortar with faces plumb and true. Slope sills and copings to drain water. Mechanically anchor copings and sills longer than 4 feet as indicated.

3.4 INSTALLATION

3.4.1 Bar Reinforcement Installation

3.4.1.1 Preparation

Submit detail drawings showing bar splice locations. Identify bent bars on a bending diagram and reference and locate such bars on the drawings. Show wall dimensions, bar clearances, and wall openings. Utilize bending details that conform to the requirements of ACI SP-66. No approval will be given to the shop drawings until the Contractor certifies that all openings, including those for mechanical and electrical service, are shown. If, during construction, additional masonry openings are required, resubmit the approved shop drawings with the additional openings shown along with the proposed changes. Clearly highlight location of these additional openings. Provide wall elevation drawings with minimum scale of 1/4 inch per foot. Submit drawings including plans, elevations, and details of wall reinforcement; details of reinforcing bars at corners and wall intersections; offsets; tops, bottoms, and ends of walls; control and expansion joints; lintels; and wall openings.

Clean reinforcement of loose, flaky rust, scale, grease, mortar, grout, and other coatings that might destroy or reduce its bond prior to placing grout. Do not use bars with kinks or bends not shown on the approved shop drawings. Place reinforcement prior to grouting. Unless otherwise indicated, extend vertical wall reinforcement to within 2 inches of tops of walls.

3.4.1.2 Positioning Bars

a. Accurately place vertical bars within the cells at the positions indicated on the drawings. Maintain a minimum clearance of 1/2 inch between the bars and masonry units. Provide minimum clearance between parallel bars of 1/2 inch between the bars and masonry units for

coarse grout and a minimum clearance of 1/4 inch between the bars and masonry units for fine grout. Provide minimum clearance between parallel bars of 1 inch or one diameter of the reinforcement, whichever is greater. Vertical reinforcement may be held in place using bar positioners located near the ends of each bar and at intermediate intervals of not more than 192 diameters of the reinforcement or by other means to prevent displacement beyond permitted tolerances. As masonry work progresses, secure vertical reinforcement to prevent displacement beyond allowable tolerances.

b. Wire column and pilaster lateral ties in position around the vertical reinforcing bars. Place lateral ties in contact with the vertical reinforcement and do not place in horizontal mortar bed joints.

c. Position horizontal reinforcing bars as indicated. Stagger splices in adjacent horizontal bars, unless otherwise indicated.

d. Form splices by lapping bars as indicated. Do not cut, bend or eliminate reinforcing bars. Foundation dowel bars may be field-bent when permitted by TMS MSJC.

3.4.1.3 Splices of Bar Reinforcement

Lap splice reinforcing bars as indicated. When used, provide welded or mechanical connections that develop at least 125 percent of the specified yield strength of the reinforcement.

3.4.2 Placing Grout

3.4.2.1 General

Fill cells containing reinforcing bars with grout. Solidly grout hollow masonry units in walls or partitions supporting plumbing, heating, or other mechanical fixtures, voids at door and window jambs, and other indicated spaces. Solidly grout cells under lintel bearings on each side of openings for full height of openings. Solidly grout walls below grade, lintels, and bond beams. Units other than open end units may require grouting each course to preclude voids in the units.

Discard site-mixed grout that is not placed within 1-1/2 hours after water is first added to the batch or when the specified slump is not met without adding water after initial mixing. Discard ready-mixed grout that does not meet the specified slump without adding water other than water that was added at the time of initial discharge. Allow sufficient time between grout lifts to preclude displacement or cracking of face shells of masonry units. Provide a grout shear key between lifts when grouting is delayed and the lower lift loses plasticity. If blowouts, flowouts, misalignment, or cracking of face shells should occur during construction, tear down the wall and rebuild.

3.4.2.2 Vertical Grout Barriers for Multi-Wythe Composite Walls

In multi-wythe composite walls, provide grout barriers in the collar join not more than 30 feet apart, or as required, to limit the horizontal flow of grout for each pour.

3.4.2.3 Horizontal Grout Barriers

Embed horizontal grout barriers in mortar below cells of hollow units

receiving grout.

3.4.2.4 Grout Holes and Cleanouts

3.4.2.4.1 Grout Holes

Provide grouting holes in slabs, spandrel beams, and other in-place overhead construction. Locate holes over vertical reinforcing bars or as required to facilitate grout fill in bond beams. Provide additional openings spaced not more than 16 inches on centers where grouting of hollow unit masonry is indicated. Fom such openings not less than 4 inches in diameter or 3 by 4 inches in horizontal dimensions. Upon completion of grouting operations, plug and finish grouting holes to match surrounding surfaces.

3.4.2.4.2 Cleanouts for Hollow Unit Masonry Construction

For hollow masonry units. provide cleanout holes at the bottom of every grout pour in cores containing vertical reinforcement when the height of the grout pour exceeds 5 feet 4 inches. Where all cells are to be grouted, construct cleanout courses using bond beam units in an inverted position to permit cleaning of all cells. Provide cleanout holes at a maximum spacing of 32 inches where all cells are to be filled with grout.

Establish a new series of cleanouts if grouting operations are stopped for more than 4 hours. Provide cleanouts not less than 3 by 3 inch by cutting openings in one face shell. Manufacturer's standard cutout units may be used at the Contractor's option. Do not cleanout holes until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected. For walls which will be exposed to view, close cleanout holes in an approved manner to match surrounding masonry.

3.4.2.4.3 Cleanouts for Multi-Wythe Composite Masonry Construction

Provide cleanouts for construction of walls that incorporate a grout filled cavity between solid masonry wythes, provide cleanouts at the bottom of every pour by omitting every other masonry unit from one wythe. Establish a new series of cleanouts if grouting operations are stopped for more than 4 hours. Do not plug cleanout holes until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected. For walls which will be exposed to view, close cleanout holes in an approved manner to match surrounding masonry.

3.4.2.5 Grout Placement

A grout pour is the total height of masonry to be grouted prior to erection of additional masonry. A grout lift is an increment of grout placement within a grout pour. A grout pour is filled by one or more lifts of grout.

a. Lay masonry to the top of a pour permitted by TMS MSJC Table 7, based on the size of the grout space and the type of grout. Prior to grouting, remove masonry protrusions that extend 1/2 inch or more into cells or spaces to be grouted. Provide grout holes and cleanouts in accordance with paragraph GROUT HOLES AND CLEANOUTS above when the grout pour height exceeds 5 feet 4 inches. Hold reinforcement, bolts, and embedded connections rigidly in position before grouting is started. Do not prewet concrete masonry units.

b. Place grout using a hand bucket, concrete hopper, or grout pump to fill the grout space without segregation of aggregate. Operate grout pumps to produce a continuous stream of grout without air pockets, segregation, or contamination.

c. If the masonry has cured at least 4 hours, grout slump is maintained between 10 to 11 inches, and no intermediate reinforced bond beams are placed between the top and bottom of the pour height, place conventional grout in lifts not exceeding 12 feet 8 inches. For the same curing and slump conditions but with intermediate bond beams, limit conventional grout lift to the bottom of the lowest bond beam that is more than 5 feet 4 inches above the bottom of the lift, but do not exceed 12 feet 8 inches. If masonry has not cured at least 4 hours or grout slump is not maintained between 10 to 11 inches, place conventional grout in lifts not exceeding 5 feet 4 inches.

d. Consolidate conventional grout lift and reconsolidate after initial settlement before placing next lift. For grout pours that are 12 inches or less in height, consolidate and reconsolidate grout by mechanical vibration or puddling. For grout pours that are greater than 12 inches in height, consolidate and reconsolidate grout by mechanical vibration. Apply vibrators at uniformly spaced points not further apart than the visible effectiveness of the machine. Limit duration of vibration to time necessary to produce satisfactory consolidation without causing segregation. If previous lift is not permitted to set, dip vibrator into previous lift. Do not insert vibrators into lower lifts that are in a semi-solidified state. If lower lift sets prior to placement of subsequent lift, form a grout key by terminating grout a minimum of 1-1/2 inch below a mortar joint. Vibrate each vertical cell containing reinforcement in partially grouted masonry. Do not form grout keys within beams.

e. If the masonry has cured 4 hours, place self-consolidating grout (SCG) in lifts not exceeding the pour height. If masonry has not cured for at least 4 hours, place SCG in lifts not exceeding 5 feet 4 inches. Do not mechanically consolidate self-consolidating grout. Place self-consolidating grout in accordance with manufacturer's recommendations.

f. Upon completion of each day's grouting, remove waste materials and debris from the equipment, and dispose of outside the masonry.

3.4.3 Joint Reinforcement Installation

Install joint reinforcement at 16 inches on center unless otherwise indicated. Lap joint reinforcement not less than 6 inches. Install prefabricated sections at corners and wall intersections. Place the longitudinal wires of joint reinforcement in mortar beds to provide not less than 5/8 inch cover to either face of the unit.

3.4.4 Bond Beams

Reinforce and grout bond beams as indicated and as described in paragraphs above. Install grout barriers under bond beam units to retain the grout as required, unless wall is fully grouted or solid bottom units are used. For high lift grouting in partially grouted masonry, provide grout retaining material on the top of bond beams to prevent upward flow of grout. Ensure that reinforcement is continuous, including around corners, except through control joints or expansion joints, unless otherwise

indicated.

3.4.5 Flashing and Weeps

a. Install through-wall flashing at obstructions in the cavity and where indicated on Drawings. Ensure continuity of the flashing at laps and inside and outside corners by splicing in a manner approved by the flashing manufacturer. Ensure that the top edge of the flashing is sealed by lapping a minimum of 6 inches under the weather resistive barrier . Terminate the horizontal leg of the flashing by extending the sheet metal 1/2 inch beyond the outside face of masonry and turning downward with a hemmed drip . Provide sealant below the drip edge of through-wall flashing.

b. Wherever through-wall flashing occurs, provide weep holes to drain flashing to exterior at acceptable locations as indicated. Provide weeps of weep ventilators. Locate weeps not more than 24 inches on centers in mortar joints of the exterior wythe directly on the horizontal leg of through-wall flashing over foundations, bond beams, and any other horizontal interruptions of the cavity. Place weep holes perfectly horizontal or slightly canted downward to encourage water drainage outward and not inward. Other methods may be used for providing weeps when spacing is reduced to 16 inches on center and approved by the Contracting Officer. Maintain weeps free of mortar and other obstructions.

3.5 APPLICATION

3.5.1 Insulation

Insulate cavity walls (multi-wythe noncomposite masonry walls), where shown, by installing board-type insulation on the cavity side of the inner wythe. Apply board type insulation directly to the masonry or thru-wall flashing with adhesive. Neatly fit insulation between obstructions without impaling insulation on ties or anchors. Apply insulation in parallel courses with vertical joints breaking midway over the course below and in moderate contact with adjoining units without forcing. Cut to fit neatly against adjoining surfaces. Tape or seal the joints between the boards.

3.5.2 Interface with Other Products

3.5.2.1 Built-In Items

Fill spaces around built-in items with mortar. Point openings around flush-mount electrical outlet boxes in wet locations with mortar. Embed anchors, ties, wall plugs, accessories, flashing, pipe sleeves and other items required to be built-in as the masonry work progresses. Fully embed anchors, ties and joint reinforcement in the mortar. Fill cells receiving anchor bolts and cells of the first course below bearing plates with grout, unless otherwise indicated.

3.5.2.2 Door and Window Frame Joints

On the exposed interior and exterior sides of exterior frames, rake joints between frames and abutting masonry walls to a depth of 3/8 inch.

3.5.2.3 Bearing Plates

Set bearing plates for beams, joists, joist girders and similar structural members to the proper line and elevation with damp-pack bedding mortar, except where non-shrink grout is indicated. Provide bedding mortar and non-shrink grout s specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.

3.5.3 Tolerances

Lay masonry plumb, true to line, with courses level within the tolerances of TMS MSJC, Article 3.3 F.

3.6 FIELD QUALITY CONTROL

3.6.1 Tests

3.6.1.1 Field Testing of Mortar

Perform mortar testing at the following frequency: 3 times per 2500 SQFT. For each required mortar test, provide a minimum of three mortar samples. Perform initial mortar testing prior to construction for comparison purposes during construction.

Prepare and test mortar samples for mortar aggregate ratio in accordance with ASTM C780 Appendix A4.

3.6.1.2 Single-Wythe Masonry Wall Water Penetration Test

Prior to start of field construction of the single-wythe concrete masonry wall, perform masonry wall water penetration test on mock-up wall assemblies consisting of the identical design, materials, mix, and construction methods as the actual wall construction and in accordance with ASTM E514/E514M. Prepare a minimum of three specimens and cure for minimum 28 days prior to testing. Construct panels by the same methods, processes, and applications to be used on the project's construction site. Spray test for 6 hours on each specimen. If water is visible on back of test panels during the test and areas of dampness on the backside of the test panels do not exceed 25 percent of the wall area, the panels will be considered to have passed. Dampness is defined as any area of surface darkening or discoloration due to moisture penetration or accumulation below the observed surface.

Construct additional test panels for each failed test performed until three test panels pass the test. Factors that can affect test performance include materials, mixing, and quality of application and workmanship. Materials, mixing, and methods adjustments may be necessary in order to provide construction that passes the water penetration test. Document and record the test specimen construction materials and application and provide written test report in accordance with ASTM E514/E514M, supplemented by a detailed discussion of the specifics of test panel construction, application methods and processes used, quality of construction, and any variances or deviations that may have occurred between test panels during test panel construction. For failed test panels, identify in the supplemental report the variances, deficiencies or flaws that contributed to test panel failure and itemize the precautions to be taken in field construction of the masonry wall to prevent similar deficiencies and assure the wall construction replicates test panel conditions that pass the water penetration test. Submit the complete, certified test report, including supplemental report, to the Contracting

Officer prior to start of single-wythe concrete masonry wall construction. Significant changes to materials, proportions, or construction techniques from those used in the passing water penetration test are grounds for performing new tests, at the discretion of the Contracting Officer.

3.6.2 Special Inspection

Perform special inspections and testing in accordance with Section 01 45 35 SPECIAL INSPECTIONS.

3.7 POINTING AND CLEANING

After mortar joints have attained their initial set, but prior to hardening, completely remove mortar and grout daubs and splashings from masonry-unit surfaces that will be exposed or painted. Before completion of the work, rake out defects in joints of masonry to be exposed or painted, fill with mortar, and tool to match existing joints. Immediately after grout work is completed, remove scum and stains that have percolated through the masonry work using a low pressure stream of water and a stiff bristled brush. Do not clean masonry surfaces, other than removing excess surface mortar, until mortar in joints has hardened. Leave masonry surfaces clean, free of mortar daubs, dirt, stain, and discoloration, including scum from cleaning operations, and with tight mortar joints throughout. Do not use metal tools and metal brushes for cleaning.

3.7.1 Dry-Brushing Concrete Masonry

Dry brush exposed concrete masonry surfaces at the end of each day's work and after any required pointing, using stiff-fiber bristled brushes.

3.7.2 Clay Brick Surfaces

Clean exposed clay brick masonry surfaces to obtain surfaces free of stain, dirt, mortar and grout daubs, efflorescence, and discoloration or scum from cleaning operations. Perform cleaning in accordance with the approved cleaning procedure demonstrated on the mockup.

After cleaning, examine the sample panel of similar material for discoloration or stain as a result of cleaning. If the sample panel is discolored or stained, change the method of cleaning to ensure that the masonry surfaces in the structure will not be adversely affected. Water-soak exposed masonry surfaces and then clean with a proprietary masonry cleaning agent specifically recommended for the color and texture by the clay brick manufacturer and manufacturer of the cleaning product. Apply the solution with stiff fiber brushes, followed immediately by thorough rinsing with clean water. Use proprietary cleaning agents in conformance with the cleaning product manufacturer's printed recommendations. Remove efflorescence in conformance with the brick manufacturer's recommendations.

3.8 CLOSE-OUT TAKE-BACK PROGRAM

Collect information from manufacturer for take-back program options. Set aside masonry units, full and partial to be returned to manufacturer for recycling into new product. When such a service is not available, seek local recyclers to reclaim the materials. Submit documentation that includes contact information, summary of procedures, and the limitations and conditions applicable to the project. Indicate manufacturer's commitment to reclaim materials for recycling and/or reuse.

3.9 PROTECTION

Protect facing materials against staining. Cover top of walls with nonstaining waterproof covering or membrane to protect from moisture intrusion when work is not in progress. Continue covering the top of the unfinished walls until the wall is waterproofed with a complete roof or parapet system. Extend covering a minimum of 2 feet down on each side of the wall and hold securely in place. Before starting or resuming work, clean top surface of masonry in place of loose mortar and foreign material.

-- End of Section --

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SECTION 05 12 00

STRUCTURAL STEEL
08/18, CHG 2: 05/21

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 207	(2016; R 2017) Certification Standard for Steel Fabrication and Erection, and Manufacturing of Metal Components
AISC 303	(2016) Code of Standard Practice for Steel Buildings and Bridges
AISC 325	(2017) Steel Construction Manual
AISC 326	(2009) Detailing for Steel Construction
AISC 341	(2016) Seismic Provisions for Structural Steel Buildings
AISC 360	(2016) Specification for Structural Steel Buildings
AISC 420	(2010) Certification Standard for Shop Application of Complex Protective Coating Systems
AISC DESIGN GUIDE 10	(1997) Erection Bracing of Low-Rise Structural Steel Buildings

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ANSI/ASNT CP-189	(2020) ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B46.1	(2020) Surface Texture, Surface Roughness, Waviness and Lay

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(2012) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS D1.1/D1.1M	(2020; Errata 1 2021) Structural Welding Code - Steel

AWS QC1	(2016) Specification for AWS Certification of Welding Inspectors

ASTM INTERNATIONAL (ASTM)

ASTM A6/A6M	(2024) Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A53/A53M	(2022) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A307	(2021) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A500/A500M	(2023) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A563	(2021; E 2022a) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A780/A780M	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A992/A992M	(2022) Standard Specification for Structural Steel Shapes
ASTM B695	(2021) Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
ASTM C827/C827M	(2023) Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
ASTM C1107/C1107M	(2020) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM F436/F436M	(2019) Standard Specification for Hardened Steel Washers Inch and Metric Dimensions
ASTM F844	(2019) Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use
ASTM F959/F959M	(2017a; R 2023) Standard Specification for Compressible-Washer-Type Direct Tension

	Indicators for Use with Structural Fasteners, Inch and Metric Series
ASTM F1136/F1136M	(2011) Standard Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners
ASTM F1554	(2020) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
ASTM F2329/F2329M	(2015; R 2023) Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners
ASTM F2833	(2011; R 2017) Standard Specification for Corrosion Protective Fastener Coatings with Zinc Rich Base Coat and Aluminum Organic/Inorganic Type
ASTM F3125/F3125M	(2019) Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PA 1	(2016) Shop, Field, and Maintenance Coating of Metals
SSPC Paint 20	(2019) Zinc-Rich Primers (Type I, Inorganic, and Type II, Organic)
SSPC Paint 29	(2002; E 2004) Zinc Dust Sacrificial Primer, Performance-Based
SSPC SP 3	(2018) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-301-01	(2023; with Change 1, 2023) Structural Engineering

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR Part 1926, Subpart R	Steel Erection

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the

Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Erection and Erection Bracing Drawings; G

SD-02 Shop Drawings

Fabrication Drawings Including Details of Connections; G

SD-03 Product Data

Shop Primer

Welding Electrodes and Rods

Direct Tension Indicator Washers

Non-Shrink Grout

Tension Control Bolts

Recycled Content for Structural Steel; S

Recycled Content for Structural Steel Tubing; S

Recycled Content for Steel Pipe; S

SD-05 Design Data

SD-06 Test Reports

Class B Coating

Bolts, Nuts, and Washers

Weld Inspection Reports

Direct Tension Indicator Washer Inspection Reports

Bolt Testing Reports

SD-07 Certificates

Steel

Bolts, Nuts, and Washers

Galvanizing

AISC Structural Steel Fabricator Quality Certification

AISC Structural Steel Erector Quality Certification

Welding Procedures and Qualifications

Welding Electrodes and Rods

Certified Welding Inspector

NDT Technician

Welding Procedure Specifications (WPS)

1.3 AISC QUALITY CERTIFICATION

Work must be fabricated by an AISC Certified Structural Steel Fabricator, in accordance with AISC 207, Category BU. Submit AISC Structural Steel Fabricator quality certification.

Work must be erected by an AISC Structural Steel Certified Erector, in accordance with AISC 207, Category CSE. Submit AISC Structural Steel erector quality certification.

1.4 SEISMIC PROVISIONS

Provide the structural steel system in accordance with AISC 341, Chapter J as amended by UFC 3-301-01.

1.5 QUALITY ASSURANCE

1.5.1 Preconstruction Submittals

1.5.1.1 Erection and Erection Bracing Drawings

Submit for record purposes. Indicate the sequence of erection, temporary shoring and bracing. The erection drawings must conform to AISC 303.

1.5.2 Fabrication Drawing Requirements

Submit fabrication drawings for approval prior to fabrication. Prepare in accordance with AISC 303, AISC 326 and AISC 325. Fabrication drawings must not be reproductions of contract drawings. Include complete information for the fabrication and erection of the structure's components, including the location, type, and size of bolts, welds, member sizes and lengths, connection details, blocks, copes, and cuts. Use AWS A2.4 standard welding symbols. Clearly highlight any deviations from the details shown on the contract drawings highlighted on the fabrication drawings. Explain the reasons for any deviations from the contract drawings.

1.5.3 Certifications

1.5.3.1 Welding Procedures and Qualifications

Prior to welding, submit certification for each welder stating the type of welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests.

Conform to all requirements specified in AWS D1.1/D1.1M.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide the structural steel system, including shop primer or galvanizing, complete and ready for use. Provide structural steel systems including design, materials, installation, workmanship, fabrication, assembly, erection, inspection, quality control, and testing in accordance with AISC 303, AISC 360, and UFC 3-301-01 except as modified in this contract.

2.2 STEEL

2.2.1 Structural Steel

Wide flange and WT shapes, ASTM A992/A992M. Angles, Channels and Plates, ASTM A36/A36M. Provide structural steel containing a minimum of 80 percent recycled content. Submit data identifying percentage of recycled content for structural steel.

2.2.2 Structural Steel Tubing

ASTM A500/A500M, Grade C. Provide structural steel tubing containing a minimum of 25 percent recycled content. Submit data identifying percentage of recycled content for structural steel tubing.

2.2.3 Steel Pipe

ASTM A53/A53M, Type E or S, Grade B, weight class STD (Standard) or as indicated. Provide steel pipe containing a minimum of 50 percent recycled content. Submit data identifying percentage of recycled content for steel pipe.

2.3 BOLTS, NUTS, AND WASHERS

Submit the certified manufacturer's mill reports which clearly show the applicable ASTM mechanical and chemical requirements together with the actual test results for the supplied fasteners.

2.3.1 Common Grade Bolts

2.3.1.1 Bolts

ASTM A307, Grade A, plain finish hot dipped zinc coating. The bolt heads and the nuts of the supplied fasteners must be marked with the manufacturer's identification mark, the strength grade and type specified by ASTM specifications.

2.3.1.2 Nuts

ASTM A563, Grade A, heavy hex style.

2.3.1.3 Washers

ASTM F844.

2.3.2 High-Strength Bolts

High strength bolts and nuts must be shipped together in the same shipping container. Fasteners indicated to be galvanized shall be tested by the

supplier to show that the galvanized nut with the supplied lubricant provided may be rotated from the snug tight condition well in excess of the rotation required for pretentioned installation without stripping. The supplier shall supply nuts that have been lubricated and tested with the supplied bolts.

2.3.2.1 Bolts

ASTM F3125/F3125M, Grade A325M A325 , Type 1 Heavy Hex Head Style, plain finish hot dipped zinc coating. The bolt heads and the nuts of the supplied fasteners must be marked with the manufacturer's identification mark, the strength grade and type specified by ASTM sep

2.3.2.2 Nuts

ASTM A563, Grade and Style as specified in the applicable ASTM bolt standard.

2.3.2.3 Direct Tension Indicator Washers

ASTM F959/F959M. Submit product data for direct tension indicator washers.

2.3.2.4 Washers

ASTM F436/F436M, plain carbon steel.

2.3.3 Tension Control Bolts

ASTM F3125/F3125M, Grade F1852, Type 1, twistoff style assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon steel nuts, and hardened carbon steel washers. Assembly finish must be plain. Submit product data for tension control bolts.

2.3.4 Foundation Anchorage

2.3.4.1 Anchor Rods

ASTM F1554 Gr 55, Class 1A.

2.3.4.2 Anchor Nuts

ASTM A563, Grade A, hex style.

2.3.4.3 Anchor Washers

ASTM F844.

2.3.4.4 Anchor Plate Washers

ASTM A36/A36M.

2.4 STRUCTURAL STEEL ACCESSORIES

2.4.1 Welding Electrodes and Rods

AWS D1.1/D1.1M. Submit product data for welding electrodes and rods.

2.4.2 Non-Shrink Grout

ASTM C1107/C1107M, with no ASTM C827/C827M shrinkage. Grout must be nonmetallic. Submit product data for non-shrink grout.

2.5 GALVANIZING

ASTM F2329/F2329M, ASTM F1136/F1136M, ASTM F2833 or ASTM B695 for threaded parts or ASTM A123/A123M for structural steel members, as applicable, unless specified otherwise galvanize after fabrication where practicable.

2.6 FABRICATION

Fabrication must be in accordance with the applicable provisions of AISC 325. Fabrication and assembly must be done in the shop to the greatest extent possible. Punch, subpunch and ream, or drill bolt holes perpendicular to the surface of the member.

Compression joints depending on contact bearing must have a surface roughness not in excess of 500 micro inch as determined by ASME B46.1, and ends must be square within the tolerances for milled ends specified in ASTM A6/A6M.

Shop splices of members between field splices will be permitted only where indicated on the Contract Drawings. Splices not indicated require the approval of the Contracting Officer.

2.6.1 Markings

Prior to erection, identify members by a painted erection mark. Connecting parts assembled in the shop for reaming holes in field connections must be match marked with scratch and notch marks. Do not locate erection markings on areas to be welded. Do not locate match markings in areas that will decrease member strength or cause stress concentrations.

2.6.2 Shop Primer

SSPC Paint 20 or SSPC Paint 29, (zinc rich primer). Shop prime structural steel, except as modified herein, in accordance with SSPC PA 1. Do not prime steel surfaces embedded in concrete, galvanized surfaces, surfaces to receive epoxy coatings, or surfaces within 0.5 inch of the toe of the welds prior to welding (except surfaces on which metal decking and shear studs are to be welded). If flash rusting occurs, re-clean the surface prior to application of primer. Apply primer in accordance with endorsement "SPE-P1" of AISC 420 or approved equal NACE or SSPC certification to a minimum dry film thickness of 2.0 mil. Submit shop primer product data.

Prime slip critical surfaces with a Class B coating in accordance with AISC 325. Submit test report for Class B coating.

Prior to assembly, prime surfaces which will be concealed or inaccessible after assembly. Do not apply primer in foggy or rainy weather; when the ambient temperature is below 45 degrees F or over 95 degrees F; or when the primer may be exposed to temperatures below 40 degrees F within 48 hours after application, unless approved otherwise by the Contracting Officer. Repair damaged primed surfaces with an additional coat of primer.

2.6.2.1 Cleaning

SSPC SP 6/NACE No.3, except steel exposed in spaces above ceilings, attic spaces, furred spaces, and chases that will be hidden to view in finished construction may be cleaned to SSPC SP 3 when recommended by the shop primer manufacturer. Maintain steel surfaces free from rust, dirt, oil, grease, and other contaminants through final assembly.

2.7 DRAINAGE HOLES

Drill adequate drainage holes to eliminate water traps. Hole diameter must be 1/2 inch and location indicated on the detail drawings. Hole size and locations must not affect the structural integrity.

PART 3 EXECUTION

3.1 ERECTION

a. Erection of structural steel, except as indicated in item b. below, must be in accordance with the applicable provisions of AISC 325, AISC 303 and 29 CFR Part 1926, Subpart R.

b. For low-rise structural steel buildings (60 feet tall or less and a maximum of 2 stories), erect the structure in accordance with AISC DESIGN GUIDE 10.

After final positioning of steel members, provide full bearing under base plates and bearing plates using nonshrink grout. Place nonshrink grout in accordance with the manufacturer's instructions.

3.1.1 STORAGE

Store the material out of contact with the ground in such manner and location as to minimize deterioration.

3.2 CONNECTIONS

Except as modified in this section, design connections indicated in accordance with AISC 360. Build connections into existing work. Do not tighten anchor bolts set in concrete with impact torque wrenches. Holes must not be cut or enlarged by burning. Bolts, nuts, and washers must be clean of dirt and rust, and lubricated immediately prior to installation.

3.2.1 Common Grade Bolts

Tighten ASTM A307 bolts to a "snug tight" fit. "Snug tight" is the tightness that exists when plies in a joint are in firm contact. If firm contact of joint plies cannot be obtained with a few impacts of an impact wrench, or the full effort of a man using a spud wrench, contact the Contracting Officer for further instructions.

3.2.2 High-Strength Bolts

Provide direct tension indicator washers in all ASTM F3125/F3125M, Grade A325 and Grade A490 bolted connections. Bolts must be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, fully tension bolts, progressing from the most rigid part of a connection to the free edges.

Fastener components shall be protected from dirt and moisture in closed

containers at the site of the installation. Fastener components that are not incorporated into the work shall be returned to protected storage at the end of the work shift.

3.2.2.1 Installation of Direct Tension Indicator Washers (DTIW)

Where possible, install the DTIW under the bolt head and tighten the nut. If the DTIW is installed adjacent to the turned element, provide a flat washer between the DTIW and nut when the nut is turned for tightening, and between the DTIW and bolt head when the bolt head is turned for tightening. In addition to the LIW, provide flat washers under both the bolt head and nut when ASTM F3125/F3125M, Grade A490 bolts are used.

3.2.3 Tension Control Bolts

Bolts must be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, fully tension bolts, progressing from the most rigid part of a connection to the free edges.

3.3 GAS CUTTING

Use of gas-cutting torch in the field for correcting fabrication errors is not permitted on any major member in the structural framing. Use of a gas cutting torch will be permitted on minor members not under stress only after approval has been obtained from the Contracting Officer.

3.4 WELDING

Welding must be in accordance with AWS D1.1/D1.1M. Provide AWS D1.1/D1.1M qualified welders, welding operators, and tackers.

Develop and submit the Welding Procedure Specifications (WPS) for all welding, including welding done using prequalified procedures. Submit for approval all WPS, whether prequalified or qualified by testing.

3.4.1 Removal of Temporary Welds, Run-Off Plates, and Backing Strips

Remove only from finished areas.

3.5 SHOP PRIMER REPAIR

Repair shop primer in accordance with the paint manufacturer's recommendation for surfaces damaged by handling, transporting, cutting, welding, or bolting.

3.5.1 Field Priming

Field prime steel exposed to the weather, or located in building areas without HVAC for control of relative humidity. After erection, the field bolt heads and nuts, field welds, and any abrasions in the shop coat must be cleaned and primed with paint of the same quality as that used for the shop coat.

3.6 GALVANIZING REPAIR

Repair damage to galvanized coatings using ASTM A780/A780M zinc rich paint for galvanizing damaged by handling, transporting, cutting, welding, or bolting. Do not heat surfaces to which repair paint has been applied.

3.7 FIELD QUALITY CONTROL

Perform field tests, and provide labor, equipment, and incidentals required for testing. Notify the Contracting Officer in writing of defective welds, bolts, nuts, and washers within 7 working days of the date of the inspection.

3.7.1 Welds

3.7.1.1 Visual Inspection

AWS D1.1/D1.1M. Furnish the services of AWS-certified welding inspectors for fabrication and erection inspection and testing and verification inspections. A Certified Welding Inspector must perform visual inspection on 100 percent of all welds. Document this inspection in the Visual Weld Inspection Log. Submit certificates indicating that certified welding inspectors meet the requirements of AWS QC1.

Inspect proper preparation, size, gaging location, and acceptability of all welds; identification marking; operation and current characteristics of welding sets in use.

3.7.1.2 Nondestructive Testing

Nondestructive testing must be in accordance with AWS D1.1/D1.1M. Ultrasonic testing must be performed in accordance with Table 6.2 of AWS D1.1/D1.1M. Test locations must be random by the special inspector or selected by the Contracting Officer. All personnel performing NDT must be certified in accordance with ANSI/ASNT CP-189 in the method of testing being performed. Submit certificates showing compliance with ANSI/ASNT CP-189 for all NDT technicians. If more than 20 percent of welds made by a welder contain defects identified by testing, then all groove welds made by that welder must be tested by ultrasonic testing, and all fillet welds made by that welder must be inspected by magnetic particle testing (MT) or dye penetrant testing (PT) as approved by the Contracting Officer. When groove welds made by an individual welder are required to be tested, magnetic particle or dye penetrant testing may be used only in areas inaccessible to ultrasonic testing. Retest all repaired areas. Submit weld inspection reports.

Testing frequency: Provide the following types and number of tests:

Test Type	Number of Tests
Ultrasonic	50 percent of CJP Welds
Magnetic Particle	50 percent of PJP and Fillet Welds
Dye Penetrant	50 percent of PJP and Fillet Welds

3.7.2 Direct Tension Indicator Washers

3.7.2.1 Direct Tension Indicator Washer Compression

Test direct tension indicator washers in place to verify that they have

been compressed sufficiently to provide the 0.015 inch gap, as required by ASTM F959/F959M. Submit direct tension indicator washer inspection reports.

3.7.2.2 Direct Tension Indicator Gaps

In addition to the above testing, an independent testing agency as approved by the Contracting Officer, must test in place the direct tension indicator gaps on 20 percent of the installed direct tension indicator washers to verify that the ASTM F959/F959M direct tension indicator gaps have been achieved. If more than 10 percent of the direct tension indicators tested have not been compressed sufficiently to provide the average gaps required by ASTM F959/F959M, test all in place direct tension indicator washers to verify that the ASTM F959/F959M direct tension indicator gaps have been achieved. Test locations must be selected by the Contracting Officer.

3.7.3 High-Strength Bolts

3.7.3.1 Testing Bolt, Nut, and Washer Assemblies

Test a minimum of 3 bolt, nut, and washer assemblies from each mill certificate batch in a tension measuring device at the job site prior to the beginning of bolting start-up. Demonstrate that the bolts and nuts, when used together, can develop tension not less than the provisions specified in AISC 360, depending on bolt size and grade. The bolt tension must be developed by tightening the nut. A representative of the manufacturer or supplier must be present to ensure that the fasteners are properly used, and to demonstrate that the fastener assemblies supplied satisfy the specified requirements. Submit bolt testing reports.

3.7.3.2 Inspection

Inspection procedures must be in accordance with AISC 360. Confirm and report to the Contracting Officer that the materials meet the project specification and that they are properly stored. Confirm that the faying surfaces have been properly prepared before the connections are assembled. Observe the specified job site testing and calibration, and confirm that the procedure to be used provides the required tension. Monitor the work to ensure the testing procedures are routinely followed on joints that are specified to be fully tensioned.

3.7.3.3 Testing

The Government has the option to perform nondestructive tests on 5 percent of the installed bolts to verify compliance with pre-load bolt tension requirements. Provide the required access for the Government to perform the tests. The nondestructive testing will be done in-place using an ultrasonic measuring device or any other device capable of determining in-place pre-load bolt tension. The test locations must be selected by the Contracting Officer. If more than 10 percent of the bolts tested contain defects identified by testing, then all bolts used from the batch from which the tested bolts were taken, must be tested at the Contractor's expense. Retest new bolts after installation at the Contractor's expense.

3.7.4 Inspection and Testing of Steel Stud Welding

Perform verification inspection and testing of steel stud welding conforming to the requirements of AWS D1.1/D1.1M, Stud Welding Clause. The Contracting Officer will serve as the verification inspector. Bend

test studs that do not show a full 360 degree weld flash or have been repaired by welding as required by AWS D1.1/D1.1M, Stud Welding Clause. Studs that crack under testing in the weld, base metal or shank will be rejected and replaced by the Contractor at no additional cost.

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SECTION 05 21 00

STEEL JOIST FRAMING
05/15, CHG 1: 08/18

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2020; Errata 1 2021) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2021) International Building Code

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PA 1	(2016) Shop, Field, and Maintenance Coating of Metals
SSPC Paint 15	(1999; E 2004) Steel Joist Shop Primer/Metal Building Primer
SSPC SP 2	(2018) Hand Tool Cleaning

STEEL JOIST INSTITUTE (SJI)

SJI COMPOSITE JOISTS	(2007; Supplement 1 2010) Standard Specifications for Composite Steel Joist Catalog
SJI LOAD TABLES	(2020) Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders - 45th Edition
SJI MANUAL	(2009) 80 Years of Open Web Steel Joist Construction

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1926	Safety and Health Regulations for Construction
29 CFR 1926.756	Steel Erection; Beams and Columns
29 CFR 1926.757	Steel Erection; Open Web Steel Joists

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Welder Qualification

SD-02 Shop Drawings

Steel Joist Framing; G

SD-03 Product Data

Recycled Content Of Steel Products; S

SD-05 Design Data

Design Calculations; G

SD-06 Test Reports

Erection Inspection

Welding Inspections

SD-07 Certificates

Certification of Compliance

1.3 QUALITY ASSURANCE

Perform all work in compliance with the requirements set forth in 29 CFR 1926.

1.3.1 Drawing Requirements

Submit drawings of steel joist framing including fabrication, specifications for shop painting, and identification markings of joists . Show joist type and size, layout in plan, all applicable loads, deflection criteria, and erection details including methods of anchoring, framing at openings, type, size, and location and connections for and spacing of bridging, requirements for field welding, and details of accessories as applicable. Show profiles for nonstandard joist configurations.Show steel joist field splice locations and details.

1.3.2 Certification of Compliance

Prior to construction commencement, submit certification for welder qualification, in compliance with AWS D1.1/D1.1M, welding operation, and tacker, stating the type of welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests. Submit certification of compliance for the following:

a. SJI MANUAL

b. Steel Joist Institute Member Fabricator

c. 29 CFR 1926

d. 29 CFR 1926.757

e. Statement from steel joist manufacturer, that work was performed in accordance with approved construction documents and with SJI standard specifications, in accordance with ICC IBC Section 1704.2.5.2.

1.4 DELIVERY, STORAGE, AND HANDLING

Handle, transport, and store joists in a manner to prevent damage affecting their structural integrity. Verify piece count of all joist products upon delivery and inspect all joists products for damage. Report any damage to the joist supplier. Store all items off the ground in a well drained location protected from the weather and easily accessible for inspection and handling. Store joists with top chord down and with joists in a vertical position. Store deep joists horizontally if they were shipped on their sides.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Designate steel joists on the drawings in accordance with the standard designations of the Steel Joist Institute. Joists of other standard designations or joists with properties other than those shown may be substituted for the joists designated provided the structural properties are equal to or greater than those of the joists shown and provided all other specified requirements are met.

2.2 STEEL JOISTS

Provide steel joists conforming to SJI LOAD TABLES. Design joists designated K, KCS, LH and DLH to support the loads given in the applicable standard load tables of SJI LOAD TABLES. Submit design calculations for special steel joists, composite steel joists, net uplift loads, non-SJI standard details, and field splices. Include cover letter signed and sealed by the joist manufacturer's registered design professional.

2.2.1 Steel Joist Camber

Camber joists as indicated.

2.2.2 Special Steel Joists

Provide special joists and connections capable of withstanding the design loads indicated with a live-load deflection less than L/240 for roof joists and L/360 for floor joists.

2.2.3 Steel Joist Substitutes and Outriggers

Provide joist substitutes and outriggers conforming to SJI LOAD TABLES with steel angle or channel members.

2.2.4 Composite Steel Joists

Provide composite steel joists conforming to SJI COMPOSITE JOISTS.

2.3 RECYCLED CONTENT

Provide products with an average recycled content of steel products of postconsumer recycled content plus one half of preconsumer recycled content not less than 25 percent.

2.4 ACCESSORIES AND FITTINGS

2.4.1 Bridging

Provide bridging of material, size, and type required by SJI LOAD TABLES for type of joist, chord size, spacing and span. Furnish additional erection bridging if required for stability.

2.4.2 Bearing Plates

Fabricate steel bearing plats from ASTM A36/A36M steel of size and thickness indicated.

2.4.3 Ceiling Extensions

Furnish ceiling extensions, either bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface unless otherwise indicated.

2.5 SHOP PAINTING

SSPC Paint 15. Shop prime joists, except as modified herein, in accordance with SSPC PA 1. Clean joists in accordance with SSPC SP 2 before priming. If flash rusting occurs, re-clean the surface prior to application of primer. For joists which require finish painting under Section 09 90 00 PAINTS AND COATINGS, the primer paint must be compatible with the finish paint.

PART 3 EXECUTION

3.1 ERECTION

Install joists in conformance with SJI LOAD TABLES for the joist series indicated, and the requirements of 29 CFR 1926 and 29 CFR 1926.757 and 29 CFR 1926.756. Handle and set joists avoiding damage to the members. Place the "tag end" of joists as shown on the joists placement plans. Ensure that square-end joists are erected right side up. Distribute temporary loads so that joist capacity is not exceeded. Remove damaged joists from the site, except when field repair is approved and such repairs are satisfactorily made in accordance with the manufacturer's recommendations. Do not repair, field modify, or alter any joists without specific written instructions from the Designer of Record and/or joist manufacturer.

Install and connect bridging concurrently with joist erection, before construction loads are applied. Do not apply loads to bridging. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams. Do not cut away vertical leg of bridging where bridging makes an

elevation transition; weld a separate piece of bridging at the transition. Perform all welding in accordance with AWS D1.1/D1.1M.

3.2 BEARING PLATES

Provide bearing plates to accept full bearing after the supporting members have been plumbed and properly positioned, but prior to placing superimposed loads. The area under the plate must be damp-packed solidly with bedding mortar, except where nonshrink grout is indicated on the drawings. Provide bedding mortar and grout as specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.

3.3 PAINTING

3.3.1 Touch-Up Painting

After erection of joists , touch-up connections and areas of abraded shop coat with paint of the same type used for the shop coat.

3.4 VISUAL INSPECTIONS

Perform the following visual inspections:

a. Verify that all joists are spaced properly.

b. Verify that there is sufficient joist bearing on steel beams, concrete, and masonry.

c. Verify all bridging lines are properly spaced and anchored.

d. Verify that damage has not occurred to the joists during erection.

e. Verify the joists are aligned vertically and there is no lateral sweep in the joists.

f. Where concentrated loads are present on the joists verify that they are located in accordance with the joists placement plan.

g. Verify welding of bridging and joist seats in accordance with AWS D1.1/D1.1M, Section 6. Perform erection inspection and field welding inspections with AWS certified welding inspectors.

h. Verify proper bolting of diagonal bridging and joist seats where the bolts are snug-tight.

-- End of Section --

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SECTION 05 30 00

STEEL DECKS
05/15, CHG 2: 08/18

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI D100	(2017) Cold-Formed Steel Design Manual

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2020; Errata 1 2021) Structural Welding Code - Steel
AWS D1.3/D1.3M	(2018) Structural Welding Code - Sheet Steel

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A780/A780M	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A792/A792M	(2022) Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
ASTM A1008/A1008M	(2023) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
ASTM D746	(2014) Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
ASTM D1056	(2020) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D1149	(2007; R 2012) Standard Test Method for Rubber Deterioration - Surface Ozone

	Cracking in a Chamber
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/
FM DS 1-28R	(1998) Data Sheet: Roof Systems

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 20	(2019) Zinc-Rich Primers (Type I, Inorganic, and Type II, Organic)

STEEL DECK INSTITUTE (SDI)

ANSI/SDI C	(2017) Standard for Composite Steel Floor Deck - Slabs
ANSI/SDI NC	(2017) Standard for Non-Composite Steel Floor Deck
ANSI/SDI QA/QC	(2017) Standard for Quality Control and Quality Assurance for Installation of Steel Deck
ANSI/SDI RD	(2017) Standard for Steel Roof Deck
SDI DDM04	(2015; Errata 1-3 2016; Add 1 2015; Add 2 20162006) Diaphragm Design Manual; 4th Edition
SDI DDP	(1987; R 2000) Deck Damage and Penetrations
SDI MOC3	(2016) Manual of Construction with Steel Deck (3rd Edition)

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-301-01	(2023; with Change 1, 2023) Structural Engineering

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1926	Safety and Health Regulations for Construction

UNDERWRITERS LABORATORIES (UL)

UL 580	(2006; Reprint Mar 2019) UL Standard for Safety Tests for Uplift Resistance of Roof Assemblies
UL Fire Resistance	(2014) Fire Resistance Directory

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication Drawings; G

SD-03 Product Data

Accessories

Deck Units

Galvanizing Repair Paint

Mechanical Fasteners

Touch-Up Paint

Welding Equipment

Welding Rods and Accessories

Recycled Content of Steel Products; S

SD-04 Samples

Metal Roof Deck Units

Flexible Closure Strips

SD-05 Design Data

Deck Units; G

SD-07 Certificates

Powder-Actuated Tool Operator

Welder Qualifications

Welding Procedures

Fire Safety

Wind Storm Resistance

Manufacturer's Certificate

1.3 QUALITY ASSURANCE

1.3.1 Deck Units

Furnish deck units and accessory products from a manufacturer regularly engaged in manufacture of steel decking. Provide manufacturer's certificates attesting that the decking material meets the specified requirements.

1.3.2 Certification of Powder-Actuated Tool Operator

Provide manufacturer's certificate attesting that the operators are authorized to use the low velocity powder-actuated tool.

1.3.3 Qualifications for Welding Work

Follow Welding Procedures of AWS D1.3/D1.3M for sheet steel and AWS D1.1/D1.1M for stud welding.
Submit qualified Welder Qualifications in accordance with AWS D1.3/D1.3M for sheet steel and AWS D1.1/D1.1M for stud welding, or under an equivalent approved qualification test. Perform tests on test pieces in positions and with clearances equivalent to those actually encountered. If a test weld fails to meet requirements, perform an immediate retest of two test welds until each test weld passes. Failure in the immediate retest will require the welder be retested after further practice or training, performing a complete set of test welds.

Submit manufacturer's catalog data for Welding Equipment and Welding Rods and Accessories.

1.3.4 Regulatory Requirements

1.3.4.1 Fire Safety

Test roof deck as a part of a roof deck construction assembly of the type used for this project, listing as fire classified in the UL Fire Resistance, or listing as Class I construction in the FM APP GUIDE, and so labeled.

1.3.4.2 Wind Storm Resistance

Provide roof construction assembly capable of withstanding a nominal uplift pressure of 60 pounds per square foot when tested in accordance with the uplift pressure test described in the FM DS 1-28R or as described in UL 580 and in general compliance with UFC 3-301-01.

1.3.5 Fabrication Drawings

Show type and location of units, location and sequence of connections, bearing on supports, methods of anchoring, attachment of accessories, adjusting plate details, cant strips, ridge and valley plates, metal closure strips, size and location of holes to be cut and reinforcement to be provided, the manufacturer's erection instructions and other pertinent details.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver deck units to the site in a dry and undamaged condition. Store and handle steel deck in a manner to protect it from corrosion, deformation, and other types of damage. Do not use decking for storage or

as working platform until units have been fastened into position. Exercise care not to damage material or overload decking during construction. The maximum uniform distributed storage load must not exceed the design live load. Stack decking on platforms or pallets and cover with weathertight ventilated covering. Elevate one end during storage to provide drainage. Maintain deck finish at all times to prevent formation of rust. Repair deck finish using touch-up paint. Replace damaged material.

1.5 DESIGN REQUIREMENTS FOR ROOF DECKS

1.5.1 Properties of Sections

Properties of metal roof deck sections must comply with engineering design width as limited by the provisions of AISI D100.

1.5.2 Allowable Loads

Indicate total uniform dead and live load for detailing purposes.

PART 2 PRODUCTS

2.1 DECK UNITS

Submit manufacturer's design calculations, or applicable published literature for the structural properties of the proposed deck units.

Provide products with an average recycled content of steel products so postconsumer recycled content plus one half of preconsumer recycled content not less than 25 percent.

2.1.1 Roof Deck

Conform to ASTM A792/A792M or ASTM A1008/A1008M for deck used in conjunction with insulation and built-up roofing. Fabricate roof deck units of the steel design thickness required by the design drawings and galvanized . Furnish sample of Metal Roof Deck Units used to illustrate actual cross section dimensions and configurations.

2.1.2 Length of Deck Units

Provide deck units of sufficient length to span three or more spacings where possible.

2.1.3 Shop Priming

Shop prime accessories and deck at the factory after coating. Clean surfaces in accordance with the manufacturer's standard procedure followed by a spray, dip or roller coat of rust-inhibitive primer, oven cured.

2.1.4 Touch-Up Paint

Provide a high zinc-dust content paint for regalvanizing welds in galvanized steel conforming to ASTM A780/A780M.

Provide touch-up paint for shop-painted units of the same type used for the shop painting, and touch-up paint for zinc-coated units of an approved

galvanizing repair paint with a high-zinc dust content. Touch-up welds with paint conforming to SSPC Paint 20 in accordance with ASTM A780/A780M. Maintain finish of deck units and accessories by using touch-up paint whenever necessary to prevent the formation of rust.

2.2 ACCESSORIES

Provide accessories of same material as deck, unless specified otherwise. Provide manufacturer's standard type accessories, as specified.

2.2.1 Adjusting Plates

Provide adjusting plates, or segments of deck units, of same thickness and configuration as deck units in locations too narrow to accommodate full size units. Provide factory cut plates of predetermined size where possible.

2.2.2 End Closures

Fabricated of sheet metal by the deck manufacturer. Provide end closures minimum 0.0295 inch thick to close open ends at columns, walls, and openings through deck.

2.2.3 Partition Closures

Provide closures for closing voids above interior walls and partitions that are perpendicular to the direction of the configurations. Provide rubber, plastic, or sheet steel closures above typical partitions. Provide sheet steel closures above fire-resistant interior walls and partitions located on both sides of wall or partition.

2.2.4 Flexible Closure Strips for Roof Decks

Provide strips made of vulcanized, closed-cell, synthetic rubber material specified and premolded to the configuration required to provide tight-fitting closures at open ends and sides of steel roof decking.

Conforming to ASTM D1056, Grade 2A1, with the following additional properties:

Brittleness temperature of minus 40 degrees F when tested in accordance with ASTM D746.

Flammability resistance with a flame spread rating of less than 25 when tested in accordance with ASTM E84.

Resistance to ozone must be "no cracks" after exposure of a sample kept under a surface tensile strain of 25 percent to an ozone concentration of 100 parts per million of air by volume in air for 100 hours at 104 degrees F and tested in accordance with ASTM D1149.

Provide a elastomeric type adhesive as recommended by the manufacturer of the flexible closure strips.

2.2.5 Closure Plates for Composite Deck

Support and retain concrete at each floor level. Provide edge closures at all edges of the slab of sufficient strength and stiffness to support the wet concrete. Provide metal closures for all openings in composite steel

deck 1/4 inch and over.

2.2.6 Sheet Metal Collar

Where deck is cut for passage of pipes, ducts, columns, etc., and deck is to remain exposed, provide a neatly cut sheet metal collar to cover edges of deck. Do not cut deck until after installation of supplemental supports.

2.2.7 Cover Plates

Sheet metal to close panel edge and end conditions, and where panels change direction or butt. Polyethylene-coated, self-adhesive, 2 inch wide joint tape may be provided in lieu of cover plates on flat-surfaced decking butt joints.

Fabricate cover plates for abutting floor deck units from the specified structural-quality steel sheets not less than nominal 18 gagethick before galvanizing. Provide 6 inch wide cover plates and form to match the contour of the floor deck units.

2.2.8 Column Closures

Sheet metal, minimum 0.0358 inch thick or metal rib lath.

2.2.9 Access Hole Covers

Sheet metal, minimum 0.0474 inch thick.

2.2.10 Metal Closure Strips for Roof Decks

Fabricate strips from the specified commercial-quality steel sheets not less than nominal 0.0358 inch thick before galvanizing. Provide strips from the configuration required to provide tight-fitting closures at open ends and sides of steel roof decking.

2.2.11 Galvanized Steel Angles for Roof Decks

Provide hot-rolled carbon steel angles conforming to ASTM A36/A36M, and hot-dip galvanized in accordance with ASTM A123/A123M.

2.2.12 Mechanical Fasteners

Provide mechanical fasteners, such as powder actuated fasteners, pneumatically driven fasteners or self-drilling screws, for anchoring the deck to structural supports and adjoining units as indicated.

2.2.13 Miscellaneous Accessories

Furnish the manufacturer's standard accessories to complete the deck installation. Furnish metal accessories of the same material as the deck and with the minimum design thickness as follows: saddles, 0.0474 inch welding washers, 0.0598 inch other metal accessories, 0.0358 inch unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

Prior to installation of decking units and accessories, examine worksite

to verify that as-built structure will permit installation of decking system without modification.

3.2 INSTALLATION

Install steel deck units in accordance with 29 CFR 1926, Subpart R – Steel Erection, ANSI/SDI QA/QC, ANSI/SDI CANSI/SDI NCANSI/SDI RDSDI DDM04 and approved shop drawings. Place units on structural supports, properly adjusted, leveled, and aligned at right angles to supports before permanently securing in place. Damaged deck and accessories including material which is permanently stained or contaminated, deformed, or with burned holes shall not be installed. Extend deck units over three or more supports unless absolutely impractical. Report inaccuracies in alignment or leveling to the Contracting Officer and make necessary corrections before permanently anchoring deck units. Locate deck ends over supports only. Lap 2 inch deck ends. Do not use unanchored deck units as a work or storage platform. Permanently anchor units placed by the end of each working day. Do not support suspended ceilings, light fixtures, ducts, utilities, or other loads by steel deck unless indicated. Distribute loads by appropriate means to prevent damage.

3.2.1 Attachment

Immediately after placement and alignment, and after correcting inaccuracies, permanently fasten steel deck units to structural supports and to adjacent deck units by welding with normal 5/8 inch diameter puddle welds, as indicated on the design drawings and in accordance with manufacturer's recommended procedure and ANSI/SDI C, ANSI/SDI NC or ANSI/SDI RD. Clamp or weight deck units to provide firm contact between deck units and structural supports while performing welding or fastening. Anchoring the deck to structural supports with powder-actuated fasteners or pneumatically driven fasteners is prohibited. Attachment of adjacent deck units by button-punching is prohibited.

3.2.1.1 Welding

Perform welding in accordance with AWS D1.3/D1.3M using methods and electrodes recommended by the manufacturers of the base metal alloys being used. Ensure only operators previously qualified by tests prescribed in AWS D1.3/D1.3M make welds. Immediately recertify, or replace qualified welders, that are producing unsatisfactory welding. Conform to the recommendations of the Steel Deck Institute and the steel deck manufacturer for location, size, and spacing of fastening. Do not use welding washers at the connections of the deck to supports. Do not use welding washers at sidelaps. Holes and similar defects will not be acceptable. Attach all partial or segments of deck units to structural supports in accordance with Section 2.5 of SDI DDM04. . Immediately clean welds by chipping and wire brushing. Heavily coat welds, cut edges and damaged portions of shop primed finish with the manufacturer's standard touch-up paint.

3.2.1.2 Mechanical Fastening

Anchor deck to structural supports and adjoining units with mechanical fasteners. Drive screws to properly clamp deck to supporting steel.

3.2.1.3 Sidelap Fastening

Lock sidelaps between adjacent floor deck units together by welding or screws as indicated.

3.2.2 Openings

Cut or drill all holes and openings required and be coordinated with the drawings, specifications, and other trades. Frame and reinforce openings through the deck in conformance with SDI DDP. Reinforce holes and openings 6 to 12 inch across by 0.0474 inch thick steel sheet at least 12 inch wider and longer than the opening and be fastened to the steel deck at each corner of the sheet and at a maximum of 6 inch on center. Reinforce holes and openings larger than 12 inch by steel channels or angles installed perpendicular to the steel joists and supported by the adjacent steel joists. Install steel channels or angles perpendicular to the deck ribs and fasten to the channels or angles perpendicular to the steel joists. Deck manufacturer shall approve holes or openings larger than 6 inch in diameter prior to drilling or cutting.

3.2.3 Deck Damage

SDI MOC3, for repair of deck damage.

3.2.4 Touch-Up Paint

3.2.4.1 Roof Deck

After roof decking installation, wire brush, clean, and touchup paint the scarred areas on top and bottom surfaces of metal roof decking. The scarred areas include welds, weld scars, bruises, and rust spots. Touchup galvanized surfaces with galvanizing repair paint. Touchup painted surfaces with repair paint of painted surfaces.

3.2.4.2 Floor Deck

For floor decking installation, wire brush, clean, and touchup paint the scarred areas on the top and bottom surfaces of the metal floor decking and on the surface of supporting steel members. Include welds, weld scars, bruises, and rust spots for scarred areas. Touched up the galvanized surfaces with galvanizing repair paint. Touch up the painted surfaces with paint for the repair of painted surfaces.

3.2.5 Accessory Installation

3.2.5.1 Adjusting Plates

Provide in locations too narrow to accommodate full-size deck units and install as shown on shop drawings.

3.2.5.2 End Closures

Provide end closure to close open ends of cells at columns, walls, and openings in deck.

3.2.5.3 Closures Above Partitions

Provide for closing voids between cells over partitions that are perpendicular to direction of cells. Provide a one-piece closure strip for partitions 4 inch nominal or less in thickness and two-piece closure strips for wider partitions. Provide sheet metal closures above fire-rated partitions at both sides of partition with space between filled with fiberglass insulation.

3.2.5.4 Cover Plates

Provide metal cover plates, or joint tape, at joints between cellular decking sheets to be used as electrical raceways. Where concrete leakage would be a problem, provide metal cover plates, or joint tape, at joints between decking sheets, cellular or noncellular, to be covered with concrete fill.

3.2.5.5 Column Closures

Provide for spaces between floor decking and columns which penetrate the deck. Field cut closure plate to fit column in the field and tack weld to decking and columns.

3.2.5.6 Access Hole Covers

Provide access hole covers to seal holes cut in decking to facilitate welding of the deck to structural supports.

3.2.6 Preparation of Fire-Proofed Surfaces

Provide deck surfaces, both composite and noncomposite, which are to receive sprayed-on fireproofing, galvanized and free of all grease, mill oil, paraffin, dirt, salt, and other contaminants which impair adhesion of the fireproofing. Complete any required cleaning prior to steel deck installation using a cleaning method that is compatible with the sprayed-on fireproofing.

3.3 ROOF SUMP PANS

Place sump pans over openings in roof decking and fusion welded to top surface of roof decking. Do not exceed spacing of welds of 12 inch with not less than one weld at each corner. Field cut opening in the bottom of each roof sump pan to receive the roof drain as part of the work of this section.

3.4 CANT STRIPS FOR ROOF DECKS

Provide strips to be fusion welded to surface of roof decking, secured to wood nailers by galvanized screws or to steel framing by galvanized self-tapping screws or welds. Do not exceed spacing of welds and fasteners of 12 inch. Lap end joints a minimum 3 inch and secure with galvanized sheet metal screws spaced a maximum 4 inch on center.

3.5 RIDGE AND VALLEY PLATES FOR ROOF DECKS

Provide plates to be fusion welded to top surface of roof decking. Lap end joints a minimum 3 inch. For valley plates, provide endlaps to be in the direction of water flow.

3.6 CLOSURE STRIPS FOR ROOF DECKS

Provide closure strips at open, uncovered ends and edges of the roof decking and in voids between roof decking and top of walls and partitions where indicated. Install closure strips in position in a manner to provide a weathertight installation.

3.7 ROOF INSULATION SUPPORT FOR ROOF DECKS

Provide metal closure strips for support of roof insulation where rib openings in top surface of metal roof decking occur adjacent to edges and openings. Weld metal closure strips in position.

3.8 CLEANING AND PROTECTION FOR ROOF DECKS

Upon completion of the deck, sweep surfaces clean and prepare for installation of the roofing.

3.9 FIELD QUALITY CONTROL

3.9.1 Headed Stud Inspection

In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.

b. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

3.9.2 Deck Weld Inspection

Visual inspect welds in accordance with AWS D1.3/D1.3M.

3.9.3 Decks Not Receiving Concrete

Inspect the decking top surface for distortion after installation. For roof decks not receiving concrete, verify distortion by placing a straight edge across three adjacent top flanges. The maximum allowable gap between the straight edge and the top flanges should not exceed manufacturing and construction tolerances of supporting members. When gap is more than the allowable, provide corrective measures or replacement. Reinspect decking after performing corrective measures or replacement.

-- End of Section --

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SECTION 05 40 00

COLD-FORMED METAL FRAMING
05/15, CHG 1: 08/18

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 318	(2019; R 2022) Building Code Requirements for Structural Concrete (ACI 318-19) and Commentary (ACI 318R-19)

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI S100	(2012) North American Specification for the Design of Cold-Formed Steel Structural Members
AISI S110	(2007; Suppl 1; Reaffirmed 2012) Standard for Seismic Design of Cold-Formed Steel Structural Systems - Special Bolted Moment Frames
AISI S200	(2007) North American Standard for Cold-Formed Steel Framing - General Provision
AISI S201	(2007) North American Standard for Cold-Formed Steel Framing - Product Data
AISI S202	(2011) Code of Standard Practice for Cold-formed Steel Structural Framing
AISI S211	(2007) North American Standard for Cold-Formed Steel Framing - Wall Stud Design
AISI S212	(2007) North American Standard for Cold-Formed Steel Framing - Header Design
AISI S213	(2007; Suppl 1 2009) North American Standard for Cold-Formed Steel Framing - Lateral Design
AISI S214	(2012) North American Standard for Cold-Formed Steel Framing – Truss Design

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2020; Errata 1 2021) Structural Welding Code - Steel

AWS D1.3/D1.3M	(2018) Structural Welding Code - Sheet Steel

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2023) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A307	(2021) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A370	(2023) Standard Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A1003/A1003M	(2023) Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members
ASTM C955	(2017) Standard Specification for Cold-Formed Steel Structural Framing Members
ASTM C1007	(2020) Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories
ASTM C1513	(2018) Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections
ASTM E119	(2022) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E329	(2023) Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
ASTM E488/E488M	(2022) Standard Test Methods for Strength of Anchors in Concrete Elements
ASTM F1554	(2020) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

ASTM F1941	(2010) Standard Specification for Electrodeposited Coatings on Threaded Fasteners (Unified Inch Screw Threads (UN/UNR))
ASTM F2329/F2329M	(2015; R 2023) Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2021) International Building Code

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-301-01	(2023; with Change 1, 2023) Structural Engineering

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Framing Components; G

SD-03 Product Data

Steel Studs, Joists, Tracks, Bracing, Bridging and Accessories

SD-05 Design Data

Metal Framing Calculations; G

SD-07 Certificates

Load-Bearing Cold-Formed Metal Framing

Welds

1.3 DELIVERY, STORAGE, AND HANDLING

Steel framing and related accessories shall be stored and handled in accordance with the AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing".

1.4 LOAD-BEARING COLD-FORMED METAL FRAMING

Include top and bottom tracks, bracing, fastenings, and other accessories

necessary for complete installation. Framing members shall have the structural properties indicated. Where physical structural properties are not indicated, they shall be as necessary to withstand all imposed loads. Design framing in accordance with AISI S100.

Submit mill certificates or test reports from independent testing agency, qualified in accordance with ASTM E329, showing that the steel sheet used in the manufacture of each cold-formed component complies with the minimum yield strengths and uncoated steel thickness specified. Test reports shall be based on the results of three coupon tests in accordance with ASTM A370.

1.5 MAXIMUM DEFLECTION

Deflections of structural members shall not exceed the more restrictive of the limitations of ICC IBC and UFC 3-301-01.

1.6 QUALITY ASSURANCE

a. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a registered professional engineer.

b. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E329 for testing indicated.

c. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

d. Welding Qualifications: Qualify procedures and personnel according to the following:

(1) AWS D1.1/D1.1M, "Structural Welding Code - Steel".

(2) AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel".

e. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E119 by, and displaying a classification label from, a testing and inspecting agency acceptable to authorities having jurisdiction.

f. AISI Specifications and Standards: Comply with:

(1) AISI S100, "North American Specification for the Design of Cold-Formed Steel Structural Members".

(2) AISI S110, "Standard for Seismic Design of Cold-Formed Steel Structural Systems - Special Bolted Moment Frames".

(3) AISI S200, "North American Standard for Cold-Formed Steel Framing - General Provision".

(4) AISI S201, "North American Standard for Cold-Formed Steel Framing - Product Data".

(5) AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing".

(6) AISI S211, "North American Standard for Cold-Formed Steel Framing - Wall Stud Design".

(7) AISI S212, "North American Standard for Cold-Formed Steel Framing - Header Design".

(8) AISI S213, "North American Standard for Cold-Formed Steel Framing - Lateral Design".

(9) AISI S214, "North American Standard for Cold-Formed Steel Framing - Truss Design".

1.6.1 Drawing Requirements

Submit framing components to show sizes, thicknesses, layout, material designations, methods of installation, and accessories including the following:

a. Cross sections, plans, and/or elevations showing component types and locations for each framing application; including shop coatings and material thicknesses for each framing component.

b. Connection details showing fastener type, quantity, location, and other information to assure proper installation.

c. Drawings depicting panel configuration, dimensions, components, locations, and construction sequence if the Contractor elects to install prefabricated/prefinished frames.

Sign and seal fabrication drawings by a registered professional engineer.

1.6.2 Design Data Required

Submit metal framing calculations with design criteria and structural loading to verify sizes, thickness, and spacing of members and connections signed and sealed by a registered professional engineer. Show methods and practices used in installation.

PART 2 PRODUCTS

2.1 STEEL STUDS, JOISTS, TRACKS, BRACING, BRIDGING AND ACCESSORIES

Framing components shall comply with ASTM C955 and the following.

a. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

(1) Grade: As required by structural performance.

(2) Coating: G60 (Z180),.

b. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

(1) Minimum Base-Metal Thickness: 0.0428 inch.

(2) Flange Width: 1-5/8 inches.

c. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

(1) Minimum Base-Metal Thickness: Matching steel studs.

(2) Flange Width: 1-1/4 inches .

d. Roof Truss Members: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as follows:

(1) Minimum Base-Metal Thickness: Matching steel studs.

(2) Flange Width: 1-5/8 inches , minimum at top and bottom chords connecting to sheathing or directly fastened construction.

2.1.1 Studs and Joists of 54 mils (0.054 Inch) and Heavier

Galvanized steel, ASTM A653/A653M and ASTM A1003/A1003M, SS Grade 50, G60 .

2.1.2 Studs and Joists of 43 mils (0.043 Inch) and Lighter

Studs and Joists of 43 mils (0.043 Inch) and Lighter, Track, and Accessories (All thicknesses): Galvanized steel, ASTM A653/A653M and ASTM A1003/A1003M, SS, Grade 33 33,000 psi G60.

2.1.3 Sizes, Thickness, Section Modulus, and Other Structural Properties

Size and thickness as required.

2.2 MARKINGS

Studs and track shall have product markings stamped on the web of the section. The markings shall be repeated throughout the length of the member at a maximum spacing of 4 feet on center and shall be legible and easily read. The product marking shall include the following:

a. An ICC number.

b. Manufacturer's identification.

c. Minimum delivered uncoated steel thickness.

d. Protective coating designator.

e. Minimum yield strength.

2.3 CONNECTIONS

2.3.1 Steel-To-Concrete Connections

a. Anchor Rods: ASTM F1554, Grade 36; galvanized per ASTM A153/A153M.

b. Post-Installed Concrete Anchors: Adhesive or expansion anchors fabricated from corrosion-resistant materials with allowable load capacities in accordance with ICC-ES AC193 and ACI 318 greater than or equal to the design load as determined by testing per ASTM E488/E488M conducted by a qualified testing agency.

c. Power-Actuated Fasteners: Fabricated from corrosion-resistant materials with allowable load capacities in accordance with ICC-ES AC 70 greater than or equal to the design load as determined by testing per ASTM E1190 conducted by a qualified testing agency.

2.3.2 Steel-To-Steel Connections

a. Screws: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping steel screws of the type and size indicated. Provide low-profile head beneath sheathing and manufacturer's standard elsewhere. Electroplated to a minimum of 5 micron zinc coating per ASTM F1941 or hot-dipped galvanized per ASTM A123/A123M or ASTM A153/A153M.

b. Bolts: ASTM A307 coated by hot-dip process per ASTM F2329/F2329M or zinc-coated by mechanical-deposition process per ASTM B695, Class 55.

c. Welding Electrodes: Comply with AWS standards.

2.4 PLASTIC GROMMETS

Supply plastic grommets for stud webs as recommended by stud manufacturer, to protect electrical wires and plumbing piping. Prevent metal-to-metal contact between wiring/piping and studs.

2.5 SEALER GASKET

Closed-cell neoprene foam, 1/4-inch thick, selected from manufacturer's standard widths to match width of bottom track on concrete slab or foundation.

PART 3 EXECUTION

3.1 TRUSS FABRICATION

a. Fabricate cold-formed steel trusses and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

b. Truss must be fabricated either on site or off site prior to erection.

c. Fabricate trusses using jigs or templates.

d. Splices can only occur at joints.

e. Cut truss members by sawing or shearing: do not torch cut.

f. Fasten cold-formed steel truss members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator.

g. Fasten other materials to cold-formed steel trusses by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

h. Reinforce, stiffen, and brace trusses to withstand handling, delivery, and erection stresses. Lift fabricated trusses to prevent damage or permanent distortion.

3.2 FASTENING

Fasten framing members together by welding or by using self-drilling, self-tapping screws. Electrodes and screw connections shall be as required and indicated in the design calculations.

3.2.1 Welds

All welding shall be performed in accordance with AWS D1.3/D1.3M, as modified by AISI S100. All welders, welding operations, and welding procedures shall be qualified according to AWS D1.3/D1.3M. Submit certified copies of welder qualifications test records showing qualification in accordance with AWS D1.3/D1.3M. All welds shall be cleaned and coated with rust inhibitive galvanizing paint. Do not field weld materials lighter than 43 mils.

3.2.2 Screws

Screws shall be of the self-drilling self-tapping type, size, and location as required. Screw penetration through joined materials shall not be less than three exposed threads. Minimum spacings and edge distances for screws shall be as specified in AISI S100. Screws covered by sheathing materials shall have low profile heads.

3.2.3 Anchors

Anchors shall be of the type, size, and location as required.

3.2.4 Powder-Actuated Fasteners

Powder-actuated fasteners shall be of the type, size, and location as required.

3.3 INSTALLATION

Install cold-formed framing in accordance with ASTM C1007 and AISI S200.

Install cold-formed steel framing according to AISI S202 and to manufacturer's written instructions unless more stringent requirements are indicated.

3.3.1 Tracks

Provide accurately aligned runners at top and bottom of studs. Install sealer gasket under bottom of track on concrete slab or foundation. Anchor tracks as indicated in design calculations. Butt weld joints in tracks or splice with stud inserts. Fasteners shall be at least 3 inches from the edge of concrete slabs.

3.3.2 Studs

Cut studs square and set with firm bearing against webs of top and bottom tracks. Position studs vertically in tracks and space as indicated in design. Do not splice studs. Provide at least two studs at jambs of doors and other openings 2 feet wide or larger. Provide jack studs over openings, as necessary, to maintain indicated stud spacing. Provide tripled studs at corners, positioned to receive interior and exterior finishes. Fasten studs to top and bottom tracks by welding or screwing both flanges to the tracks. Framed wall openings shall include headers and supporting components as shown on the drawings. Headers shall be installed in all openings that are larger than the stud spacing in a wall. In curtain wall construction, provide for vertical movement where studs connect to the structural frame. Provide horizontal bracing in accordance with the design calculations and AISI S100. Bracing shall be not less than the following:

LOAD	HEIGHT	BRACING
Wind load only	Up to 10 feet	One row at mid-height
	Over 10 feet	Rows 5'-0" o.c. maximum
Axial load	Up to 10 feet	Two rows at 1/3 points
	Over 10 feet	Rows 3'-4" o.c. maximum

3.3.3 Joists and Trusses

a. Provide a stud directly under each joist or truss. The maximum spacing of studs as indicated shall be maintained.

b. Install, bridge, and brace cold-formed steel trusses according to AISI S200, AISI S214, AISI's "Code of Standard Practice for Cold-Formed Steel Structural Framing," and manufacturer's written instructions unless more stringent requirements are indicated.

c. Install temporary bracing and supports. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

d. Do not alter, cut, or remove framing members or connections of trusses.

3.3.4 Erection Tolerances

a. Framing members which will be covered by finishes such as wallboard, plaster, or ceramic tile set in a mortar setting bed, shall be within the following limits:

(1) Layout of walls and partitions: 1/4 inch from intended position;

(2) Plates and runners: 1/4 inch in 8 feet from a straight line;

(3) Studs: 1/4 inch in 8 feet out of plumb, not cumulative; and

(4) Face of framing members: 1/4 inch in 8 feet from a true plane.

b. Framing members which will be covered by ceramic tile set in dry-set mortar, latex-portland cement mortar, or organic adhesive shall be within the following limits:

(1) Layout of walls and partitions: 1/4 inch from intended position;

(2) Plates and runners: 1/8 inch in 8 feet from a straight line;

(3) Studs: 1/8 inch in 8 feet out of plumb, not cumulative; and

(4) Face of framing members: 1/8 inch in 8 feet from a true plane.

-- End of Section --

SECTION 05 50 13

MISCELLANEOUS METAL FABRICATIONS
05/17, CHG 1: 08/18

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 303	(2016) Code of Standard Practice for Steel Buildings and Bridges

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B18.2.1	(2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(2022) Nuts for General Applications: Machine Screw Nuts, and Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
ASME B18.6.2	(2020) Square Head Set Screws and Slotted Headless Set Screws (Inch Series)
ASME B18.6.3	(2013; R 2017) Machine Screws, Tapping Screws, and Machine Drive Screws (Inch Series)
ASME B18.21.1	(2009; R 2016) Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series)
ASME B18.21.2M	(1999; R 2014) Lock Washers (Metric Series)
ASME B18.22M	(1981; R 2017) Metric Plain Washers

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP A10.3	(2020) Safety Requirements for Powder-Actuated Fastening Systems American National Standard for Construction and Demolition Operations

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2020; Errata 1 2021) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A47/A47M	(1999; R 2022; E 2022) Standard Specification for Ferritic Malleable Iron Castings
ASTM A53/A53M	(2022) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A108	(2013) Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2023) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A307	(2021) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A500/A500M	(2023) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A780/A780M	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A924/A924M	(2022a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B26/B26M	(2018; E 2018) Standard Specification for Aluminum-Alloy Sand Castings
ASTM B108/B108M	(2019) Standard Specification for Aluminum-Alloy Permanent Mold Castings
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B209M	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric)

ASTM B221	(2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B221M	(2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
ASTM C1513	(2018) Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections
ASTM D1187/D1187M	(1997; R 2018) Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal
ASTM F1554	(2020) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

MASTER PAINTERS INSTITUTE (MPI)

MPI 79	(2016) Primer, Alkyd, Anti-Corrosive for Metal

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 3	(2018) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2024) Safety -- Safety and Health Requirements Manual

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Expansion Joint Covers, Installation Drawings; G

Bollards/Pipe Guards; G

Embedded Angles and Plates, Installation Drawings; G

SD-03 Product Data

Expansion Joint Covers; G

Roof Hatches; G Each Downspout Terminations Type; G

SD-04 Samples

Expansion Joint Covers

SD-07 Certificates

Certificates of Compliance; G

SD-11 Closeout Submittals

Recycled Content; S

1.3 QUALIFICATION OF WELDERS

Qualify welders in accordance with AWS D1.1/D1.1M. Use procedures, materials, and equipment of the type required for the work.

1.4 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new items.

1.5 MISCELLANEOUS REQUIREMENTS

1.5.1 Fabrication Drawings

Submit fabrication drawings showing layout(s), connections to structural system, and anchoring details as specified in AISC 303.

1.5.2 Installation Drawings

Submit templates, erection, and installation drawings indicating thickness, type, grade, class of metal, and dimensions. Show construction details, reinforcement, anchorage, and installation in relation to the building construction.

PART 2 PRODUCTS

2.1 RECYCLED CONTENT

Provide products with recycled content. Provide certificates of compliance for recycled content in accordance with Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING.

2.2 MATERIALS

Provide exposed fastenings of compatible materials (avoid contact of dissimilar metals). Coordinate color and finish with the material to which fastenings are applied.

2.2.1 Structural Carbon Steel

Provide in accordance with ASTM A36/A36M.

2.2.2 Structural Tubing

Provide in accordance with ASTM A500/A500M.

2.2.3 Steel Pipe

Provide in accordance with ASTM A53/A53M, Type E or S, Grade B.

2.2.4 Fittings for Steel Pipe

Provide standard malleable iron fittings in accordance with ASTM A47/A47M.

2.2.5 Anchor Bolts

Provide in accordance with ASTM F1554. Where exposed, provide anchor bolts of the same material, color, and finish as the metal to which they are applied.

2.2.5.1 Lag Screws and Bolts

Provide in accordance with ASME B18.2.1, type and grade best suited for the purpose.

2.2.5.2 Toggle Bolts

Provide in accordance with ASME B18.2.1.

2.2.5.3 Bolts, Nuts, Studs and Rivets

Provide in accordance with ASME B18.2.2 or ASTM A307.

2.2.5.4 Powder Actuated Fasteners

Follow safety provisions in accordance with ASSP A10.3.

2.2.5.5 Screws

Provide in accordance with ASME B18.2.1, ASME B18.6.2, ASME B18.6.3 and ASTM C1513.

2.2.5.6 Washers

Provide plain washers in accordance with ASME B18.22M, ASME B18.21.1. Provide beveled washers for American Standard beams and channels, square or rectangular, tapered in thickness, and smooth. Provide lock washers in accordance with ASME B18.21.2M, ASME B18.21.1.

2.2.5.7 Welded Headed Shear Studs

Provide in accordance with ASTM A108.

2.2.6 Aluminum Alloy Products

Provide in accordance with ASTM B209M, ASTM B209 for sheet plate, ASTM B221M, ASTM B221M, ASTM B221 for extrusions and ASTM B26/B26M or ASTM B108/B108M for castings. Provide aluminum extrusions at least 1/8 inch thick and aluminum plate or sheet at least 0.050 inch thick.

2.3 FABRICATION FINISHES

2.3.1 Galvanizing

Hot-dip galvanize items specified to be zinc-coated, after fabrication where practicable. Provide galvanizing in accordance with ASTM A123/A123M, ASTM A153/A153M, ASTM A653/A653M or ASTM A924/A924M, Z275 G90.

2.3.2 Galvanize

Anchor bolts, grating fasteners, washers, and parts or devices necessary for proper installation, unless indicated otherwise.

2.3.3 Repair of Zinc-Coated Surfaces

Repair damaged surfaces with galvanizing repair method and paint in accordance with ASTM A780/A780M or by application of stick or thick paste material specifically designed for repair of galvanizing, as approved by Contracting Officer. Clean areas to be repaired and remove slag from welds. Heat, with a torch, surfaces to which stick or paste material will be applied. Heat to a temperature sufficient to melt the metals in the stick or paste. Spread molten material uniformly over surfaces to be coated and wipe off excess material.

2.3.4 Shop Cleaning and Painting

2.3.4.1 Surface Preparation

Blast clean surfaces in accordance with SSPC SP 6/NACE No.3. Surfaces that will be exposed in spaces above ceiling or in attic spaces, crawl spaces, furred spaces, and chases may be cleaned in accordance with SSPC SP 3 in lieu of being blast cleaned. Wash cleaned surfaces which become contaminated with rust, dirt, oil, grease, or other contaminants with solvents until thoroughly clean. Steel to be embedded in concrete must be free of dirt and grease prior to embed. Do not paint or galvanize bearing surfaces, including contact surfaces within slip critical joints. Shop coat these surfaces with rust prevention.

2.3.4.2 Pretreatment, Priming and Painting

Apply pre-treatment, primer, and paint in accordance with manufacturer's printed instructions. On surfaces concealed in the finished construction or not accessible for finish painting, apply an additional prime coat to a minimum dry film thickness of 1.0 mil. Tint additional prime coat with a small amount of tinting pigment.

2.3.5 Nonferrous Metal Surfaces

Protect by plating, anodic, or organic coatings.

2.3.6 Aluminum Surfaces

2.3.6.1 Surface Condition

Before finishes are applied, remove roll marks, scratches, rolled-in scratches, kinks, stains, pits, orange peel, die marks, structural streaks, and other defects which will affect uniform appearance of finished surfaces.

2.3.6.2 Aluminum Finishes

Unexposed sheet, plate and extrusions may have mill finish as fabricated. Sandblast castings' finish, medium, AA DAF45. Unless otherwise specified, provide all other aluminum items with a standard mill finish. Provide a coating thickness not less than that specified for protective and decorative type finishes for items used in interior locations or architectural Class I type finish for items used in exterior locations. Provide in accordance with AA DAF45. Provide a polished satin finish on items to be anodized.

2.4 GALVANIZED STEEL PIPE HANDRAILS AT EGRESS STAIRS

Fabricate joint posts, rails, and corners by one of the following methods:

a. Flush-type rail fittings of commercial standard, welded and ground smooth, with railing splice locks secured with 3/8 inch hexagonal-recessed-head setscrews.

b. Mitered and welded joints made by fitting post to top rail and intermediate rail to post, mitering corners, groove-welding joints, and grinding smooth. Butt railing splices and reinforce them by a tight-fitting interior sleeve not less than 6 inches long.

c. Railings may be bent at corners in lieu of jointing, provided that bends are made in suitable jigs and the pipe is not crushed.

d. Galvanize exterior railings, including pipe, fittings, brackets, fasteners, and other ferrous metal components.

2.5 MISCELLANEOUS PLATES AND SHAPES

Provide items that do not form a part of the structural steel framework, such as lintels, sill angles, miscellaneous mountings and frames. Provide lintels fabricated from structural steel shapes over openings in masonry walls and partitions as indicated and as required to support wall loads over openings. Provide with connections and fasteners. Construct to have at least 8 in bearing on masonry at each end.

Provide angles and plates in accordance with ASTM A36/A36M, for embedment as indicated. Galvanize embedded items exposed to the elements in accordance with ASTM A123/A123M.

2.6 ROOF HATCHES (SCUTTLES)

Provide aluminum sheets not less than 14 gauge with 3 inch beaded flange, welded and ground at corners. Provide a minimum clear opening of 16 SF MIN 48 inches by 48 inches. Insulate cover and curb with one inch thick rigid fiberboard insulation, covered and protected by zinc-coated steel liner of not less than 26 gage. Provide with 12 inches high curb, formed with 3 inch mounting flanges with holes for securing to the roof deck.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated in accordance with manufacturer's instructions. Verify all field dimensions prior to fabrication. Include

materials and parts necessary to complete each assembly, whether indicated or not. Miss-alignment and miss-sizing of holes for fasteners is cause for rejection. Conceal fastenings where practicable. Joints exposed to weather must be watertight.

3.2 WORKMANSHIP

Provide miscellaneous metalwork that is true and accurate in shape, size, and profile. Make angles and lines continuous and straight. Make curves consistent, smooth and unfaceted. Provide continuous welding along the entire area of contact except where tack welding is permitted. Do not tack weld exposed connections. Unless otherwise indicated and approved, provide a smooth finish on exposed surfaces. Provide countersuck rivets where exposed. Provide coped and mitered corner joints aligned flush and without gaps.

3.3 ANCHORAGE, FASTENINGS, AND CONNECTIONS

Provide anchorage as necessary, whether indicated or not, for fastening miscellaneous metal items securely in place. Include slotted inserts, expansion shields, powder-driven fasteners, toggle bolts (when approved for concrete), through bolts for masonry, headed shear studs, machine and carriage bolts for steel, through bolts, lag bolts, and screws for wood. Do not use wood plugs. Provide non-ferrous attachments for non-ferrous metal. Provide exposed fastenings of compatible materials (avoid contact of dissimilar metals), that generally match in color and finish the surfaces to which they are applied. Conceal fastenings where practicable. Provide all fasteners flush with the surfaces they fasten, unless indicated otherwise.

3.4 BUILT-IN WORK

Where necessary and not otherwise indicated, form built-in metal work for anchorage with concrete or masonry. Provide built-in metal work in ample time for securing in place as the work progresses.

3.5 WELDING

Perform welding, welding inspection, and corrective welding in accordance with AWS D1.1/D1.1M. Use continuous welds on all exposed connections. Grind visible welds smooth in the finished installation. Provide welded headed shear studs in accordance with AWS D1.1/D1.1M, Clause 7, except as otherwise specified. Provide in accordance with the safety requirements of EM 385-1-1.

3.6 DISSIMILAR METALS

Where dissimilar metals are in contact, protect surfaces with a coating in accordance with MPI 79 to prevent galvanic or corrosive action. Where aluminum is in contact with concrete, plaster, mortar, masonry, wood, or absorptive materials subject to wetting, protect in accordance with ASTM D1187/D1187M, asphalt-base emulsion. Clean surfaces with metal shavings from installation at the end of each work day.

3.7 PREPARATION

3.7.1 Material Coatings and Surfaces

Remove rust preventive coating just prior to field erection, using a

remover approved by the metal manufacturer. Surfaces, when assembled, must be free of rust, grease, dirt and other foreign matter.

3.7.2 Environmental Conditions

Do not clean or paint surfaces when damp or exposed to foggy or rainy weather, when metallic surface temperature is less than minus 5 degrees F above the dew point of the surrounding air, or when surface temperature is below 45 degrees F or over 95 degrees F, unless approved by the Contracting Officer. Metal surfaces to be painted must be dry for a minimum of 48 hours prior to the application of primer or paint.

3.8 EXPANSION JOINT COVERS

Provide in accordance with manufacturer's written instructions. Verify installation allows specified movement prior to completion of work

3.9 ROOF HATCH THERMALLY BROKEN (SCUTTLES)

Construction and accessories as follows:

a. Provide thermally brokeninsulated cover and curb with mounting flanges for securing to roof deck. Provide curbs with integral metal cap flashing of the same gage and metal as the curb, fully welded and ground at corners for weather tightness.

b. Provide hatches completely assembled, with pintle hinges, compression spring operators enclosed in telescopic tubes, positive snap latches with turn handles on inside and outside, and neoprene draft seals. Provide fasteners for padlocking from the inside. Provide covers with automatic hold-open arms complete with grip handle to permit one hand release. Cover action must be smooth through its entire range of motion with an operating pressure of approximately 30 pounds.

c. Aluminum to be mill finish. All hardware to be corrosion resistant.

3.10 INSTALLATION OF BOLLARDS/PIPE GUARDS

Set bollards/pipe guards vertically in concrete piers. Fill hollow cores with concrete having a compressive strength of 3000 psi.

3.11 INSTALLATION OF DOWNSPOUT TERMINATIONS

Secure downspout terminations to downspouts and substrate per manufacturer's instructions.

3.12 INSTALLATION MISCELLANEOUS PLATES AND SHAPES

Provide lintels fabricated from structural steel shapes over openings in masonry walls and partitions as indicated and as required to support wall loads over openings. Provide with connections and fasteners. Construct to have at least 8 inches bearing on masonry at each end.

-- End of Section --

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SECTION 05 51 33

METAL LADDERS
02/16, CHG 2: 02/18

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes

AMERICAN LADDER INSTITUTE (ALI)

ALI A14.3	(2008; R 2018) Ladders - Fixed - Safety Requirements

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP Z359.16	(2016) Safety Requirements for Climbing Ladder Fall Arrest Systems

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2020; Errata 1 2021) Structural Welding Code - Steel
AWS D1.2/D1.2M	(2014; Errata 1 2014; Errata 2 2020) Structural Welding Code - Aluminum

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A47/A47M	(1999; R 2022; E 2022) Standard Specification for Ferritic Malleable Iron Castings
ASTM A53/A53M	(2022) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2023) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A500/A500M	(2023) Standard Specification for

	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A780/A780M	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A924/A924M	(2022a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B26/B26M	(2018; E 2018) Standard Specification for Aluminum-Alloy Sand Castings
ASTM B108/B108M	(2019) Standard Specification for Aluminum-Alloy Permanent Mold Castings
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B221	(2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM D1187/D1187M	(1997; R 2018) Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal
MASTER PAINTERS INSTITUTE (MPI)	
MPI 79	(2016) Primer, Alkyd, Anti-Corrosive for Metal
SOCIETY FOR PROTECTIVE COATINGS (SSPC)	
SSPC SP 3	(2018) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning
U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)	
29 CFR 1910.23	(Nov 2016) Ladders
29 CFR 1910.29	(Nov 2016) Fall Protection System and Falling Object Protection - Criteria and Practices

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29

SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Ladders, Installation Drawings

SD-03 Product Data

Ladders

Ladder Safety Devices (Climbing Ladder Fall Arrest Systems)

SD-07 Certificates

Fabricator Certification for Ladder Assembly

Certificates Of Compliance

1.3 CERTIFICATES

Provide fabricator certification for ladder assembly stating that the ladder and associated components have been fabricated according to the requirements of 29 CFR 1910.23.

1.4 QUALIFICATION OF WELDERS

Qualify welders in accordance with AWS D1.1/D1.1M. Use procedures, materials, and equipment of the type required for the work.

1.5 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new items.

PART 2 PRODUCTS

2.1 RECYCLED CONTENT

Provide products with recycled content and provide certificates of compliance in accordance with Section 01 33 29 SUSTAINABILITY REPORTING.

2.2 MATERIALS

2.2.1 Structural Carbon Steel

ASTM A36/A36M.

2.2.2 Structural Tubing

ASTM A500/A500M.

2.2.3 Steel Pipe

ASTM A53/A53M, Type E or S, Grade B.

2.2.4 Fittings for Steel Pipe

Standard malleable iron fittings ASTM A47/A47M.

2.2.5 Aluminum Alloy Products

Conform to ASTM B209 for sheet plate, ASTM B221 for extrusions and ASTM B26/B26M or ASTM B108/B108M for castings, as applicable. Provide aluminum extrusions at least 1/8 inch thick and aluminum plate or sheet at least 0.050 inch thick.

2.3 FABRICATION FINISHES

2.3.1 Galvanizing

Hot-dip galvanize items specified to be zinc-coated, after fabrication where practicable. Galvanizing: ASTM A123/A123M, ASTM A153/A153M, ASTM A653/A653M or ASTM A924/A924M, G90, as applicable.

2.3.2 Galvanize

Anchor bolts, washers, and parts or devices necessary for proper installation, unless indicated otherwise.

2.3.3 Repair of Zinc-Coated Surfaces

Repair damaged surfaces with galvanizing repair method and paint conforming to ASTM A780/A780M or by application of stick or thick paste material specifically designed for repair of galvanizing, as approved by Contracting Officer. Clean areas to be repaired and remove slag from welds. Heat surfaces to which stick or paste material is applied, with a torch to a temperature sufficient to melt the metallics in stick or paste; spread molten material uniformly over surfaces to be coated and wipe off excess material.

2.3.4 Shop Cleaning and Painting

2.3.4.1 Surface Preparation

Blast clean surfaces in accordance with SSPC SP 6/NACE No.3. Surfaces that will be exposed in spaces above ceiling or in attic spaces, crawl spaces, furred spaces, and chases may be cleaned in accordance with SSPC SP 3 in lieu of being blast cleaned. Wash cleaned surfaces which become contaminated with rust, dirt, oil, grease, or other contaminants with solvents until thoroughly clean.

2.3.4.2 Pretreatment, Priming and Painting

Apply pretreatment, primer, and paint in accordance with manufacturer's printed instructions. On surfaces concealed in the finished construction or not accessible for finish painting, apply an additional prime coat to a minimum dry film thickness of 1.0 mil. Tint additional prime coat with a small amount of tinting pigment.

2.3.5 Nonferrous Metal Surfaces

Protect by plating, anodic, or organic coatings.

2.3.6 Aluminum Surfaces

2.3.6.1 Surface Condition

Before finishes are applied, remove roll marks, scratches, rolled-in scratches, kinks, stains, pits, orange peel, die marks, structural streaks, and other defects which will affect uniform appearance of finished surfaces.

2.3.6.2 Aluminum Finishes

Unexposed plate and extrusions may have mill finish as fabricated. Sandblast castings' finish, medium, AA DAF45. Unless otherwise specified, provide all other aluminum items with standard mill finish. Provide a coating thickness not less than that specified for protective and decorative type finishes for items used in interior locations or architectural Class I type finish for items used in exterior locations in AA DAF45.

2.4 LADDERS

Fabricate vertical ladders conforming to 29 CFR 1910.23 and Section 5 of ALI A14.3. Ladders shall be capable of supporting their maximum intended load. Use 2 1/2 by 3/8 inch steel flats for stringers and 3/4 inch diameter steel rods for rungs. Ladder rungs, step and cleats must be spaced not less than 10 inches and not more than 16 inches wide (measured before installation of ladder safety system), spaced no more than 14 inches apart, plug welded or shouldered and headed into stringers. Install ladders so that the maximum perpendicular distance from the centerline of the steps or rungs, or grab bars, or both, to the nearest permanent object in the back of the ladder or to the finished wall surface will not be less than 7 inches, except for the elevator pit ladders, which have a minimum perpendicular distance of 4.5 inches. Provide heavy clip angles riveted or bolted to the stringer and drilled for not less than two 1/2 inch diameter expansion bolts as indicated. Provide intermediate clip angles not over 48 inches on centers. The top rung of the ladder must be level with the top of the access level, parapet or landing served by the ladder except for hatches or wells. Extend the side rails of through or side step ladders 42 inches above the access level. The drawings must indicate ladder locations and details of critical dimensions and materials.

a. Steel Exterior Wall Mounted Roof Access Ladder: Galvanized finish. Off the floor mounting with top bracket, and handrail extansions at least 42" above final ladder rung. Provide safety cap at tops of vertical stringers.

b. Steel Interior Floor Mounted Roof Access Ladder: Provide safety post.

2.4.1 Ladder Safety Devices (Climbing Ladder Fall Arrest Systems)

Conform to 29 CFR 1910.29, Section 7 of ALI A14.3 and ASSP Z359.16. Install ladder safety devices on ladders over 20 feet long or more. The ladder safety systems must meet the design requirement of the ladders which they serve. The ladder safety system must be capable of sustaining a minimum static load of 1,000 pounds. The applied loads transferred to the climbing ladder mounting locations as a result of a fall shall be specified by the manufacturer of the climbing ladder fall arrest system. Each ladder safety system must allow the worker to climb up and down using

both hands and does not require the employee continuously, hold, push, or pull any part of the system while climbing. The connection between the carrier or lifeline and the point of attachment to the body harness does not exceed 9 inches. The ladder safety system consists of a rigid or flexible carrier. Mountings for the rigid carries are attached at each end of the carrier, with intermediate mountings spaced as necessary, along the entire length of the carrier. Mountings for flexible carrier are attached at each end of the carrier and cable guides for flexible carriers are installed at least 25 feet apart but not more than 40 feet apart along the entire length of the carrier. The design and installation of mountings and cable guides does not reduce the design strength of the ladder.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated, according to manufacturer's instructions. Verify all measurements and take all field measurements necessary before fabrication. Provide Exposed fastenings of compatible materials, generally matching in color and finish, and harmonize with the material to which fastenings are applied. Include materials and parts necessary to complete each item, even though such work is not definitely shown or specified. Poor matching of holes for fasteners will be cause for rejection. Conceal fastenings where practicable. Thickness of metal and details of assembly and supports must provide strength and stiffness. Formed joints exposed to the weather to exclude water. Items listed below require additional procedures.

3.2 WORKMANSHIP

Metalwork must be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching must produce clean true lines and surfaces. Continuously weld along the entire area of contact. Do not tack weld exposed connections of work in place. Grind smooth exposed welds. Provide smooth finish on exposed surfaces of work in place, unless otherwise approved. Where tight fits are required, mill joints. Cope or miter corner joints, well formed, and in true alignment. Install in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

3.3 ANCHORAGE, FASTENINGS, AND CONNECTIONS

Provide anchorage where necessary for fastening metal items securely in place. Include for anchorage not otherwise specified or indicated slotted inserts, expansion anchors, and powder-actuated fasteners, when approved for concrete; toggle bolts and through bolts for masonry; machine bolts, carriage bolts and powder-actuated threaded studs for steel; through bolts, lag bolts, and screws for wood. Do not use wood plugs in any material. Provide non-ferrous attachments for non-ferrous metal. Make exposed fastenings of compatible materials, generally matching in color and finish, to which fastenings are applied. Conceal fastenings where practicable.

3.4 WELDING

Perform welding, welding inspection, and corrective welding, in accordance with AWS D1.1/D1.1M or AWS D1.2/D1.2M. Use continuous welds on all exposed connections. Grind visible welds smooth in the finished

installation.

3.5 FINISHES

3.5.1 Dissimilar Materials

Where dissimilar metals are in contact, protect surfaces with a coat conforming to MPI 79 to prevent galvanic or corrosive action. Where aluminum is in contact with concrete, plaster, mortar, masonry, wood, or absorptive materials subject to wetting, protect with ASTM D1187/D1187M, asphalt-base emulsion.

3.5.2 Field Preparation

Remove rust preventive coating just prior to field erection, using a remover approved by the rust preventive manufacturer. Surfaces, when assembled, must be free of rust, grease, dirt and other foreign matter.

3.5.3 Environmental Conditions

Do not clean or paint surface when damp or exposed to foggy or rainy weather, when metallic surface temperature is less than 5 degrees F above the dew point of the surrounding air, or when surface temperature is below 45 degrees F or over 95 degrees F, unless approved by the Contracting Officer.

3.6 LADDERS

Secure to the adjacent construction with the clip angles attached to the stringer. Secure to masonry or concrete with not less than two 1/2 inch diameter expansion bolts. Install intermediate clip angles not over 48 inches on center. Install brackets as required for securing of ladders welded or bolted to structural steel or built into the masonry or concrete. Ends of ladders must not rest upon finished roof.

-- End of Section --

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SECTION 06 10 00

ROUGH CARPENTRY
08/16, CHG 2: 11/18

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF TIMBER CONSTRUCTION (AITC)

AITC TCM	(2012) Timber Construction Manual, 5th Edition

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)

ALSC PS 20	(2015) American Softwood Lumber Standard

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B18.2.1	(2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(2022) Nuts for General Applications: Machine Screw Nuts, and Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
ASME B18.5.2.1M	(2006; R 2011) Metric Round Head Short Square Neck Bolts
ASME B18.5.2.2M	(1982; R 2010) Metric Round Head Square Neck Bolts
ASME B18.6.1	(2016) Wood Screws (Inch Series)

AMERICAN WOOD COUNCIL (AWC)

AWC NDS	(2015) National Design Specification (NDS) for Wood Construction
AWC WFCM	(2012) Wood Frame Construction Manual for One- and Two-Family Dwellings

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA M2	(2019) Standard for the Inspection of Preservative Treated Wood Products for Industrial Use
AWPA M6	(2013) Brands Used on Preservative Treated Materials

APA - THE ENGINEERED WOOD ASSOCIATION (APA)

APA EWS T300	(2007) Technical Note: Glulam Connection Details
APA L870	(2010) Voluntary Product Standard, PS 1-09, Structural Plywood

ASTM INTERNATIONAL (ASTM)

ASTM A153/A153M	(2023) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A307	(2021) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM C1136	(2023) Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
ASTM C1396/C1396M	(2017) Standard Specification for Gypsum Board
ASTM D2898	(2010; R 2017) Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing
ASTM E96/E96M	(2022a; E 2023) Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
ASTM F547	(202) Standard Terminology of Nails for Use with Wood and Wood-Base Materials
ASTM F1667/F1667M	(2021a) Standard Specification for Driven Fasteners: Nails, Spikes, and Staples

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

GREEN SEAL (GS)

GS-36	(2013) Adhesives for Commercial Use

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2021) International Building Code

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

TRUSS PLATE INSTITUTE (TPI)

TPI 1	(2014) National Design Standard for Metal Plate Connected Wood Truss Construction, Including Commentary and Appendices

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-1923	(Rev A; Notice 1; Notice 2; Notice 3; Notice 4) Shield, Expansion (Lag, Machine and Externally Threaded Wedge Bolt Anchors)
CID A-A-1924	(Rev A; Notice 3) Shield, Expansion (Self Drilling Tubular Expansion Shell Bolt Anchors
CID A-A-1925	(Rev A; Notice 1; Notice 2; Notice 3; Notice 4) Shield Expansion (Nail Anchors)

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2022) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Nailers and Nailing Strips; G

SD-03 Product Data

Fire-retardant Treatment; G, S

Adhesives; G, S

SD-06 Test Reports

Preservative-treated Lumber and Plywood

SD-07 Certificates

Certificates of Grade; G

Certified Sustainably Harvested Plywood for Other Uses;

Preservative Treatment

Indoor Air Quality for Aerosol Adhesives; S

Indoor Air Quality for Non-aerosol Adhesives; S

1.3 DELIVERY AND STORAGE

Deliver materials to the site in an undamaged condition. Store, protect, handle, and install prefabricated structural elements in accordance with manufacturer's instructions and as specified. Store materials off the ground to provide proper ventilation, with drainage to avoid standing water, and protection against ground moisture and dampness. Store materials with a moisture barrier at both the ground level and as a cover forming a well ventilated enclosure. Adhere to requirements for stacking, lifting, bracing, cutting, notching, and requirements. Do not use materials that have visible moisture or biological growth. Remove defective and damaged materials and provide new materials. Store separated reusable wood waste convenient to cutting station and area of work.

1.4 GRADING AND MARKING

1.4.1 Lumber

Mark each piece of framing and board lumber or each bundle of small pieces of lumber with the grade mark of a recognized association or independent inspection agency. Such association or agency must be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. Surfaces that are to be exposed to view must not bear grademarks, stamps, or any type of identifying mark. Hammer marking will be permitted on timbers when all surfaces will be exposed to view.

1.4.2 Plywood

Mark each sheet with the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of the plywood. The mark must identify the plywood by species group or span rating, exposure durability classification, grade, and compliance with APA L870. Surfaces that are to be exposed to view must not bear grademarks or other types of identifying marks.

1.4.3 Preservative-Treated Lumber and Plywood

The Contractor is responsible for the quality of treated wood products. Each treated piece must be inspected in accordance with AWPA M2 and permanently marked or branded, by the producer, in accordance with AWPA M6. The Contractor must provide Contracting Officer's Representative (COR) with the inspection report of an approved independent inspection agency that offered products comply with applicable AWPA Standards. The appropriate Quality Mark on each piece will be accepted, in lieu of inspection reports, as evidence of compliance with applicable AWPA treatment standards.

1.4.4 Fire-Retardant Treated Lumber

Mark each piece in accordance with AWPA M6, except pieces that are to be natural or transparent finished. In addition, exterior fire-retardant lumber must be distinguished by a permanent penetrating blue stain.

Labels of a nationally recognized independent testing agency will be accepted as evidence of conformance to the fire-retardant requirements of AWPA M6.

1.4.5 Hardboard, Gypsum Board, and Fiberboard

Mark each sheet or bundle to identify the standard under which the material is produced and the producer.

1.5 SIZES AND SURFACING

ALSC PS 20 for dressed sizes of yard and structural lumber. Lumber must be surfaced four sides. Size references, unless otherwise specified, are nominal sizes, and actual sizes must be within manufacturing tolerances allowed by the standard under which the product is produced. Other measurements are IP or SI standard.

1.6 MOISTURE CONTENT

Air-dry or kiln-dry lumber. Kiln-dry treated lumber after treatment. Maximum moisture content of wood products must be as follows at the time of delivery to the job site:

a. Framing lumber and board, 19 percent maximum

b. Materials other than lumber; moisture content must be in accordance with standard under which the product is produced

1.7 PRESERVATIVE TREATMENT

a. 0.25 pcf intended for above ground use.

b. 0.40 pcf intended for ground contact and fresh water use. 0.60 pcf intended for Ammoniacal Copper Quaternary Compound (ACQ)-treated foundations. 0.80 to 1.00 pcf intended for ACQ-treated pilings. All wood must be air or kiln dried after treatment. Specific treatments must be verified by the report of an approved independent inspection agency, or the AWPA Quality Mark on each piece. Brush coat areas that are cut or drilled after treatment with either the same preservative used in the treatment or with a 2 percent copper naphthenate solution. Plastic lumber must not be preservative treated. The following items must be preservative treated:

(1) Wood framing, woodwork, and plywood up to and including the subflooring at the first-floor level of structures having crawl spaces when the bottoms of such items are 24 inches or less from the earth underneath.

(2) Wood members that are in contact with water.

(3) Exterior wood steps, platforms, and railings; and all wood framing of open, roofed structures.

(4) Wood sills, soles, plates, furring, and sleepers that are less than 24 inches from the ground, furring and nailers that are set into or in contact with concrete or masonry.

(5) Nailers, edge strips, crickets, curbs, and cants for roof decks.

1.8 FIRE-RETARDANT TREATMENT

Fire-retardant treated wood must be pressure treated Treatment and performance inspection must be by an independent and qualified testing agency that establishes performance ratings. Each piece or bundle of treated material must bear identification of the testing agency to indicate performance in accordance with such rating. Treated materials to be exposed to rain wetting must be subjected to an accelerated weathering technique in accordance with ASTM D2898 prior to being tested. Such items which will not be inside a building, and such items which will be exposed to heat or high humidity, must receive exterior fire-retardant treatment. Items to be treated include the following:

1.9 CERTIFICATIONS

1.9.1 Certified Wood Grades

Provide certificates of grade from the grading agency on graded but unmarked lumber or plywood attesting that materials meet the grade requirements specified herein.

1.9.2 Indoor Air Quality Certifications

Submit required indoor air quality certifications in one submittal package.
1.9.2.1 Adhesives and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party programs that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

PART 2 PRODUCTS

2.1 MATERIALS2.2 PLYWOOD PANELSAPA L8702.2.1 Other Uses

2.2.1.1 Plywood

Plywood for general construction.. C-D Grade, Exposure 1. Provide certified sustainably harvested plywood for other uses.

2.3 OTHER MATERIALS

2.3.1 Glass-MatGypsum Wall Sheathing

ASTM C1396/C1396M, 1/2 inch thick fire retardant (Type X) 5/8 inch thick; 4 feet wide with square edge for supports 16 inches o.c. with or without corner bracing of framing ; 2 feet wide with V-tongue and groove (T&G) edge for supports 16 inches o.c. with corner bracing of framing.

2.3.2 Miscellaneous Wood Members

2.3.2.1 Nonstress Graded Members

Members must include bridging, corner bracing, furring, grounds, and nailing strips. Members must be in accordance with TABLE I for the species used. Sizes must be as follows unless otherwise shown:

Member	Size inch
Bridging	1 x 3 or 1 x 4 for use between members 2 x 12 and smaller; 2 x 4 for use between members larger than 2 x 12.
Corner bracing	1 x 4.
Furring	1 x 2
Grounds	Plaster thickness by 38.
Nailing strips	1 x 3 or 1 x 4 when used as shingle base or interior finish, otherwise 2 inch stock.

2.3.2.2 Blocking

Blocking must be standard or number 2 grade.

2.3.3 Adhesives

Comply with applicable regulations regarding toxic and hazardous materials and as specified. Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide aerosol adhesives used on the interior of the building meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of GS-36. Provide certification or validation of indoor air quality for non-aerosol adhesives applied on the interior of the building (inside of the weatherproofing system). Provide certification or validation of indoor air quality for aerosol adhesives used on the interior of the building (inside of the weatherproofing system).

2.4 ROUGH HARDWARE

Unless otherwise indicated or specified, rough hardware must be of the type and size necessary for the project requirements. Sizes, types, and spacing of fastenings of manufactured building materials must be as recommended by the product manufacturer unless otherwise indicated or specified. Rough hardware exposed to the weather or embedded in or in contact with preservative treated wood, exterior masonry, or concrete walls or slabs must be hot-dip zinc-coated in accordance with ASTM A153/A153M. Nails and fastenings for fire-retardant treated lumber and woodwork exposed to the weather must be copper alloy or hot-dipped galvanized fasteners as recommended by the treated wood manufacturer.

2.4.1 Bolts, Nuts, Studs, and Rivets

ASME B18.2.1, ASME B18.5.2.1M, ASME B18.5.2.2M and ASME B18.2.2.

2.4.2 Anchor Bolts

ASTM A307, size as indicated, complete with nuts and washers.

2.4.3 Expansion Shields

CID A-A-1923, CID A-A-1924, and CID A-A-1925. Except as shown otherwise, maximum size of devices must be 3/8 inch.

2.4.4 Lag Screws and Lag Bolts

ASME B18.2.1.

2.4.5 Wood Screws

ASME B18.6.1.

2.4.6 Nails

ASTM F547, size and type best suited for purpose. For sheathing and subflooring, length of nails must be sufficient to extend 1 inch into supports. In general, 8-penny or larger nails must be used for nailing through 1 inch thick lumber and for toe nailing 2 inch thick lumber; 16-penny or larger nails must be used for nailing through 2 inch thick lumber. Nails used with treated lumber and sheathing must be hot-dipped galvanized in accordance with ASTM A153/A153M. Nailing must be in accordance with the recommended nailing schedule contained in AWC WFCM. Where detailed nailing requirements are not specified, nail size and spacing must be sufficient to develop an adequate strength for the connection. The connection's strength must be verified against the nail capacity tables in AWC NDS. Reasonable judgment backed by experience must ensure that the designed connection will not cause the wood to split. If a load situation exceeds a reasonable limit for nails, a specialized connector must be used.

2.4.7 Wire Nails

ASTM F1667/F1667M.

2.4.8 Timber Connectors

Unless otherwise specified, timber connectors must be in accordance with TPI 1, APA EWS T300 or AITC TCM.

2.4.9 Clip Angles

Steel, 3/16 inch thick, size as indicated; or zinc-coated steel or iron commercial clips designed for connecting wood members.

2.4.10 Metal Bridging

Where not indicated or specified otherwise, No. 16 U.S. Standard gage, cadmium-plated or zinc-coated.

2.4.11 Toothed Rings and Shear Plates

AWC NDS.

2.4.12 Metal Framing Anchors

Construct anchors to the configuration shown using hot dip zinc-coated steel conforming to ASTM A653/A653M, G90. Except where otherwise shown,

Steel must be not lighter than 18 gage. Special nails supplied by the manufacturer must be used for all nailing.

2.5 AIR INFILTRATION BARRIER

Air infiltration barrier must be building paper meeting the requirements of ASTM C1136, Type IV, style optional or a tear and puncture resistant olefin building wrap (polyethylene or polypropylene) with a moisture vapor transmission rate of 125 g per square meter per 24 hours in accordance with ASTM E96/E96M, Desiccant Method at 23 degrees C or with a moisture vapor transmission rate of 670 g per square meter per 24 hours in accordance with ASTM E96/E96M, Water Method at 23 degrees C.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

Conform to AWC WFCM unless otherwise indicated or specified. Select lumber sizes to minimize waste. Fit framing lumber and other rough carpentry, set accurately to the required lines and levels, and secure in place in a rigid manner. Do not splice framing members between bearing points. Set joists, rafters, and purlins with their crown edge up. Frame members for the passage of pipes, conduits, and ducts. Do not cut or bore structural members for the passage of ducts or pipes without approval. Reinforce all members damaged by such cutting or boring by means of specially formed and approved sheet metal or bar steel shapes, or remove and provide new, as approved. Provide as necessary for the proper completion of the work all framing members not indicated or specified. Spiking and nailing not indicated or specified otherwise must be in accordance with the Nailing Schedule contained in ICC IBC; perform bolting in an approved manner. Spikes, nails, and bolts must be drawn up tight. Use slate or steel shims when leveling joists, beams, and girders on masonry or concrete. Do not use shimming on wood or metal bearings. When joists, beams, and girders are placed on masonry or concrete, a wood base plate must be positioned and leveled with grout. The joist, beam, or girder must then be placed on the plate. When joists, beams, and girders are set into masonry or concrete, a pocket must be formed into the wall. The joist, beam, or girder must then be placed into the pocket and leveled with a steel shim.

3.1.1 Sills

Set sills level and square and wedge with steel or slate shims; point or grout with non-shrinking cement mortar to provide continuous and solid bearing. Anchor sills to the foundations as indicated. Where sizes and spacing of anchor bolts are not indicated, provide not less than 5/8 inch diameter bolts at all corners and splices and space at a maximum of 6 feet o.c. between corner bolts. Provide at least two bolts for each sill member. Lap and splice sills at corners and bolt through the laps or butt the ends and through-bolt not more than 6 inches from the ends. Provide bolts with plate washers and nuts. Bolts in exterior walls must be zinc-coated.

3.1.2 Wall Framing

3.1.2.1 Firestops

Provide firestops for wood framed walls and partitions and for furred spaces of concrete or masonry walls at each floor level and at the ceiling line in the top story. Where firestops are not automatically provided by the framing system used, they must be formed of closely fitted wood blocks of nominal 2 inch thick material of the same width as the studs and joists. Lightweight concrete units may be used at the first-floor level to serve jointly as firestopping and ratproofing.

3.1.3 Wall Sheathing

3.1.3.1 Plywood, Structural-Use, and OSB Panel Wall Sheathing

Apply horizontally or vertically. Extend sheathing over and nail to sill and top plate. Abut sheathing edges over centerlines of supports. Allow 1/8 inch spacing between panels and 1/8 inch at windows and doors. If sheathing is applied horizontally, stagger vertical end joints. Nail panels with 6-penny nails spaced 6 inches o.c. along edges of the panel and 12 inches o.c. over intermediate supports. Keep nails 3/8 inches away from panel ledges. Provide 2 by 4 blocking for horizontal edges not otherwise supported.

3.1.3.2 Gypsum Sheathing Board

Apply gypsum sheathing board either horizontally or vertically. Butt joints and locate over the centerlines of supports. Horizontally applied sheathing must be T&G, applied with tongued edge up. Stagger vertical joints and abut sheet closely to frames of openings. Nail sheathing with 11 gage, 3/8 inch head, zinc-coated nails 1-1/2 inches long for 1/2 inch sheathing and 1-3/4 inches long for 5/8 inch sheathing, spaced 3/8 inch minimum from edges. Provide 2 by 4 blocking for horizontal edges of 4 foot wide panels not otherwise supported.

a. Gypsum Sheathing Board Used with Diagonal-Braced Framing: Sheathing must be either 2 or 4 feet wide. Apply sheathing 2 feet wide horizontally. Nail 4 inches maximum o.c. at edges and over intermediate bearings. Apply sheathing 4 feet wide either horizontally or vertically. Nail 4 inches maximum o.c. at edges and 8 inches maximum o.c. at intermediate bearings.

b. Gypsum Sheathing Board Used with Unbraced Frames: Sheathing must be 4 feet wide and applied vertically. Extend sheathing over and nail to both sill and top plates. Nail 4 inches maximum o.c. at edges and 8 inches maximum o.c. at intermediate bearings.

3.2 MISCELLANEOUS

3.2.1 Wood Roof Nailers, Edge Strips, Crickets, Curbs, and Cants. Provide sizes and configurations indicated or specified and anchored securely to continuous construction.

3.2.1.1 Crickets, Cants, and Curbs

Provide wood saddles or crickets, cant strips, curbs for scuttles and ventilators, and at expansion joints, as indicated, specified, or necessary and of lumber.

3.2.2 Rough Wood Bucks

Size as indicated. Set wood bucks true and plumb. Anchor bucks to concrete or masonry with steel straps extending into the wall 8 inches minimum. Place anchors near the top and bottom of the buck and space uniformly at 2 foot maximum intervals.

3.2.3 Wood Blocking

Provide proper sizes and shapes at proper locations for the installation and attachment of wood and other finish materials, fixtures, equipment, and items indicated or specified.

3.2.4 Temporary Closures

Provide with hinged doors and padlocks and install during construction at exterior doorways and other ground level openings that are not otherwise closed. Cover windows and other unprotected openings with polyethylene or other approved material, stretched on wood frames. Provide dustproof barrier partitions to isolate areas as directed.

3.2.5 Temporary Centering, Bracing, and Shoring

Provide for the support and protection of masonry work during construction as specified in Section 04 20 00. Forms and centering for cast-in-place concrete work are specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.

3.2.6 Sill Plates

Sill plates must be set level and square and anchor bolted at not more than 6 feet on centers and not more than 12 inches from end of each piece. A minimum of two anchors must be used for each piece.

3.3 WASTE MANAGEMENT OF WOOD PRODUCTS

In accordance with the Waste Management Plan and as specified. Separate and reuse scrap sheet materials larger than 2 square feet , framing members larger than 16 inches , and multiple offcuts of any size larger than 12 inches . Clearly separate damaged wood and other scrap lumber for acceptable alternative uses on site, including bracing, blocking, cripples, ties, and shims.

Separate composite wood from other wood types and recycle or reuse. Fold up metal banding, flatten, and recycle.

Separate treated, stained, painted, and contaminated wood and place in designated area for hazardous materials. Dispose of according to local regulations. Do not leave any wood, shavings, sawdust, or other wood waste buried in fill or on the ground, unless for planned future use. Prevent sawdust and wood shavings from entering the storm drainage system. Do not burn scrap lumber that has been pressure treated, or lumber that is less than one year old.

-- End of Section --

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SECTION 06 41 16.00 10

PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS
08/10, CHG 1: 11/18

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A161.2	(1998) Decorative Laminate Countertops, Performance Standards for Fabricated High Pressure

ASTM INTERNATIONAL (ASTM)

ASTM D1037	(2012) Evaluating Properties of Wood-Base Fiber and Particle Panel Materials
ASTM F547	(202) Standard Terminology of Nails for Use with Wood and Wood-Base Materials

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.9	(2020) Cabinet Hardware

COMPOSITE PANEL ASSOCIATION (CPA)

CPA A208.1	(2016) Particleboard

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA LD 3	(2005) Standard for High-Pressure Decorative Laminates

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

UL ENVIRONMENT (ULE)

ULE Greenguard	UL Greenguard Certification Program

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

ANSI/WDMA I.S.1A	(2013) Interior Architectural Wood Flush Doors

WOODWORK INSTITUTE (WI)

NAAWS 3.1	(2017; 2018 Errata Edition) North American Architectural Woodwork Standards

1.2 SYSTEM DESCRIPTION

Work in this section includes laminate clad custom casework cabinets and vanities as shown on the drawings and as described in this specification. This Section includes high-pressure laminate surfacing and cabinet hardware. Comply with EPA requirements in accordance with Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING. Sand smooth and apply a clear finish of polyurethane to all exposed and semi-exposed surfaces, whose finish is not otherwise noted on the drawings or finish schedule.

1.3 SUSTAINABILITY REPORTING

Materials in this technical specification may contribute towards contract compliance with sustainability requirements. See Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING for low-emitting materials recycled content, and rapidly renewable materials HPSB Guiding Principles requirements.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings; G,AE

Shop Drawings

Installation

SD-03 Product Data; G, AE

Wood Materials

Finish Schedule

Certification

SD-04 Samples; G, AE
Plastic Laminates

Cabinet Hardware

SD-07 Certificates; S

Quality Assurance

Laminate Clad Casework

SD-11 Closeout Submittals

Sustainability eNotebook

1.5 QUALITY ASSURANCE

1.5.1 General Requirements

Unless otherwise noted on the drawings, furnish all materials, construction methods, and fabrication conforming to and complying with the custom grade quality standards as outlined in NAAWS 3.1, Section for laminate clad cabinets. These standards apply in lieu of omissions or specific requirements in this specification. Contractors and their personnel engaged in the work must be able to demonstrate successful experience with work of comparable extent, complexity and quality to that shown and specified. Submit a quality control statement which illustrates compliance with and understanding of NAAWS 3.1 requirements, in general, and the specific NAAWS 3.1 requirements provided in this specification. The quality control statement must also certify a minimum of ten years Contractor's experience in laminate clad casework fabrication and construction. Provide a list of a minimum of five successfully completed projects of a similar scope, size, and complexity in the quality control statement.

1.5.2 Sustainable Design Certification

Product must be third party certified in accordance with ULE Greenguard Gold, SCS Scientific Certification Systems Indoor Advantage Gold or equal and meet the requirements of ASHRAE 189.1 Section 8.4.2. Perform certification annually and keep current.

1.6 DELIVERY, STORAGE, AND HANDLING

Casework may be delivered knockdown or fully assembled. Deliver all units to the site in undamaged condition, stored off the ground in fully enclosed areas, and protected from damage. Ventilate the storage area and do not subject to extreme changes in temperature or humidity.

1.7 SEQUENCING AND SCHEDULING

Coordinate work with other trades. Do not install units in any room or space until painting, and ceiling installation are complete within the room where the units are located. Install floor cabinets before finished flooring materials are installed.

PART 2 PRODUCTS

2.1 WOOD MATERIALS

2.1.1 Lumber

a. Provide kiln-dried Grade III framing lumber to dimensions as shown on the drawings. Frame front, where indicated on the drawings, must be nominal 3/4 inch hardwood.

2.1.2 Panel Products

2.1.2.1 Particleboard

Provide industrial grade, medium density (40 to 50 pounds per cubic foot), 3/4 inch thick particleboard. Use a moisture-resistant particleboard in grade Type 2-M-2 or 2-M-3 as the substrate for plastic laminate covered

cabinets at sink areas and other areas subjected to moisture. Provide particleboard meeting the minimum standards listed in ASTM D1037 and CPA A208.1.

2.2 SOLID POLYMER MATERIAL

Provide solid surfacing casework components in conformance to the requirements of Section 06 61 16 SOLID SURFACING FABRICATIONS.

2.3 HIGH PRESSURE DECORATIVE LAMINATE (HPDL)

Provide plastic laminates meeting the requirements of ANSI/NEMA LD 3 and ANSI A161.2 for high-pressure decorative laminates. Indicate design, colors, surface finish and texture, and locations on the drawings per Section 09 06 00 SCHEDULES FOR FINISHES. Submit two samples of each plastic laminate pattern and color. Samples less than 5 by 7 inches in size are not acceptable. Provide plastic laminate types and nominal minimum thicknesses for casework components as indicated in the following paragraphs.

2.3.1 Horizontal General Purpose Standard (HGS) Grade

Provide horizontal general purpose standard grade plastic laminate that is 0.048 inches (plus or minus 0.005 inches) in thickness. This laminate grade is intended for horizontal surfaces where postforming is not required.

2.3.2 Vertical General Purpose Standard (VGS) Grade

Provide vertical general purpose standard grade plastic laminate that is 0.028 inches (plus or minus 0.004 inches) in thickness. This laminate grade is intended for exposed exterior vertical surfaces of casework components where postforming is not required.

2.3.3 Cabinet Liner Standard (CLS) Grade

Provide cabinet liner standard grade plastic laminate that is 0.020 inches in thickness. This laminate grade is intended for light duty semi-exposed interior surfaces of casework components.

2.3.4 Backing Sheet (BK) Grade

Undecorated backing sheet grade laminate is formulated specifically to be used on the backside of plastic laminated panel substrates to enhance dimensional stability of the substrate. Backing sheet thickness must be 0.020 inches. Provide backing sheets for all laminated casework components where plastic laminate finish is applied to only one surface of the component substrate.

2.4 THERMOSET DECORATIVE OVERLAYS (MELAMINE)

Use thermoset decorative overlays (melamine panels) for casework cabinet interior and drawer interior surfaces excluding the shelves.

2.5 EDGE BANDING

Provide PVC vinyl, 0.125 inch thick, edge banding for casework doors and drawer fronts. Material width must be as indicated on the drawings. Color and pattern must match exposed door and drawer front laminate

pattern and color.

2.6 CABINET HARDWARE

Provide hardware conforming to ANSI/BHMA A156.9, unless otherwise noted, and consisting of the following components:

2.6.1 Door Hinges

Provide framless concealed European Style, back mounted hinges with 165 degree opening and a self closing feature when at less than 90 degrees open.

2.6.2 Cabinet Pulls

Provide wire type cabinet and drawer pulls with center-to-center dimension of not less than 3-1/2 inches and a cross sectional diameter of 5/16 inch. Provide handle projections not less than 1-5/16 inches. Finish to be stainless steel.

2.6.3 Drawer Slide

Side mounted with full extension and a minimum 100 pound load capacity, medium-duty. Include a positive stop to avoid accidental drawer removal. Slides to have a self closing/stay closed action, zinc or epoxy coated steel finish, ball bearing rollers.

2.6.4 Adjustable Shelf Support System

Recessed (mortised) metal standards, BHMA No. BO4071, finish: zinc plated steel. Support clips for the standards must be open type, BHMA No. B04091.

2.7 FASTENERS

Provide nails, screws, and other suitable fasteners that are the size and type best suited for the purpose and conforming to ASTM F547 where applicable.

2.8 ADHESIVES, CAULKS, AND SEALANTS

2.8.1 Adhesives

Use formula and type of adhesives recommended by AWI. Select adhesives for their ability to provide a durable, permanent bond and take into consideration such factors as materials to be bonded, expansion and contraction, bond strength, fire rating, and moisture resistance. Meet local regulations regarding VOC emissions and off-gassing.

2.8.1.1 Wood Joinery

Use Type II for interior use polyvinyl acetate resin emulsion adhesives to bond wood members. Adhesives must withstand a bond test as described in ANSI/WDMA I.S.1A and low emitting materials requirements as required in the HPSB Guiding Principles.

2.8.1.2 Laminate Adhesive

Adhesive used to join high-pressure decorative laminate to wood must be adhesive consistent with AWI and laminate manufacturer's recommendations

and low emitting materials requirements as required in the HPSB Guiding Principles. Adhere PVC edgebanding using a polymer-based hot melt glue.

2.8.2 Caulk

Use clear, 100 percent silicone caulk to fill voids and joints between laminated components and between laminated components and adjacent surfaces.

2.8.3 Sealant

Use sealant recommended by the substrate manufacturer to provide a moisture barrier at sink cutouts and all other locations where unfinished substrate edges may be subjected to moisture.

2.9 ACCESSORIES

2.10 FABRICATION

Verify field measurements as indicated in the shop drawings before fabrication. Accomplish fabrication and assembly of components at the shop site to the maximum extent possible. Meet or exceed the requirements for AWI custom grade unless otherwise indicated in this specification. Make cabinet style, in accordance with NAAWS 3.1, Section 400-G descriptions, flush overlay.

2.10.1 Base and Wall Cabinet Case Body

2.10.1.1 Cabinet Components

Use frame members that are glued-together, kiln-dried hardwood lumber. Brace top corners, bottom corners, and cabinet bottoms with either hardwood blocks or water-resistant glue and nailed in place metal or plastic corner braces. Construct cabinet components from the following materials and thicknesses:

2.10.1.1.1 Body Members (Ends, Divisions, Bottoms, and Tops)

3/4 inch particleboard panel product

2.10.1.1.2 Face Frames and Rails

3/4 inch hardwood lumber

2.10.1.1.3 Shelving

3/4 inch particleboard panel product

2.10.1.1.4 Cabinet Backs

1/4 inch particleboard panel product

2.10.1.1.5 Drawer Sides, Backs, and Subfronts

1/2 inch panel product

2.10.1.1.6 Drawer Bottoms

1/4 inch particleboard panel product

2.10.1.1.7 Door and Drawer Fronts

3/4-inch particleboard panel product

2.10.1.2 Joinery Method for Case Body Members

2.10.1.2.1 Tops, Exposed Ends, and Bottoms

a. Steel "European" assembly screws (1-1/2 inch from end, 5 inch on center, fasteners will not be visible on exposed parts).

b. Doweled, glued under pressure (approx. 4 dowels per 12 inches of joint).

c. Stop dado, glued under pressure, and either nailed, stapled or screwed (fasteners will not be visible on exposed parts).

d. Spline or biscuit, glued under pressure.

2.10.1.2.2 Exposed End Corner and Face Frame Attachment

2.10.1.2.2.1 Mitered Joint

Lock miter or spline or biscuit, glued under pressure (no visible fasteners)

2.10.1.2.2.2 Non-Mitered Joint (90 degree)

Butt joint glued under pressure (no visible fasteners)

2.10.1.2.2.3 Butt Joint

Glued and nailed

2.10.1.2.3 Cabinet Backs (Wall Hung Cabinets)

Wall hung cabinet backs must not be relied upon to support the full weight of the cabinet and its anticipated load for hanging/mounting purposes. Method of back joinery and hanging/mounting mechanisms should transfer the load to case body members. Use the following fabrication method:

2.10.1.2.3.1 Full Bound

Full bound, captured in grooves on cabinet sides, top, and bottom. Cabinet backs for floor standing cabinets must be side bound, captured in grooves; glued and fastened to top and bottom.

2.10.1.2.4 Wall Anchor Strips

Wall Anchor Strips are required for all cabinets with backs less than 1/2 inch thick. Use strips consisting of minimum 1/2 inch thick lumber, minimum 2-1/2 inches width; securely attache to wall side of cabinet back - top and bottom for wall hung cabinets, top only for floor standing cabinets.

2.10.2 Cabinet Floor Base

Mount floor cabinets on a base constructed of nominal 2 inch thick lumber.

Provide base assembly components that are treated lumber a moisture-resistant panel product. Make finished height for each cabinet base no less than the full height of the installed, specified wall base. Make bottom edge of the cabinet door or drawer face flush with top of base.

2.10.3 Cabinet Door and Drawer Fronts

Fabricate door and drawer fronts from 3/4 inch medium density particleboard. Surface all door and drawer front edges with PVC edgebanding, color and pattern to match exterior face laminate.

2.10.4 Drawer Assembly

2.10.4.1 Drawer Components

Provide drawer components consisting of a removable drawer front, sides, backs, and bottom. Construct drawer components of the following materials and thicknesses:

2.10.4.1.1 Drawer Sides and Back For Thermoset Decorative Overlay (Melamine) Finish

1/2 inch thick medium density particleboard or MDF fiberboard substrate

2.10.4.1.2 Drawer Bottom

1/4 inch thick thermoset decorative overlay melamine panel product

2.10.4.2 Drawer Assembly Joinery Method

a. Multiple dovetail (all corners) or French dovetail front/dadoed back, glued under pressure.

2.10.5 Shelving

2.10.5.1 General Requirements

Fabricate shelving from 3/4 inch medium density particleboard. Finish all shelving top and bottom surfaces with HPDL plastic laminate. Finish shelf edges in a HPDL plastic laminate.

2.10.5.2 Shelf Support System

The shelf support system is as follows:

2.10.5.2.1 Recessed (Mortised) Metal Shelf Standards

Mortise standards flush with the finishes surface of the cabinet interior side walls, two per side. Position and space standards on the side walls to provide a stable shelf surface that eliminates tipping when shelf front is weighted. Install and adjust standards vertically to provide a level, stable shelf surface when clips are in place.

2.10.6 Laminate Application

Apply laminate to substrates following the recommended procedures and instructions of the laminate manufacturer and ANSI/NEMA LD 3, using tools and devices specifically designed for laminate fabrication and

application. Provide a balanced backer sheet (Grade BK) wherever only one surface of the component substrate requires a plastic laminate finish. Apply required grade of laminate in full uninterrupted sheets consistent with manufactured sizes using one piece for full length only, using adhesives specified herein or as recommended by the manufacturer. Fit corners and joints hairline. Machined flush, file, sand, or buff all laminate edges to remove machine marks and ease (sharp corners removed). Clean up at easing must be such that no overlap of the member eased is visible. Perform fabrication in conformance to ANSI A161.2. Provide laminate types and grades for component surfaces as follows unless otherwise indicated on the drawings:

2.10.6.1 Base/Wall Cabinet Case Body

a. Exterior (exposed) surfaces to include exposed and semi-exposed face frame surfaces: HPDL Grade VGS.

b. Interior (semi-exposed) surfaces to include interior back wall, bottom, and side walls: Thermoset Decorative Overlay (melamine).

2.10.6.2 Adjustable Shelving

2.10.6.2.1 Top and Bottom Surfaces

HPDL Grade HGS

2.10.6.2.2 All Edges

HPDL Grade VGS

2.10.6.3 Door, Drawer Fronts, Access Panels

2.10.6.3.1 Exterior (Exposed) and Interior (Semi-Exposed) Faces

HPDL Grade VGS

2.10.6.3.2 Edges

PVC edgebanding

2.10.6.4 Drawer Assembly

All interior and exterior surfaces: Thermoset Decorative Overlay (melamine).

2.10.6.5 Tolerances

Meet the NAAWS 3.1 custom grade requirements for flushness, flatness, and joint tolerances of laminated surfaces.

2.10.7 Finishing

2.10.7.1 Filling

Do not expose fasteners on laminated surfaces. Make all nails, screws, and other fasteners in non-laminated cabinet components countersunk and fill the holes with wood filler consistent in color with the wood species.

2.10.7.2 Sanding

Prepare all surfaces requiring coatings by sanding with a grit and in a manner that scratches will not show in the final system.

PART 3 EXECUTION

3.1 INSTALLATION

Installation must comply with applicable requirements for NAAWS 3.1 custom quality standards. Install countertops and fabricated assemblies level, plumb, and true to line, in locations shown on the drawings. Attach and securely anchor cabinets and other laminate clad casework assemblies to the floor and walls with mechanical fasteners that are appropriate for the wall and floor construction.

3.1.1 Anchoring Systems

3.1.1.1 Floor

Utilize a floor anchoring system for base cabinets. Anchoring and mechanical fasteners must not be visible from the finished side of the casework assembly. Attach cabinet assemblies to anchored bases without visible fasteners. Where assembly abuts a wall surface, include a minimum 1/2 inch thick lumber or panel product hanging strip, minimum 2-1/2 inch width; securely attached to the top of the wall side of the cabinet back.

3.1.1.2 Wall

Utilize minimum 1/2 inch thick lumber or panel product hanging strips, minimum 2-1/2 inch width to wall mount cabinet and vanity; securely attach to the wall side of the cabinet back, both top and bottom.

3.1.2 Hardware

Install casework hardware in types and locations as indicated on the drawings. Where fully concealed European-style hinges are specified to be used with particleboard or fiberboard doors, use plastic or synthetic insertion dowels to receive 3/16 inch "Euroscrews". The use of wood screws without insertion dowels is prohibited.

3.1.3 Doors, Drawers and Removable Panels

Accomplish the fitting of doors, drawers and removable panels within target fitting tolerances for gaps and flushness in accordance with NAAWS 3.1 custom grade requirements.

3.1.4 Plumbing Fixtures

Install sinks, sink hardware, and other plumbing fixtures in locations as indicated on the drawings and in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.

-- End of Section --

SECTION 06 61 16

SOLID SURFACING FABRICATIONS
08/20

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM D570	(1998; E 2010; R 2010) Standard Test Method for Water Absorption of Plastics
ASTM D638	(2014) Standard Test Method for Tensile Properties of Plastics
ASTM D696	(2016) Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C With a Vitreous Silica Dilatometer
ASTM D790	(2017) Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D2583	(2013a) Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM G21	(2015; R 2021; E 2021) Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

INTERNATIONAL CAST POLYMER ASSOCIATION (ICPA)

ICPA SS-1	(2001) Performance Standard for Solid Surface Materials

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA LD 3	(2005) Standard for High-Pressure Decorative Laminates

NSF INTERNATIONAL (NSF)

NSF/ANSI 51	(2023) Food Equipment Materials

1.2 SYSTEM DESCRIPTION

a. Work under this section includes window sills and countertops and other items utilizing solid surfacing material fabrications as indicated on the drawings and as described in this specification. Do not change source of supply for materials after work has started, if the appearance of finished work would be affected.

b. In most instances, installation of solid surfacing material fabricated components and assemblies requires strong correctly located structural support provided by other trades. To provide a stable, sound, secure installation, close coordination is required between the solid surfacing material fabricator/installer and other trades to ensure that necessary structural wall support, cabinet counter top structural support, proper clearances, and other supporting components are provided for the installation of wall panels, counter tops, shelving, and all other solid surfacing material fabrications to the degree and extent recommended by the solid surfacing material manufacturer.

c. Provide appropriate staging areas for solid surfacing material fabrications. Allow variation in component size and location of openings of plus or minus 1/8 inch.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings G, AE

Installation; G

SD-03 Product DataG, AE

Solid Polymer; G

Indoor air quality for solid surface seam and sealant products; S

SD-04 Samples

Material; G, AE

Counter Tops; G, AE

SD-07 Certificates

Qualifications; G
Indoor Air Quality for solid surface fabrication products; S

SD-10 Operation and Maintenance Data; G

1.4 QUALITY ASSURANCE

1.4.1 Qualifications

To ensure warranty coverage, provide manufacturer certified solid surfacing fabricators to fabricate the solid surfacing material being utilized. Mark all fabrications with the fabricator's certification label affixed in an inconspicuous location. Minimum of 5 years of experience working with solid surfacing materials is required of fabricators. Submit solid surfacing material manufacturer's certification attesting to fabricator qualification approval.

1.5 DELIVERY, STORAGE, AND HANDLING

Do not deliver materials to project site until areas are ready for installation. Deliver components and materials to the site undamaged, in containers clearly marked and labeled with manufacturer's name. Store materials indoors and take adequate precautions to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation, for duration of project.

1.6 WARRANTY

Provide manufacturer's warranty to repair or replace defective materials, excluding damages caused by physical or chemical abuse or excessive heat, and workmanship for a period of 10 years from date of final acceptance of the work.

PART 2 PRODUCTS

2.1 MATERIAL

Submit detail fabrication drawings and installation drawings of each solid surfacing fabrication indicated. Include elevations, dimensions, clearances, details of construction and anchorage, and details of joints and connections.

Submit manufacturers' descriptive product data for each type of solid polymer fabrication indicated. Include manufacturers' literature, finishes, profiles and thicknesses of materials.

Submit manufacturers' operations and maintenance data for each type of solid polymer fabrication in accordance with Section 01 78 23 OPERATIONS AND MAINTENANCE DATA.

2.1.1 Solid Surfacing MaterialProvide solid polymer that is a homogeneous filled solid polymer; not coated, laminated or of a composite construction, complying with ICPA SS-1. Provide material that meets or exceeds the minimum physical and performance properties specified. Superficial damage to a depth of 0.01 inch must be repairable by sanding or polishing. Material thickness is as indicated below; required minimum thickness is 1/4 inch. Submit a minimum 4 inch by 4 inch sample of each color and pattern for approval; include full range of color and pattern variation. Retain approved samples as a standard for this work. Submit test report results from an independent testing laboratory attesting that

the submitted solid surfacing materials meet or exceed each of the specified performance requirements.

a. Horizontal Surfaces: 1/2 inch thick material

b. Provide materials that meet the emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type). Provide certification or validation of indoor air quality for solid surface fabrication products.2.1.2 Cast, 100 Percent Acrylic Polymer Solid Surfacing Material

Cast, 100 percent acrylic solid polymer material composed of acrylic polymer, mineral fillers, and pigments. Provide acrylic polymer that meets or exceeds the following minimum performance requirements:

PROPERTY	REQUIREMENT (min. or max.)	TEST PROCEDURE
Tensile Strength	4000 psi (max.)	ASTM D638
Hardness	55-Barcol Impressor (min.)	ASTM D2583
Thermal Expansion	.000023 in/in/F (max.)	ASTM D696
Boiling Water Surface Resistance	No Change	ANSI/NEMA LD 3-3.05
High Temperature Resistance	No Change	ANSI/NEMA LD 3-3.06
Impact Resistance (Ball drop)		ANSI/NEMA LD 3-303
1/4 inch sheet	36-inches, 1/2 lb ball, no failure	
1/2 inch sheet	140-inches, 1/2 lb ball, no failure	
3/4 inch sheet	200-inches, 1/2 lb ball, no failure	
Mold & Mildew Growth	No growth	ASTM G21
Bacteria Growth	No growth	ASTM G21
Liquid Absorption (Weight in 24 hrs.)	0.1 percent max.	ASTM D570
Flammability		ASTM E84
Flame Spread	25 max.	
Smoke Developed	30 max.	
Sanitation	"Food Contact" approval	NSF/ANSI 51

PROPERTY	REQUIREMENT (min. or max.)	TEST PROCEDURE
Flexural Strength	10,000 psi (min.)	ASTM D790

2.1.3 Material Patterns and Colors

Provide pattern and color for all solid surfacing material components and fabrications as specified in Section 09 06 00 SCHEDULES FOR FINISHES. Provide products with consistent patterned color throughout thickness of the product.

2.1.4 Surface Finish

Provide a uniform appearance on exposed finished surfaces and edges. Exposed surface finish is matte; gloss rating of 5-20.

2.2 ACCESSORY PRODUCTS

Provide accessory products, as specified below, as manufactured by the solid surfacing material manufacturer or as approved by the solid surfacing material manufacturer for use with the solid surfacing materials being specified.

2.2.1 Adhesives

Provide a two-part seam adhesive kit to create permanent, inconspicuous, non-porous, hard seams and joints by chemical bond between solid surfacing materials and components to create a monolithic appearance of the fabrication. Provide adhesive approved by the solid surfacing material manufacturer. Color-match adhesive to the surfaces being bonded where solid-colored, solid surfacing materials are being bonded together. Provide clear or color matched seam adhesive where particulate patterned, solid surfacing materials are being bonded together.

2.2.2 Seam and Sealant Emissions

Provide seam and other accessory materials that meet the emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type). Provide validation of indoor air quality for solid surface seam and sealant products.

2.2.3 Silicone Sealant

Provide silicone sealant, mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, acid-curing; ASTM C920, Type S, Grade NS, Class 25, Use NT; clear formulation; approved for use by the solid surfacing material manufacturer.

2.2.4 Mounting Hardware

Provide mounting hardware, including sink/bowl clips, inserts and fasteners for attachment of undermount sinks and lavatories.

2.3 FABRICATIONS

Provide factory or shop fabricate components to sizes and shapes indicated, to the greatest extent practical, in accordance with approved Shop Drawings and manufacturer's requirements. Provide factory cutouts for sinks, lavatories, and plumbing fixtures where indicated on the drawings. Contours and radii must be routed to template, with edges smooth. Defective and inaccurate work will be rejected. Submit product data indicating product description, fabrication information, and compliance with specified performance requirements for solid surfacing material, joint adhesive, sealants, and heat reflective tape. Both the manufacturer of materials and the fabricator are required to submit a detailed description of operations and processes in place that support efficient use of natural resources, energy efficiency, emissions of ozone depleting chemicals, management of water and operational waste, indoor environmental quality, and other production techniques supporting sustainable design and products.

2.3.1 Joints and Seams

Form joints and seams between solid surfacing material components using manufacturer's approved seam adhesive. Provide inconspicuous joints in appearance without voids to create a monolithic appearance.

2.3.2 Edge Finishing

Rout and finish component edges to a smooth, uniform appearance and finish. Provide edge shapes and treatments, including any inserts, as detailed on the drawings. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.

2.3.3 Counter Top Splashes

Fabricate backsplashes and end splashes from 1/2 inch thick solid surfacing material to be 4 inches high. Provide backsplashes and end splashes at locations indicated. Shop fabricate backsplashes and provide loose, to be field attached.

2.3.3.1 End Splashes

Provide end splashes loose for installation at the jobsite after horizontal surfaces to which they are to be attached have been installed.

2.3.4 Window Stools

Fabricate window stools from 1/2 inch thick solid surfacing material; dimensions, edge shape, and other details as indicated . Provide eased edge profile.

2.3.5 Counter Tops

Fabricate all solid surfacing material, counter top components from 1/2 inch thick material. Indicate details, dimensions, locations, and quantities on the drawings. Attach 2 inch wide reinforcing strip of solid surfacing material under each horizontal counter top seam. Submit a minimum 1 foot wide by 6 inch deep, full size sample for each type of counter top shown on the project drawings. Retain approved sample as standard for this work. Provide square eased edge profile.

2.3.5.1 Counter Tops with Sinks

a. Provide stainless steel sink; include cutouts to template for counter tops with sinks as furnished by the sink manufacturer. Provide manufacturer's standard sink mounting hardware for stainless steel under-mount installation. Seal between sink and counter top with specified silicone sealant. Provide sink, faucet, and plumbing requirements in accordance with Section 22 00 00 PLUMBING,GENERAL PURPOSE.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Components

Install all components and fabricated units plumb, level, and rigid. Make field joints between solid surfacing material components using solid surfacing material manufacturer's approved seam adhesives, to provide a monolithic appearance with joints inconspicuous in the finished work. Attach metal sinks and lavatory bowls to counter tops using solid surfacing material manufacturer's recommended clear silicone sealant and mounting hardware.

3.1.1.1 Loose Counter Top Splashes

Mount loose splashes in the locations noted on the drawings. Adhere loose splashes to the counter top with a color matched silicone sealant when the solid surfacing material components are solid colors. Use a clear silicone sealant to provide adhesion of particulate patterned solid surfacing material splashes to counter tops.

3.1.2 Silicone Sealant

Use specified silicone sealant to seal all expansion joints between solid surfacing material components and all joints between solid surfacing material components and other adjacent surfaces such as walls, floors, ceiling, and plumbing fixtures. Provide sealant bead smooth and uniform in appearance and minimum size necessary to bridge any gaps between the solid surfacing material and the adjacent surface. Provide continuous bead and run the entire length of the joint being sealed.

3.1.3 Plumbing

Make plumbing connections to sinks and lavatories in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.

3.2 CLEAN-UP

Components must be cleaned after installation and covered to protect against damage during completion of the remaining project items. Damaged components must be repaired or replaced at the Contractor's sole expense.

-- End of Section --

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SECTION 07 05 23

PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS
05/14

PART 1 GENERAL

1.1 SUMMARY

Employ an independent agency to conduct the pressure test on the building envelope in accordance with this specification section and ASTM E779.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referenced within the text by the basic designation only.

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ANSI/ASNT CP-189	(2020) ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel
ASNT CP-105	(2011) ASNT Standard Topical Outlines for Qualification of Nondestructive Testing Personnel - Item No. 2821
ASNT SNT-TC-1A	(2020) Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE RP-935	(1998) Protocol for Field Testing of Tall Buildings to Determine Envelope Air Leakage Rate

ASTM INTERNATIONAL (ASTM)

ASTM D3464	(1996; R 2014) Standard Test Method for Average Velocity in a Duct Using a Thermal Anemometer
ASTM E1186	(2022) Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems
ASTM E1827	(2022) Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door
ASTM E2029	(2011) Standard Test Method for Volumetric and Mass Flow Rate Measurement in a Duct Using Tracer Gas Dilution

ASTM E779	(2019) Standard Test Method for Determining Air Leakage Rate by Fan Pressurization

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 6781	(1983) Thermal Insulation - Qualitative Detection of Thermal Irregularities in Building Envelopes - Infrared Method

1.3 DEFINITIONS

The following terms as they apply to this section:

1.3.1 Air Barrier Envelope

The surface that separates the inside air from the outside air. The combination of air barrier assemblies and air barrier components, connected by air barrier accessories are designed to provide a continuous barrier to the movement of air through an environmental separator. A single building may have more than one air barrier envelope. The air barrier surface includes the top, bottom, and sides of the envelope. The term "air barrier envelope" is also known as "air barrier system" or simply "air barrier".

1.3.2 Air Leakage Rate

How leaky, or conversely how air tight a building envelope is. The air leakage is normally described in terms of air flow rate for the surface area of the envelope at a defined differential pressure.

1.3.3 Bias Pressure

Also known as zero flow pressure, baseline pressure, offset pressure or background pressure. With the envelope not artificially pressurized, bias is the differential pressure that always exists between the envelope that has been prepared (sealed) for the pressure test and the outdoors. Bias pressure is made up of two components, fixed static offset (usually due to stack effect or the HVAC system) and fluctuating pressure (usually due to wind or a moving elevator). Because of pressure fluctuations many bias pressure readings are recorded and averaged for use in the calculations.

1.3.4 Blower Door

Commonly used term for an apparatus used to pressurize and depressurize the space within the building envelope and quantify air leakage through the envelope. The blower door typically includes a door fan and an air resistant fabric or a series of hard panels that extends to cover and seal the door opening between the fan shroud and door frame. The door fan is a calibrated fan capable of measuring air flow and is usually placed in the opening of an exterior door. With the air barrier otherwise sealed, air produced by the door fan pressurizes or de-pressurizes the envelope, depending on the fan's orientation.

1.3.5 Environmental Separator

The parts of a building that separate the controlled interior environment from the uncontrolled exterior environment, or that separate spaces within a building that have dissimilar environments. The term "environmental

separator" is also known as the "control layer".

1.3.6 Pressure Test

A generic term for a test in which the envelope is either pressurized or de-pressurized with respect to the outdoors.

1.3.6.1 Negative Pressure Test (Depressurization Test)

A test wherein air inside the envelope is drawn to the outdoors. This places the envelope at a lower (negative) pressure with respect to the outdoors.

1.3.6.2 Positive Pressure Test (Pressurization Test)

A test wherein outdoor air is pushed into the envelope. This air movement places the envelope at a higher (positive) pressure with respect to the outdoors.

1.4 WORK PLAN

Submit the following not later than 120 calendar days after contract award, but before start of pressure testing work, steps to be taken by the lead pressure test technician to accomplish the required testing.

a. Memorandum of test procedure.

(1) Proposed dates for conducting the pressure, thermographic and fog tests.

(2) Submit detailed pressure test procedures prior to the test. Provide a plan view showing proposed locations (personnel doors or other similar openings) to install blower doors or flexible ducts (for trailer-mounted fans), if used.

b. Test equipment to be used.

c. Scaffolding, scissor lifts, power, electrical extension cords, duct tape, plastic sheeting and other Contractor's support equipment required to perform all tests.

d. Other Contractor's support personnel who will be on site for testing.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" classification. submittals not having a "G" classification are Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Work Plan; G

SD-03 Product Data

Thermal Imaging Camera; G

SD-05 Design Data

Envelope Surface Area Calculations; G

SD-07 Certificates

Pressure Test Agency
Thermographer Qualifications
Test Instruments
Date Of Last Calibration

SD-06 Test Reports

Pressure Test Procedures; G
Air Leakage Test Report; G
Diagnostic Test Report; G

No later than 14 days after completion of the pressure test, submit 6 copies of an organized report bound in a durable 3-ring binder. The report is to contain a table of contents, an executive summary, an introduction, a results section and a discussion of the results. Submit the Air Leakage Test Report as described in paragraph AIR LEAKAGE TEST REPORT. Submit a diagnostic test report as described in paragraph LOCATING LEAKS BY DIAGNOSTIC TESTING. The diagnostic test report is to include the Thermographic Investigation Report and the Fog Test Report (if performed).

Submit field data and completed report forms found in the appendices. Use the sample forms, Test Agency Qualification Sheet, Air Leakage Test Form and Air Leakage Test Results Form to summarize the tests for the appropriate building envelope. Submit both electronically populated and field hand filled-in forms.

Report Data. Include in the report the following information for all tests:

a. Date of Issue
b. Project title and number
c. Name, address, and telephone number of testing agency
d. Dates and locations of samples and tests or inspections
e. Names of individuals making the inspection or test
f. Designation of the work and test method
g. Identification of product and Specification Section
h. Complete inspection or test data
i. Test results and an interpretation of test results
j. Comments or professional opinion on whether inspected or tested work complies with contract document requirements
k. Recommendations on retesting

1.6 QUALITY ASSURANCE

1.6.1 Modification of References

Perform all pressure and diagnostic tests according to the referenced publications listed in paragraph REFERENCES and as modified by this section. Consider the advisory or recommended provisions, of the referred references, as mandatory.

1.6.2 Qualifications

1.6.2.1 Pressure Test Agency

Submit, no later than 15 calendar days after contract award, information certifying that the pressure test agency is not affiliated with any other company participating in work on this contract. The work of the test agency is limited to pressure testing the building envelope, performing a thermography test and fog test, and investigating, through various methods, the location of air leaks through the air barrier. See paragraph PRESSURE TEST AGENCY for additional requirements. For thermographer qualifications, see paragraph THERMOGRAPHER QUALIFICATIONS.

Use the sample TEST AGENCY QUALIFICATIONS SHEET form (Appendix C), to submit the following information.

a. Verification of 2 years of experience as an agency in pressure testing commercial and/or industrial buildings.

b. List of at least ten commercial/industrial facilities with building envelopes that the agency has tested within the past 2 years. Include building name, address, and name of prime construction contractor and contractor's point-of-contact information.

c. Confirmation of 2 years of commercial and or industrial building pressure test experience for the lead pressure test technician and the thermographer in using the specified ASTM E779 testing standard. References from five Contracting Officers for facilities where the lead test technician has supervised commercial and or industrial building pressure tests in the last 2 years.

d. Verification that the lead pressure test technician has been employed by a building pressure testing agency in the capacity of a lead pressure test technician for not less than 1 year.

1.6.2.2 Thermographer Qualifications

To perform an infrared diagnostic evaluation, use a lead thermographer who has at least an active Level II Certification that is based on the requirements in ASNT CP-105 or ANSI/ASNT CP-189 and is in accordance with ASNT SNT-TC-1A. The course of study is to be specifically focused on infrared thermography for building science. The thermographer must have at least two years of building science thermography experience in IR testing commercial or industrial buildings. The thermographer must also have experience in building envelopes and building science in order to make effective recommendations to the contractor should the envelope require additional sealing. Submit the thermographer's certificate for approval. Submit a list of at least ten commercial/industrial buildings on which the thermographer has performed IR thermography in the past two years. The thermographer is to have a current active certification. Submit certification at least 60 days prior to thermography testing.

1.6.3 Test Instruments And Date Of Last Calibration

Submit a signed and dated list of test instruments, their application, manufacturer, model, serial number, range of operation, accuracy and date of most recent calibration.

1.7 CLIMATE CONDITIONS SUITABLE FOR A PRESSURE TEST

As the test date approaches, monitor the weather forecast for the test site. Avoid testing on days forecast to experience high winds, rain, or snow. Monitor weather forecasts prior to shipping pressure test equipment to the site. Preferred ambient weather test conditions as stated in ASTM E779 are 0 to 4 mph winds and an ambient temperature range of 41 - 95 degrees F. Based on current and forecast weather conditions, the Contracting Officer's representative is to grant final approval for testing to occur.

1.7.1 Rain

Rain can temporarily seal roof and wall assemblies so that they leak less than under no-rain conditions. Do not test during rain or if rain is anticipated during testing. If pneumatic hoses are installed and exposed to rain inspect the hose to insure rainwater has not migrated into the hose ends. Orient all exposed hose ends to keep them out of water puddles. Success in temporarily sealing outdoor ventilation components such as louvers and exhaust fans may also be compromised by rain. Don't seal roof-mounted ventilation components during times of potential lightning.

1.7.2 Snow

Snow piled against a wall or on top of a roof can make a building envelope appear to be more airtight than it actually is. Snow may also impact thermography readings. Remove snow from around and on top of the building prior to testing.

1.7.3 Wind

Because wind can skew pressure test results, test only on days and at times when winds are anticipated to be the calmest. Avoid pressure testing during gusty or high wind conditions.

PART 2 PRODUCTS

2.1 PRESSURE TEST EQUIPMENT

Depending on site conditions and size of the envelope, the test may be conducted using blower door equipment and/or trailer-mounted fans or the building's own supply air system. The testing agency is to supply sufficient quantity of blower equipment that will produce a minimum of 75 Pa differential pressure between the envelope and outdoors using the test methods described herein. Supplying additional blower test equipment to provide additional airflow capacity or to act as a backup is highly recommended.

2.1.1 Blower Door Fans and Trailer Mounted Fans

Each air flow measuring system including blower door fans and trailer mounted fans are to be calibrated within the last 3 years in accordance with ASTM E1827. Calibrated blower door fans and trailer mounted fans must measure accurately to within plus or minus 5 percent of the flow reading. Blower door equipment and trailer mounted fans are to be specifically designed to pressurize building envelopes. Each set of blower door equipment is to include fan(s), digital gage(s), door frame, door fabric or hard panels.

2.1.2 Digital Gages as Test Instruments

Use only digital gages as measuring instruments in the pressure test; analog gages are not acceptable. The gauges must be accurate to within 1.0 percent of the pressure reading or 0.15 Pa, whichever is greater. Each gage is to have been calibrated within two years of the test. The calibration is to be checked against a National Institute of Standards and Technology (NIST, formerly National Bureau of Standards) traceable standard.

2.2 THERMAL IMAGING CAMERA REQUIREMENTS

The thermal imaging camera used in the thermography test must have a thermal sensitivity (Noise Equivalent Temperature Difference.) of +/- 0.18 degrees F at 86 degrees F or less. Ensure the camera's operating spectral range falls between 2 and 15 micrometers. Ensure the camera's IR image viewing screen resolution measures at least 240x180 pixels. Ensure the camera has a means of recording thermal images seen on the camera viewing screen. The camera is to display output as individual still frame images that also can be downloaded and inserted into an electronic Thermographic Investigation Report. Submit camera make and model, and catalog information that defines the camera thermal sensitivity for approval.

PART 3 EXECUTION

3.1 PRESSURE TEST AGENCY

The test agency is to be an independent third party subcontractor, not an affiliated or subsidiary of the prime contractor, subcontractors or A/E firm. The agency is to be regularly engaged in pressure testing of commercial/industrial building envelopes. If using blower door or trailer-mounted fans, the lead test technician must have at least two years of experience in using such equipment in building envelope pressurization tests. Formal training using pressure test equipment is highly recommended. Technicians using the building's air handling system for pressure testing are to have tested at least five commercial/industrial buildings within the past two years with each building having over 50,000 square feet of floor area. Submit the name, address and floor areas of each of these five buildings for approval.

3.1.1 Field Work

The lead pressure test technician and thermographer are to be present at the project site while testing is performed and is to be responsible for conducting, supervising, and managing of their respective test work. Management includes health and safety of test agency employees.

3.1.2 Reporting Work

The lead pressure test technician is to prepare, sign, and date the test agenda, equipment list, and submit a certified Air Leakage Test Report. The thermographer is to prepare, sign, and date the test agenda, equipment list, and submit a certified Thermographic Investigation Report. The contractor is to prepare a final report that identifies improvements that were made to the envelope to reduce leaks , eliminate moisture migration, discovered during diagnostic tests. Jointly submit all reports.

3.2 ENVELOPE SURFACE AREA CALCULATION

The architectural air barrier boundary includes the floor, walls, and ceiling. After construction of the air barrier envelope is complete, field measure the envelope to ensure the physical measurements match the design drawings and the air barrier envelope surface area calculations. If the measurements are not consistent with the defined air barrier boundary as indicated, re-calculate the envelope surface area and submit the envelope surface area calculation and results for review. If the air barrier was defined during design but the air barrier envelope surface area s have changed, calculate the changed areas during construction and submit the envelope surface area calculations and result for review.

3.3 PREPARING THE BUILDING ENVELOPE FOR THE PRESSURE TEST

3.3.1 Testing During Construction

The pressure test cannot be conducted until all components of the air barrier system have been installed. After all sealing as described herein has been completed, inspect the envelope to ensure it has been adequately prepared. During the pressure test, stop all ongoing construction within and neighboring the envelope which may impact the test or the air barrier integrity. The pressure test may be conducted before finishes that are not part of the air barrier envelope have been installed. For example, if suspended ceiling tile, interior gypsum board or cladding systems are not part of the air barrier the test can be conducted before they are installed. Recommend testing prior to installing the finished ceilings within the envelope and immediately surrounding it. The absence of finished ceilings allows for inspection and diagnostic testing of the roof/wall interface and for implementation of repairs to the air barrier, if necessary to comply with the maximum allowed leakage.

3.3.2 Sealing The Air Barrier Envelope

Seal all penetrations through the air barrier. Unavoidable penetrations due to electrical boxes or conduit, plumbing, and other assemblies that are not air tight are to be made so by sealing the assembly and the interface between the assembly and the air barrier or by extending the air barrier over the assembly. Support the air barrier so as to withstand the maximum positive and negative air pressure to be placed on the building without displacement or damage, and transfer the load to the structure. Durably construct the air barrier to last the anticipated service life of the assembly and to withstand the maximum positive and negative pressures placed on it during pressure testing. Do not install lighting fixtures that are equipped with ventilation holes through the air barrier.

3.3.3 Sealing Plumbing

Prime all plumbing traps located within the envelope full of water.

3.3.4 Close and Lock Doors

Close and lock all doors and windows in the envelope perimeter. For doors not equipped with latching hardware, temporarily secure them in the closed position. Secure the doors in such a way that they remain fully closed even when the maximum anticipated differential air pressure produced during the test acts on them.

3.3.5 Hold Excluded Building Areas at the Outdoor Pressure Level

Keep building areas immediately surrounding but excluded from the test envelope at the outdoor pressure level during the pressure test. Maintain these areas at the outdoor pressure level by propping exterior doors open, opening windows and de-energizing all air moving devices in or serving these areas.

3.3.6 Maintain an Even Pressure within the Envelope

Ensure the pressure differences within the envelope are minimized by opening all internal air pathways including propping open all interior doors. Distribute test fans throughout the envelope as necessary to ensure the internal pressures are uniform (within 10 percent of the average differential pressure). Ideally, do not install suspended ceilings until after all pressure tests have been completed. If, however the envelope includes finished suspended ceiling spaces, temporarily remove approximately 5 percent of all ceiling tiles or a minimum of 1 tile from each isolated suspended ceiling space, whichever comprises the greatest surface area. Temporarily remove additional ceiling tiles during testing to allow for inspection and diagnostic testing of the ceiling/wall interface.

3.3.7 Maintain Access to Mechanical and Electrical Rooms

Maintain access to mechanical rooms and electrical rooms associated with the envelope to allow for de-energizing ventilation equipment and resetting circuit breakers tripped by blower door equipment, if used.

3.3.8 Minimize Potential for Blowing Dust and Debris

Because high velocity air will be blown into and out of the envelope during the test, debris, including dust and litter, may become airborne. Airborne debris may become trapped or entangled in test equipment, thereby skewing test results. Ensure areas within and surrounding the envelope are free of dust, litter and construction materials that are easily airborne. If pressurizing existing, occupied areas, provide adequate notice to building occupants of blowing dust and debris, and general disruption of normal activities during the test.

3.3.9 De-energize Air Moving Devices

De-energize all air moving devices serving the envelope to keep air within the envelope as still as reasonably achievable. De-energize all fans that deliver air to, exhaust air from, or recirculate air within the envelope. Also de-energize all fans serving areas adjacent to but excluded from the envelope.

3.3.10 Installing Blower Door Equipment in a Door Opening

Where blower door fans are used, before installing blower door equipment, select a door opening that does not restrict air flow into and out of the envelope and has at least 5 feet clear distance in front of and behind the door opening. Disconnect the door actuator and secure the door open to prevent it from being drawn into the fan by fan pressure.

3.4 BUILDING ENVELOPE AIR TIGHTNESS REQUIREMENT

For each building envelope, perform the Architectural Only test. The

purpose of the pressure (air leakage) test is to determine final compliance with the airtightness requirement by demonstrating the performance of the continuous air barrier. An effective air barrier envelope minimizes infiltration and exfiltration through unintended air paths (leaks).

3.4.1 Architectural Only Test

The test envelope is the architectural air barrier boundary as defined on the contract drawings. This boundary includes connecting walls, roof and floor which comprise a complete, whole, and continuous three dimensional envelope. Perform both a positive pressure test and a negative pressure test on this envelope, unless otherwise directed.

3.4.1.1 Test Goal

Input data from the test into the Air Leakage Rate by Fan Pressurization spreadsheet as described in paragraph CALCULATION PROGRAM via the Air Leakage Test Form. Compare output from the spreadsheet against the maximum allowable leakage defined in Section 07 27 26 FLUID-APPLIED MEMBRANE AIR BARRIERS The envelope passes the test if the leakage rate, as calculated using the spreadsheet, is equal to or lower than the Architectural Only leakage rate goal.

3.4.1.2 Preparing The Envelope For The Pressure Test - Seal All Openings Through The Air Barrier

Temporarily close all perimeter windows, roof hatches and doors in the envelope perimeter except for those doors that are to remain open to accommodate blower door or trailer mounted fan test equipment installation. Seal, or isolate all other intentional openings, pathways and fenestrations through the architectural envelope prior to pressure testing. Follow the Recommended Test Envelope Conditions identified in ASTM E1827, Table 1, for the Closed Envelope condition. These openings may include boiler flues, fuel-burning water heater flues, fuel-burning kitchen equipment, clothes dryer vents, fireplaces, wall or ceiling grilles, diffusers etc. Before sealing flues, close their associated fuel valves and verify the associated pilot lights are extinguished. Prime all plumbing traps located within the envelope full of water. In lieu of applying tape and/or plastic, Typical temporary sealing materials include tape and sheet plastic or a self-adhesive grille wrap. Use and apply tape and plastic in a manner that does not deface or remove paint or mar the finish of permanent surfaces. Be especially aware of residue that remains from tape applied to stainless steel surfaces such as kitchen hoods or rollup doors. For painted surfaces, use tape types that do not remove finish paint when the tape is removed. If paint is removed from the finished surface, repaint to match existing surfaces. Secure dampers closed either manually or by using the building's HVAC system controls. Use the table below for further guidance in building preparation.

Building Component	Envelope Condition
Air handling units, duct fans	As found (open) or temporarily sealed as necessary
Clothes dryer	Off

Building Component	Envelope Condition
Clothes dryer vents	Temporarily sealed
Dampers - intake, exhaust	Physically closed or closed using control power or temporarily sealed
Diffusers, registers, grilles within the envelope	Temporarily sealed
Doors, personnel type, at the envelope perimeter	Secured closed
Doors, personnel type, within the envelope	Secured (propped) open
Doors, roll-up type, at the envelope perimeter	Closed (no additional sealing)
Exhaust hoods	Closed* and temporarily sealed
Fireplace hearth	Temporarily sealed *
Kitchen hoods	Temporarily sealed *
Pilot light and associated fuel valve	Extinguished and closed, respectively
Vented combustion appliance	Temporarily sealed *
Vented combustion appliance exhaust flue	Off
Windows	Secured closed
* If the building component has an associated manual or automatic damper, consider securing the damper closed in lieu of temporarily sealing.	

3.5 CONDUCTING THE PRESSURE TEST

Notify the Contracting Officer at least 10 working days before conducting the pressure tests to provide the Government the opportunity to witness the tests and to monitor weather forecasts for conditions favorable for testing. Do not pressure test until verifying that the continuous air barrier is in place and installed without failures in accordance with installation instructions. During the pressure test periodically inspect temporarily sealed items to ensure they are still sealed. Seals on temporarily sealed items tend to release more readily at higher pressures. Test data obtained after temporarily sealed items become unsealed cannot be used as input into the calculation program. Follow the Envelope Pressure Test Procedures in the paragraphs below. Submit detailed pressure test procedures indicating the test apparatus, the test methods and procedures, and the analysis methods to be employed for the building envelope pressure (air tightness) test. Submit these procedures not later than 60 days after Notice to Proceed.

3.5.1 Extend Pneumatic Tubes and Establish a Reference Differential Pressure

Confirm the various zones within the envelope have a relatively uniform interior pressure distribution by establishing a representative differential pressure between the envelope and the outdoors with blower

door or trailer-mounted fans operating. The number of indoor pressure difference measurements (pneumatic hoses) required depends on the number of interior zones separated by bottle necks that could create significant pressure drops (e.g. doorways and stairwells). Extend at least four pneumatic hoses (differential pressure monitoring ports) to locations within the envelope that are physically opposite of each other. In multiple story buildings, especially those over three stories, extend hoses to multiple floors. Locate the hose ends away from the effects of air discharge from blower test equipment. Select one of the four (or more) interior hoses, one judged by the test agency to be the most unaffected by air velocity produced by blower test equipment, to serve as the interior reference pressure port. Extend at least one additional pneumatic hose to the outdoors (outdoor pressure port). To the end of this hose manifold at least four hoses together and terminate each hose on a different side of the building. With the envelope sealed and the blowers energized, measure the differential pressure using the interior reference pressure port and the four outdoor pressure ports. Then measure and record the differential pressure by individually using each of the remaining three interior hoses. Ensure each reading is within plus or minus 10 percent of the reference reading. Thus at an average 75 Pa maximum pressure difference across the envelope, the difference between the highest and lowest interior pressure difference measurements should be 15 Pa or less. If this condition cannot be met, attempt to create additional air pathways within the envelope to minimize pressure differences within the envelope. If necessary, move the interior hose ends. See step 2.13 of the Air Leakage Test Form in Appendix A.

3.5.2 Bias Pressure Readings

With the fan pressurization equipment de-energized and the envelope sealed, obtain the differential pressure between the outdoors and the envelope. Record 12 bias pressure readings before the pressure test and 12 bias pressure readings after the pressure test. Each reading is the average of ten or more 1-second measurements. Include positive and negative signs for each reading. To help dampen bias pressures that significantly contribute to test pressure, reduce temperature differences between indoor and outdoor air. Temperature differences can be reduced by operating test fan equipment for a few minutes to replace most of the indoor air with outdoor air.

3.5.3 Testing in Both Positive and Negative Directions

The preferred method for testing a building envelope is to test in both the pressurized and depressurized directions. Testing in one direction is only allowed if opposite direction testing cannot logistically be performed due to test equipment limitations or restrictions. After obtaining the pre-test bias differential pressure readings, conduct the pressure test. Record the envelope pressures (in units of Pascals) from one interior pneumatic hose (monitoring port) and the outdoor pneumatic hose(s), averaged or manifolded, with corresponding flows (in units of cfm) for each fan. Record the flow rates at at least 10 to 12 positive and 10 to 12 negative building pressure readings. If conducting both positive and negative pressure tests the lowest allowable test pressure is 40 Pa and the highest test pressure is 85 Pa. Keep at least 25 Pa difference between the lowest and highest test pressure readings. Include the 75 Pa pressure value between the lowest and highest readings. The 10 to 12 readings in each direction are to be roughly evenly spaced along the range of pressures and flows. After testing is complete de-energize the equipment used to provide pressurization and obtain an additional 10 to 12

post-test bias pressure readings. None of the bias pressure readings are allowed to exceed 30 percent of the minimum test pressure. If these limits are exceeded the test fails and must be repeated.

3.5.4 Using a Building's Own Air Handling System to Pressure Test an Envelope

3.5.4.1 Test Setup

Temporarily seal the envelope in a manner similar to that for testing with blower door or trailer-mounted fans. To positively pressurize the envelope, de-energize all ventilation equipment and close all associated dampers, except those outside air intake dampers associated with supply fans that will be used to pressurize the building envelope. Fully open these dampers. For the negative pressure test, de-energize all ventilation equipment except for those fans that will be used to de-pressurize the envelope. All dampers associated with de-energized fans are to be closed and all exhaust dampers associated with fans used to de-pressurize the envelope will be fully opened.

3.5.4.2 Measuring Airflows

When using the building's own air handling system to pressure test the envelope, air flows can generally be measured using one of the following methods:

a. When testing using the building's own air handling system, ensure flow readings obtained by anemometer comply with ASTM D3464. Pitot tube or hot wire anemometer traverse in accordance with ASTM D3464.

b. Pressure compensated shrouds (especially recommended for rooftop exhaust fans)

c. Tracer gas methods for measuring airflows in ducts in accordance with ASTM E2029. Do not use tracer gas decay, constant injection and constant concentration methods for estimating the total ventilation rate of the envelope.

3.5.4.3 Outdoor Air Flow Measuring Stations

Air flow stations may be used to measure outdoor airflows if one of the above methods is used to check accuracy of at least one air flow reading for each station or if the design of the HVAC system specifically placed outdoor air flow stations in locations that will yield accurate results. Field verify the accuracy of readings at the air flow measuring stations before obtaining pressure test readings.

3.5.5 Pressure Testing - Special Cases

3.5.5.1 Pressure Testing a Large Building Envelope

Pressure testing the envelope of a large building may be unworkable and unrealistic using blower door or trailer-mounted equipment. In this case, the test agency may define and pressure test separate zones within the envelope and sum the leakage of all of the zones to create an overall envelope leakage rate. Using this method, the test agency is to comply with the requirements of ASHRAE RP-935.

3.5.5.2 Pressure Testing a Multiple Isolated Zoned Building

Pressure test each exterior corner zone plus at least an additional 20 percent (as measured by floor area) of remaining zones. The Contracting Officer is responsible for selecting which of these additional zones to test. If all zones pass the pressure test it is assumed that all untested zones also pass and no further testing is required. If, however, any zone fails to pass the test's leakage requirements, re-seal and re-test until it passes in accordance with paragraph FAILED PRESSURE TEST. Test an additional 20 percent of previously untested zones. If all tested zones pass, no further testing is needed. If any zone in this group fails the test re-seal and re-test the zone until it passes. Continue this process until all the tested zones pass. When testing a zone, the doors to all adjacent zones that share a common surface with the tested zone are to have their doors opened to the outdoors. The resulting leakage from the test zoned is that through all 6 surfaces (4 walls, roof and floor, for a rectangular shaped zone).

3.5.6 Failed Pressure Test

If the pressure test fails to meet the established criteria, use diagnostic test methods described in paragraph LOCATING LEAKS BY DIAGNOSTIC TESTING to discover the leak locations. Provide additional permanent sealing measures to reduce or eliminate leak sources discovered during diagnostic testing. Retest (perform another pressure test) after sealing has been completed. Repeat this sequence of documenting test results in the test report, performing diagnostic tests, documenting recommendations for additional sealing measures in the test report, sealing leak locations per recommendations, and re-testing as necessary until the building envelope passes the pressure test and is in compliance with the performance requirements.

3.5.7 Air Leakage Test Report

Report volumetric flow rates and corresponding differential pressures in cubic feet per minute (cfm) and Pascals (Pa), respectively, on the Air Leakage Test Form sample form found in Appendix A. Populate the accompanying spreadsheet file entitled Pressure Test Data Analysis with information obtained during the test. The spreadsheet uses equations found in ASTM E779 as a basis for calculating the envelope leakage rate. Other similar leakage rate calculation programs cannot be used or submitted for review. Submit a printout of the data input and output in the report. Should any air tightness (pressure) test fail, the pressure test report is to include data and results from all previous failed tests along with the final successful test data and results. Indicate if the resulting leakage rate did or did not meet the goal leakage requirement. Identify and document deficiencies in the building construction upon failure of a test to meet the specified maximum leakage rate.

Include the Test Agency Qualification Sheet, Air Leakage Test Form and Air Leakage Test Results Form in the written report. Document every test set-up condition with diagrams and photos to ensure the tests can be made repeatable. Document all pneumatic hose termination locations. Record in detail how the building envelope was prepared for the tests. Also describe in detail which building items were temporarily sealed. Include photos of test equipment and sealing measures in the report. Include an electronic (pdf) version of all test reports on a CD. If the building envelope fails to meet the leakage rate goal, provide recommendations to further seal the envelope and document these recommendations in the test

report.

3.6 LOCATING LEAKS BY DIAGNOSTIC TESTING

Use diagnostic test methods described herein to discover obvious leaks through the envelope. Perform diagnostic tests on the building envelope regardless of the envelope meeting or failing to meet the designated leakage rate goal. Use diagnostic test methods in accordance with ASTM E1186 and in conjunction with pressurization equipment as necessary. Use the thermography diagnostic test to establish a baseline for envelope leakage. Apply additional diagnostic tests (find, feel, fog or other tests) as necessary to further define leak locations and pathways discovered using thermography or to find additional leaks not readily detected by thermography. Using a variety of diagnostic tests may help locate leaks that would otherwise go undetected if only a single diagnostic test were used. Pay special attention to locating leaks at interfaces where there is a change in materials or a change in direction of like materials. These interfaces, at a minimum, include roof/wall, wall/wall, floor/wall, wall/window, wall/door, wall/louver, roof mounted equipment/roof curb interfaces and all utility penetrations (ducts,pipes, conduit, etc) through the envelope's architecture. Also use diagnostic tests to check for leakage between the air duct and duct damper, when the damper, under normal control power, is placed in the closed position. Should leaks be discovered during diagnostic tests, thoroughly document their exact locations on a floor plan so that sealing can be later applied, if required or as directed. If the envelope passes the leakage test, use the diagnostic test procedure described above to identify obvious leakage locations. Seal the leaks at the discretion of the COR based on the magnitude, location, potential for liquid moisture penetration or retention, potential for condensation, presence of daylight through an architectural surface or if the leakage location could potentially cause rapid deterioration or mold growth of, or in the building envelope materials and assemblies. Apply sealing measures after diagnostic testing is complete and all pressurization blowers are off. To verify that the applied sealing measures that are effective, re-test for leaks using the same diagnostic methods that discovered the leak. Reseal and retest until the envelope meets the leakage rate goal and all obvious leaks through the envelope are sealed.

3.6.1 Find Test

Use visual observation to locate daylight and/or artificial light streaming from the opposite side of the envelope. Observe all interfaces identified above.

3.6.2 Feel Test

Use the building's air handling system or blower door equipment to negatively pressurize the building envelope, to at least 25 Pa but no greater than 85 Pa, with respect to the outdoors. The larger the pressure difference, the easier discovering leaks by feeling them becomes. While inside the envelope, hand feel roof/wall, wall/wall, and floor/wall interfaces and utility penetrations (ducts, pipes, conduit, etc) for leaks and note the leak locations on a floor plan. The "Feel" test may also be used to check for leaks between the ductwork and ductwork damper. To do this, positively pressurize the envelope and check for air movement from the envelope exterior.

3.6.3 Infrared Thermography Test

Avoid performing thermography tests just after pressure testing the building envelope (pressurizing and/or depressurizing the building envelope) as thermography readings may be inaccurate due to excessive air-wash. Perform thermography either before the pressure test or wait an appropriate amount of time after pressure test completion for the temperatures within the building envelope to stabilize before starting the thermography tests. Coordinate thermography examination with the pressure test agency and the test agency's pressurization equipment. The pressure test agency is to allow adequate time for the thermographer to perform a complete thermographic examination, as described hereinafter, of the envelope interior and exterior.

3.6.3.1 Thermography Test Methods

Before thermographic testing, remove furniture, construction equipment, and all other obstructions both inside and outside the building as necessary to gain a clear field of view. In the Thermographic Investigation Report, document all areas where obstructions remain. For exterior thermal examination of the envelope, verify that no direct solar radiation has heated the envelope surfaces to be examined for a period of approximately 3 hours for frame construction and for approximately 8 hours for masonry veneer construction. Conduct exterior investigations after sunset, before sunrise, or on an overcast day when the influence of solar radiation can be determined to be minimal. Limit exterior examinations to times when the influence of solar radiation is minimal, such as after sunset or before sunrise or during an overcast day. Conduct thermal imaging tests only when wind speeds are less than 8 mph at the time of analysis and at the end of analysis. Document any variations in wind during the test. Document all variations of test conditions in the Thermographic Investigation Report. Test only when exterior surfaces are dry. Monitor and document ongoing test parameters, such as the temperatures inside and outside the air barrier envelope, wind speed, and differential pressure.

3.6.3.1.1 Thermography Testing of the Air Barrier

Test the building envelope in accordance with ISO 6781, and ASTM E1186. Perform a complete thermographic inspection consisting of the full inspection of the interior and exterior of the complete air barrier envelope. Document envelope areas that are inaccessible for testing. Use infrared thermography technology in concert with standard pressurization methods (blower doors, trailer mounted fans and/or the building's own air handling systems) to locate leaks through the air barrier. Because thermography works best with at least a 18 degree F temperature difference between the envelope interior and the exterior, adjust the HVAC system, if possible, to create or enhance this temperature difference. The minimum allowable temperature difference is 3 degrees F. Maintain this temperature difference for at least 3 hours prior to the test. Use pressurization methods to establish a minimum of +20 Pa pressure difference with respect to the outdoors while using an infrared camera to view the envelope from outdoors. When viewing with the camera from inside the envelope, keep the envelope at a pressure differential of -20 Pa with respect to the outdoors using pressure testing equipment or the building's own air handling system.

3.6.3.1.2 Thermography Testing of the Insulation Envelope to Find Insulation Voids (Qualitative Test)

After installation of the insulation envelope is complete, use thermography to identify anomalies (insulation voids) in this envelope. Test only when the temperature difference between inside and outside wall surfaces and as defined by the surface being imaged is a minimum of 18 degrees F or greater for a period of 4 hours before the test. Alternatively, the thermographer is to verify and document in the Thermographic Investigation Report that the imaging system is capable of providing satisfactory results with less temperature difference between inside and outside. Test during a time when there is no more than 0.05 inches differential pressure across the insulation envelope. Document the location of the voids on floor plans or wall sections.

3.6.3.1.3 Thermography Testing of Thermal Bridging

Take sample thermal images of representative parts of the building envelope being examined and analyze to demonstrate the majority of areas with anomalies or identifiable thermal features. Also sample thermal bridges in parts of the building that have no apparent anomalies to demonstrate the correct functioning of building components.

3.6.3.2 Thermography Test Results

Document the location of all leaks, anomalies, and unusual thermal features on a floor plan and/or elevation view and catalog them with a visible light picture for locating the defect for correction. The thermographer is to recommend corrective actions to eliminate the leaks, anomalies and unusual thermal features. Where leaks are found perform corrective sealing as necessary to achieve the whole envelope air leakage rate specified. After sealing, again use thermography in concert with standard pressurization methods to verify that the air leakage has been reduced. After these leaks have been permanently sealed note all actions taken on the drawings or in the Thermographic Investigation Report. Submit the drawings for approval as part of the Thermographic Investigation Report. Also include thermographic photos that show where leaks were discovered. Include thermograms using an imaging palette that clearly shows the observed thermal patterns indicating air leakage. The Contracting Officer's Representative is to witness all testing.

3.6.4 Fog Test

Before using a theatrical fog generator, disable all building smoke detectors as they may alarm when fog is issued. Coordinate fog tests and the disabling of all smoke detectors with the Contracting Officer's representative and the local fire department as necessary. Use pressure test equipment or the buildings own air handling system to positively pressurize the building envelope to at least 25 Pa but not greater than 85 Pa over the outdoors. Using a theatrical fog generator within the envelope, direct fog at suspected leakage points such as at building interfaces. Test the following interfaces: roof/wall, wall/wall, floor/wall, wall/window, roof/ mounted mechanical equipment. From the vantage point immediately outside the envelope and opposite that of the interface being tested, observe the effect as the fog is issued. Detection may also be further enhanced by using a scented fog liquid or a fog liquid that produces a colored fog. Look for fog and smell for associated odor percolating through the interface. Also use smoke puffers and smoke sticks as necessary to locate leaks at these and other interface

locations. If the Architectural Plus HVAC System pressure test will be/was performed introduce fog into ductwork to check for leakage between ductwork and associated dampers. After fog testing has ended, reactivate the building smoke detectors and notify the Contracting Officer and local fire department that the test has ended. After sealing has been completed retest these areas using fog. Seal additional leaks that are found.

3.6.5 Diagnostic Test Report

Once the diagnostic tests have been completed and the leakage locations identified and sealed, document these procedures, locations and recommendations in the diagnostic test report. Submit plan and/or profile drawings that thoroughly identify leak locations. Describe in detail all leak locations so that the seal-up crew knows where to apply sealing measures. After sealing measures have been applied, describe the methods used along with applicable photos of the final sealed condition.

3.6.5.1 Thermographic Investigation Report

Submit a report of each thermographic investigation identifying the thermal discontinuities in the thermal control layer. Indicate in the final report locations to which improvements for both the air control layer and the thermal control layer were made to reduce air leaks and correct discontinuities in the thermal control layer. Include in the report some selected radiometric images of suspected failure points in the air barrier envelope that indicate before and after conditions. Indicate in the final report improvements that were made to the envelope to reduce air leaks, correct wet roof and wall areas, and repair insulation. Include the following items in the report:

a. Brief description of the building construction

b. Types of interior and exterior surface materials used in the building.

c. Geographical orientation of the building with a description of the exterior surroundings including other buildings, vegetation, landscaping, and surface water drainage.

d. Camera brand, model and serial number, and date of most recent calibration date; optional lenses with serial numbers (if applicable)

e. Thermographer's and Government Inspector's names

f. Date and time of tests

g. Air temperature and humidity inside the air barrier envelope

h. Outdoor air temperature and humidity

i. General information for the last 12 hours on the solar radiation conditions in the geographic area where the test is being performed.

j. Ambient conditions such as precipitation and wind direction and speed occurring with the last 24 hours, as applicable. Refer to specific requirements in each section of each thermographic inspection type for requirements in each specific area.

k. Documentation of those portions of the building envelop which were not within test conditions when the scan was performed and which portions

were obstructed by adjacent structures, interior furnishings, intervening cavities or reflective surfaces.

l. Other relevant information, which may have influenced test results.

m. Drawings, sketches, floor plans and/or photographs detailing the locations in the buildings where thermograms were taken detailing possible irregularities in the components being tested.

n. Thermal images taken during the inspection with their relative locations and written or voiced recorded explanations of the anomaly listed along with visual and reference images.

o. An identification of the aspects or components of the building being examined.

p. Explanations for the type and the extent of each construction defect observed during the inspection.

q. Any results from additional measurements and investigations. Identify additional equipment used and support with type, model number, serial number and date of most recent calibrated.

3.6.5.2 Fog Test Report

Document all turbulent air flow and dead air spaces within the envelope. Report fog behavior as it exits from and/or is entrained within the building. Include a floor plan in the report that documents the locations where fog passed through the envelope.

3.7 CALCULATION PROGRAM

To calculate the envelope leakage rate and other required outputs, input the data obtained during the pressure tests as documented in the Air Leakage Test Form (Appendix A) into the Air Leakage Rate by Fan Pressurization Excel spreadsheet. This spreadsheet can be found at the following web site: http://wbdg.org/ccb/NAVGRAPH/graphtoc.pdf.

3.8 AFTER COMPLETION OF THE PRESSURE AND/OR DIAGNOSTIC TEST

After all pressure and/or diagnostic testing has been completed unseal all temporarily sealed items. Unless otherwise directed by the Contracting Officer, return all dampers, doors, and windows to their pre-test condition. Remove tape and plastic from all temporarily sealed openings, being careful not to deface painted surfaces. If paint is removed from finished surfaces, repaint to match existing surfaces. Unless otherwise directed by the Contracting Officer's representative, return fuel (gas) valves to their pre-test position and relight pilot lights. Return all fans and air handling units to pre-test conditions.

3.9 REPAIR AND PROTECTION

Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for testing, inspection, and similar services. Upon completion of inspection, testing, or sample taking and similar services, repair damaged construction and restore substrates and finishes, protect construction exposed by or for quality control service activities, and protect repaired construction.

3.10 APPENDICES

The following forms are available for download as a MS Word file at http://wbdg.org/ccb/NAVGRAPH/graphtoc.pdf.

Appendix A - Air Leakage Test Form
Appendix B - Air Leakage Test Results Form
Appendix C - Test Agency Qualifications Sheet

-- End of Section --

SECTION 07 13 53

ELASTOMERIC SHEET WATERPROOFING
02/16, CHG 1: 08/17

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C1305	(2008) Standard Test Method for Crack Bridging Ability of Liquid-Applied Waterproofing Membrane
ASTM D41/D41M	(2011; R 2016) Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
ASTM D146/D146M	(2004; E 2012; R 2012) Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing
ASTM D412	(2016; R 2021) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D570	(1998; E 2010; R 2010) Standard Test Method for Water Absorption of Plastics
ASTM D903	(1998; R 2017) Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
ASTM D1876	(2008; R 2015; E 2015) Standard Test Method for Peel Resistance of Adhesives (T-Peel Test)
ASTM D5385/D5385M	(1993; R 2014; E 2014) Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes
ASTM E96/E96M	(2022a; E 2023) Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
ASTM E154/E154M	(2008a; R 2019) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2021) International Building Code

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING.Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Manufacturer's Standard Details; G

Elastomeric Waterproofing Sheet Material; G

Primers, Adhesives, and Mastics; G

Hydrophilic waterstop; G

SD-06 Test Reports

Elastomeric Waterproofing Sheet Material; G

Protective Covering; G

SD-07 Certificates

Elastomeric Waterproofing Sheet Material; G

Primers, Adhesives, and Mastics; G

Protective Coverings; G

Draft Special Warranties; G

Final Special Warranties; G

Certificates Of Compliance; G

SD-08 Manufacturer's Instructions

Primers, Adhesives, and Mastics; G

SD-11 Closeout Submittals

Certificates Of Compliance with sustainable requirements for items listed in SD-07; G

1.3 MANUFACTURER'S DETAILS

Submit manufacturer's standard details indicating methods of attachment and spacing, transition and termination details, and installation details. Include verification of existing conditions.

1.4 PRODUCT DATA

Include data for material descriptions, recommendations for product shelf life, requirements for protective coverings, and manufacturer's Safety Data Sheets (SDS) for primers, adhesives, and mastics.

1.5 QUALITY ASSURANCE

1.5.1 Installer

A firm which has at least 3 years experience in work of the type required by this section. Installer shall be the same as for the waterproofing specified in Section 07 17 00 BENTONITE WATERPROOFING and waterstop specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.

1.5.2 Materials

For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer.

1.5.3 Pre-Installation Conference

A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of special details and flashing.

1.5.4 Schedule Coordination

Schedule work such that membrane will not be left exposed to weather for longer than that recommended by the manufacturer.

1.6 CODE REQUIREMENTS

Provide membrane waterproofing system in accordance with ICC IBC Section 1805 Dampproofing and Waterproofing.

1.7 DELIVERY, STORAGE, HANDLING, IDENTIFICATION

Deliver and store materials in accordance with manufacturer's printed instructions, out of the weather, in manufacturer's original packaging with brand name and product identification clearly marked. Keep materials wrapped and separated from off-gassing materials (such as drying paints and adhesives). Do not use materials that have visible moisture or biological growth. Do not permit unidentified materials in the work area or in the project.

1.8 ENVIRONMENTAL CONDITIONS

Do not apply waterproofing during inclement weather or when there is ice, frost, surface moisture, or visible dampness on the surface to receive waterproofing for when ambient and surface temperatures are 40 degrees F or below. The restriction on the application of waterproofing materials when ambient and surface temperatures are below 40 degrees F will be waived if the Contractor devises a means, approved by the Contracting Officer in writing, of maintaining the surface and ambient temperatures above 40 degrees F.

1.9 SPECIAL WARRANTIES

1.9.1 Guarantee

Guarantee waterproofing membrane installation against failure due to leaks for a period of two years from the date of Beneficial Occupancy. Submit draft and final guarantees in accordance with Sections 01 78 00 CLOSEOUT SUBMITTALS.

1.9.2 Warranty

Provide manufacturer's material warranty for all system components for a period of ten years from the Date of Final Acceptance. Submit draft and final warranties in accordance with Sections 01 78 00 CLOSEOUT SUBMITTALS and 01 78 23 OPERATION AND MAINTENANCE DATA.

PART 2 PRODUCTS

2.1 SUSTAINABILITY CRITERIA

Where allowed by performance criteria:

2.1.1 Reduced Volatile Organic Compound (VOC) Content

Provide products with reduced VOC content and provide certificates of compliance in accordance with Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING paragraph REDUCE VOLATILE ORGANIC COMPOUNDS.

2.1.2 Recycled Content

Provide products with recycled content and provide certificates of compliance in accordance with Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING paragraph RECYCLED CONTENT.

2.2 MATERIALS

Provide elastomeric waterproofing sheet material and related primers, adhesives, and mastics as specified herein. Ensure compatibility of waterproofing materials with each other, and with materials on which they are applied. Provide materials that comply with applicable requirements cited below when tested in accordance with the referenced ASTM publications.

2.3 COMPOSITE, SELF-ADHERING MEMBRANE SHEETING

Cold applied composite sheet consisting of rubberized asphalt and cross laminated, high density polyethylene film. Not less than 60 mils minimum thickness is required.

2.3.1 Composite, Self-Adhering Sheeting Performance Requirements

a. Tensile Strength ASTM D412, Die C: 250 psi minimum.

b. Ultimate Elongation, ASTM D412, Die C: 200 percent minimum.

c. Water Vapor Transmission, ASTM E96/E96M 80 degrees F Permeance, Procedure B: 0.1 perm maximum.

d. Pliability degrees, ASTM D146/D146M: 180 degrees Bend Over 1 Inch

Mandrel: No cracks at minus minus 25 degrees F.

e. Provide test report data for crack bridging ability: Either in accordance with ASTM C1305 as modified for a dry film thickness specified by the manufacturer and conducted at low temperature; or in accordance with a cycling over crack test also conducted for the specified dry film thickness at low temperature. Using either test, verify crack bridging up to 1/4 inch without damage to the membrane system.

f. Puncture Resistance, ASTM E154/E154M REV A: 40 lb minimum.

g. Lap Adhesion at Minimum Application Temperature, ASTM D1876 Modified, 5 lbs/in..

h. Peel Strength, ASTM D903: Modified 9 lbs/in.

i. Resistance to Hydrostatic Head, ASTM D5385/D5385M: 231 ft of water.

j. Water Absorption, ASTM D570; 0.1 percent maximum.

2.3.2 Primers

Asphalt composition, ASTM D41/D41M, or synthetic polymer in solvent as recommended by the membrane manufacturer.

2.3.3 Mastics

Polymer modified asphalt in suitable solvent of trowel grade consistency and as recommended by the membrane manufacturer.

2.4 HYDROPHILIC WATERSTOP

Swellable strip type compound of polymer modified chloroprene rubber that swells upon contact with water must conform to ASTM D412 as follows: Tensile strength 420 psi minimum; ultimate elongation 600 percent minimum. Hardness must be 50 minimum on the type A durometer and the volumetric expansion ratio in distilled water at 70 degrees F must be 3 to 1 minimum.

2.5 MISCELLANEOUS ACCESSORIES

Provide manufacturer's recommended miscellaneous accessories required for a complete and functioning installation, including, but not limited to, liquid membrane, joint filler, sealant, termination bar, detail tape and mastic.

PART 3 EXECUTION

3.1 VERIFICATION OF CONDITIONS

Before starting the work, verify surfaces that must be waterproofed are in satisfactory condition. Notify the Contracting Officer of defects or conditions anticipated to prevent a satisfactory application. Do not start application until defects and conditions have been corrected.

3.2 SURFACE PREPARATION

Ensure surfaces to receive treatment are clean, dry, smooth, and free from

deleterious materials and projections. Thoroughly wet holes, joints, cracks, and voids in concrete with water and fill with Portland cement mortar, strike flush, and permit to dry. Cut off high spots or grind smooth. Finish top surfaces of projecting masonry or concrete ledges below grade, except footings, to a steep bevel with Portland cement mortar. Sweep surfaces to receive covering before applying waterproofing to remove dust and foreign matter. Cure concrete by a method compatible with the waterproofing system.

3.3 APPLICATION

3.3.1 Building Envelope Requirements

Provide a continuous waterproofing system at all material and building transitions. Lap, wrap, fasten and seal products in accordance with manufacturer's printed instructions. Envelope assembly variations are not permitted without written approval from the Contracting Officer's Representative.

3.3.2 General Installation Requirements

Provide sheet waterproofing in accordance with manufacturer's printed installation instructions. Ensure the surface to receive membrane is clean, smooth and dry without surface irregularities; correct deficiencies prior to installation. When using solvent welding liquid, avoid prolonged contact with skin and breathing of vapor and provide adequate ventilation. Carry waterproofing of horizontal surfaces up abutting vertical surfaces and adhere solid to the substrate. Avoid wrinkles and buckles in applying membrane and joint reinforcement.

3.3.2.1 Self-Adhering Membrane

Apply composite, self-adhering membrane on surfaces primed at a uniform coverage rate in accordance with membrane manufacturer's printed instructions. Remove release sheet and apply with tacky surface in contact with dried primer.

3.3.2.2 Protection

Protect membrane over horizontal surfaces from traffic during installation. Use only equipment with rubber tires. Provide walkway protection where heavy traffic from other trades is expected. Do not store material on membrane.

3.4 COMPOSITE, SELF-ADHERING MEMBRANE

Lap sheets at edges and ends a minimum of 2-1/2 inches over the preceding sheet. Provide all side laps a minimum 2-1/2 inches and end laps 5 inches. Provide self-adhesive, mastic laps in accordance with manufacturer's recommendation. Roll or firmly press to adhere membrane to substrate. Cover corners and joints with two layers of reinforcement by first applying a 12 inch width of membrane centered along the axis. Flash drains and projections with a second ply of membrane for a distance of 6 inches from the drain or projection. Finish exposed, terminated edges of membrane on horizontal or vertical surfaces with a toweled bead of mastic. Apply mastic around edges of membrane, and drains and projections. Apply mastic at end of each work day.

3.5 FLASHING

Flash penetrations through membrane. Seal all penetrations where reinforcing bars penetrate a waterproofing membrane with the appropriate sealant or mastic flashing component. Embed elastomeric membrane in a heavy coat of adhesive, except for self-adhering membrane. Position continuous metal reglets horizontally on footing and vertically on intersecting and connecting walls, and as specified in Section 07 60 00 FLASHING AND SHEET METAL. Metal reglets are to receive exposed edges of membrane waterproofing. Secure membrane into reglets by lead wedges and fill with cement as recommended in writing by manufacturer of waterproofing materials. Counterflash upper edge of membrane waterproofing and protective covering as specified in Section 07 60 00 FLASHING AND SHEET METAL.

3.6 HYDROPHILIC WATERSTOP INSTALLATION AND SPLICES

Install waterstops at the locations shown to form a continuous water-tight diaphragm. Make adequate provision to support and completely protect the waterstops during the progress of the work. Repair or replace any waterstop damaged. Protect exposed waterstops during application of form release agents to avoid being coated. Provide suitable guards to protect exposed projecting edges and ends of partially embedded waterstops from damage when concrete placement has been discontinued. Accomplish splices with certified trained personnel using approved equipment and procedures. Miter cut ends to be joined with sharp knife or shears. Adhere the ends with cyanacryiate (super glue) adhesive.

3.7 PROTECTIVE COVERING

After installation has been inspected and approved by the Contracting Officer, apply a protective covering to the membrane waterproofing prior to backfilling. Protect vertical membrane waterproofing with a 1/2 inch minimum thickness of asphalt plank; 1/2 inch minimum thickness of fiberboard; or 1/8 inch minimum thickness of compatible water resistant bitumen type protection board with edges abutting adjacent edges and exposed surfaces covered by a taping system recommended by manufacturer of protection board. Cover horizontal membrane waterproofing with similar protection board and Portland cement mortar not less than 3/4 inch thick; place uniformly and allow to set before installing subsequent construction.

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SECTION 07 17 00

BENTONITE WATERPROOFING
02/16

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D217	(2021a) Standard Test Methods for Cone Penetration of Lubricating Grease
ASTM D1557	(2012; E 2015) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)

1.2 SUBMITTALS

Government approval is required for submittals with a "G"classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Bentonite Materials; G

Bentonite Panels; G

Accessories; G

SD-08 Manufacturer's Instructions

Application

Protection

Corrections Procedures; G

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver, store, and handle bentonite waterproofing materials in original manufacturer's packaging and in strict accordance with manufacturer's printed instructions. Do not place or store bentonite materials in wet areas or during precipitation. Protect materials and accessories from moisture. Remove and replace products that show evidence of exposure to moisture prior to completion of installation. Remove materials which show evidence of damage, deterioration, or contamination.

Provide bentonite products and containers with manufacturer's labels intact and identifying all materials.

PART 2 PRODUCTS

2.1 BENTONITE MATERIALS

2.1.1 Bulk Bentonite

Provide high swelling, sodium bentonite containing a minimum of 90 percent montmorillonite and a maximum of 10 percent unaltered volcanic ash or other native sediments.

2.1.2 Bentonite Properties

Provide material meeting the following requirements:

2.1.2.1 Free Swell Rating

Two grams of granular bentonite sifted into deionized water must swell to occupy a minimum volume of 16 cubic centimeters.

2.1.2.2 Active Ingredient

Hydrous silicate of alumina, composed of the following chemical percentages and their allowable deviations:

Silica	61.0 plus/minus 3.0
Alumina	19.5 plus/minus 1.5
Iron oxide	5.0 plus/minus 1.0
Magnesia	2.8 plus/minus 0.4
Soda and potash oxides	2.4 plus/minus 0.7
Calcium oxide	0.6 plus/minus 0.5
Molecular water	6.1 plus/minus 0.6
Minor	2.6 plus/minus 0.6

2.1.3 Bentonite Panels

Provide panels containing bentonite material sealed between two layers of of polypropylene geotextile fabric, one woven and one nonwoven, needle punched and heat fused together with a minimum of 1 pound of evenly distributed bentonite per square foot. Provide bentonite panels with a minimum thickness of 48 inches square by minimum dry thickness of 3/16 inch.

2.1.4 Bentonite Mineral Based Gel

Provide material in accordance with ASTM D217 for a worked penetration range of 215 to 275. Provide gel with a minimum of 45 percent controlled, partially hydrated, high swelling sodium bentonite by weight with a minimum pH of 8.8, no free water, and 25 percent or more residual swell.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Examine surfaces prior to treatment, eliminate irregularities and remove loose and foreign material. Remove form tie rods. Point cracks and honeycombs in concrete surfaces. Make surfaces of finished patches flush with adjacent concrete surfaces. Allow cement mortar to dry for minimum of 72 hours prior to application of bentonite panels.

3.2 APPLICATION

Apply bentonite waterproofing where indicated, in accordance with manufacturer's printed instructions. Securely fasten panels over all construction joints and all expansion joints. Thoroughly pack all through-wall openings and penetrations with bentonite gel, granular bentonite, or both, prior to placement of bentonite panels.

3.3 PROTECTION

Protect bentonite panels during backfilling and compaction in accordance with manufacturer's printed instructions. If backfill is not immediately applied, protect panels from precipitation by completely covering exposed panels with polyethylene; remove polyethylene immediately prior to backfilling. Replace damaged panels with new panels before and during backfilling and compaction.

3.4 BACKFILL

Backfill with smooth and uniform material with no sharp projections. Compact backfill to at least 85 percent of ASTM D1557 maximum density. Ensure backfill material is not contaminated with salt or other materials that could prevent bentonite from hydrating.

3.5 CORRECTIONS

Repair leaks and defective areas in accordance with manufacturer's printed instructions.

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SECTION 07 21 13

BOARD AND BLOCK INSULATION
08/23

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C165	(2023) Standard Test Method for Measuring Compressive Properties of Thermal Insulations
ASTM C203	(2005a; R 2017) Standard Test Methods for Breaking Load and Flexural Properties of Block-type Thermal Insulation
ASTM C553	(2013; R 2019) Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
ASTM C578	(2022) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C591	(2022) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C612	(2014; R 2019) Standard Specification for Mineral Fiber Block and Board Thermal Insulation
ASTM C930	(2019) Standard Classification of Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories
ASTM C1289	(2023) Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
ASTM D1621	(2016) Standard Test Method for Compressive Properties of Rigid Cellular Plastics
ASTM D3833/D3833M	(1996; R 2019) Standard Test Method for Water Vapor Transmission of Pressure-Sensitive Tapes
ASTM D4397	(2016) Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications

ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E96/E96M	(2022a; E 2023) Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
ASTM E136	(2022) Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2021) International Building Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2023; ERTA 7 2023; TIA 23-15) National Electrical Code

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY (TAPPI)

TAPPI T803 OM	(2010) Puncture Test of Container Board

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.134	Respiratory Protection

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or classification. Submittals not having a "G" classification are Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Manufacturer's Standard Details; G

SD-03 Product Data

Environmental Data for Materials; G

Block or Board Insulation; G

Vapor Retarder; G

Pressure Sensitive Tape; G

Protection Board or Coating; G

Accessories including sealants; G

Recycled Content for Block or Board Insulation; S

SD-07 Certificates

Indoor Air Quality For Block Or Board Insulation; S

SD-08 Manufacturer's Instructions

Insulation Installation and Handling

Protection Board or Coating Installation

Adhesive

SD-11 Closeout Submittals

Draft Guarantee; G

Final Guarantee; G

Draft Warranty; G

Final Warranty; G

1.3 MANUFACTURER'S DETAILS

Submit manufacturer's standard details indicating methods of attachment and spacing, transition and termination details, and installation details. Include verification of existing conditions.

1.4 PRODUCT DATA

Include environmental data for materials descriptions, recommendations for product shelf life, requirements for protection board or coatings, and precautions for flammability and toxicity. Include data to verify compatibility of sealants with insulation.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery

Deliver materials to the site in original sealed wrapping bearing manufacturer's name and brand designation, specification number, type, grade, R-value, and class. Store and handle to protect from damage. Do not allow insulation materials to become wet, soiled, crushed, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storing, and protecting of materials before and during installation.

1.5.2 Storage

Inspect materials delivered to the site for damage and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling. Keep materials wrapped and separated from off-gassing materials (such as drying paints and adhesives). Do not use materials that have visible moisture or biological growth. Comply with manufacturer's recommendations for handling, storage, and protection of materials before and during installation.

1.6 SAFETY PRECAUTIONS

1.6.1 Respirators

Provide installers with dust/mist respirators, training in their use, and protective clothing, all approved by the National Institute for Occupational Safety and Health (NIOSH)/Mine Safety and Health Administration (MSHA) and in accordance with 29 CFR 1910.134.

1.6.2 Other Safety Considerations

Comply with the safety requirements of ASTM C930.

1.7 SPECIAL WARRANTIES

1.7.1 Guarantee

Guarantee insulation installation against failure due to ultraviolet light exposure for a period of three years from the date of Beneficial Occupancy or Substantial Completion. Submit draft guarantee and final guarantee in accordance with Sections 01 78 00 CLOSEOUT SUBMITTALS and 01 78 23 OPERATION AND MAINTENANCE DATA.

1.7.2 Warranty

Provide manufacturer's material warranty for all system components for a period of three years from the date of Beneficial Occupancy or Substantial Completion. Submit draft warranty and final warranty in accordance with Sections 01 78 00 CLOSEOUT SUBMITTALS and 01 78 23 OPERATION AND MAINTENANCE DATA.

PART 2 PRODUCTS

2.1 BLOCK OR BOARD INSULATION

Provide thermal insulating materials as recommended by manufacturer for each type of application indicated. Provide insulation with the following physical properties and in accordance with the following standards:

a. Faced Rigid Cellular Polyisocyanurate and Polyurethane Insulation: ASTM C1289 REV A

   (4) Type IV Cellulosic fiber insulating board on the one major surface of the core foam and fibrous felt or glass fiber mat membrane on the other major surface of the core foam.

b. Unfaced Preformed Rigid Polyurethane and Polyisocyanurate Board: ASTM C591

c. Extruded Preformed Cellular Polystyrene (XPS): ASTM C578 REV A, TypeIV

d. Mineral Fiber Block and Board: ASTM C612, Type IVB

2.1.1 Thermal Resistance

Provide R-values as indicated on the drawings.

2.1.2 Fire Protection Requirements

a. Flame spread index of 75 or less when tested in accordance with ASTM E84.

b. Smoke developed index of 200 or less when tested in accordance with ASTM E84.

c. Provide insulated assemblies in accordance ICC IBC Chapter Fire and Smoke Protection Features.

2.1.3 Other Material Properties

Provide thermal insulating materials with the following properties:

a. Rigid cellular plastics: Compressive Resistance at Yield: Not less than 10 pounds per square inch (psi) when measured according to ASTM D1621.

b. Mineral fiber board: Compressive strength: Minimum load required to produce a reduction in thickness of 10 percent pounds per square foot (lbf/sf): 1000 when tested according to ASTM C165.

c. Block-type insulation: Block-type insulation: Flexural strength: Not less than 25 psi when measured according to ASTM C203 REV A.

d. Water Vapor Permeance: Not more than 1.1 Perms or less when measured according to ASTM E96/E96M, desiccant method, in the thickness required to provide the specified thermal resistance, including facings, if any.

f. Water Adsorption: Not more than 1 percent by volume when measured in accordance with paragraph 14 of ASTM C553.

2.1.4 Premolded Concrete Masonry Insert

Provide in accordance with ASTM C578 REV A. Provide inserts in concrete masonry units that are installed at the masonry unit manufacturing plant. Provide insert with thickness of not less than 1 1/4 inches.

2.1.5 Recycled Materials

Provide thermal insulation containing recycled materials to the extent practicable, provided that the material meets all other requirements of this section. The minimum required recycled material contents (by weight, not volume) are:

Polyisocyanurate/Polyurethane:	9 percent
Phenolic Rigid Foam:	5 percent

Perlite Board:	23 percent post consumer paper

Provide data identifying percentage of recycled content for block or board insulation.

2.1.6 Indoor Air Quality

Provide certification of indoor air quality for block or board insulation.

2.1.7 Prohibited Materials

Do not provide materials containing asbestos.

2.2 VAPOR RETARDER AND DAMPPROOFING

2.2.1 Vapor Retarder in Framed Walls and Roofs

a. 6 mil thick polyethylene sheeting conforming to ASTM D4397 and having a water vapor permeance of one Perm or less when tested in accordance with ASTM E96/E96M.

b. Membrane with the following properties:

(1) Water Vapor Permeance: ASTM E96/E96M: 1 Perm

(2) Maximum Flame Spread: ASTM E84: 25

(3) Combustion Characteristics: Passing ASTM E136

(4) Puncture Resistance: TAPPI T803 OM: 25

2.3 PRESSURE SENSITIVE TAPE

As recommended by manufacturer of vapor retarder(s). Match water vapor permeance rating for each vapor retarder specified. Provide tape in accordance with ASTM D3833/D3833M.

2.4 PROTECTION BOARD OR COATING

As recommended by insulation manufacturer.

2.5 ACCESSORIES

2.5.1 Adhesive

As recommended by insulation manufacturer.

2.5.2 Mechanical Fasteners

Corrosion resistant fasteners as recommended by the insulation manufacturer.

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

Prior to installation, ensure all areas that will be in contact with the insulation are dry and free of projections that could cause voids, compressed insulation, or punctured vapor retarders. For foundation perimeter or under slab applications, check that subsurface fill is flat, smooth, dry, and well tamped. Do not proceed with installation if moisture or other conditions are present and notify the Contracting Officer of such conditions. Do not proceed with the work until conditions have been corrected and verified to be dry.

3.2 PREPARATION

3.2.1 Blocking Around Heat Producing Devices

Provide noncombustible blocking at all spaces between heat producing devices and the floors, ceilings and roofs through which they pass. Provide in accordance with ICC IBC Section 2111.13 Fireplace Fireblocking and with the following clearances:

a. Recessed lighting fixtures, including wiring compartments, ballasts, and other heat producing devices, unless certified for installation surrounded by insulation: 3 inches from outside face of fixtures and devices or as required by NFPA 70 and, if insulation is placed above fixture or device, 24 inches above fixture.

3.3 INSTALLATION

3.3.1 Insulation Installation and Handling

Provide insulation in accordance with the manufacturer's printed installation instructions. Keep material dry and free of extraneous materials.

3.3.2 Electrical Wiring

Do not install insulation in a manner that would enclose electrical conductors, that are not installed in conduit, between two layers of insulation.

3.3.3 Cold Climate Requirement

Place insulation on the outside of pipes.

3.3.4 Continuity of Insulation

Butt tightly against adjoining boards, studs, rafters, joists, sill plates, headers and obstructions. Provide continuity and integrity of insulation at corners, wall to ceiling joint, roof, and floor. Avoid creating thermal bridges and voids. Provide and verify continuity of insulative barrier throughout the building enclosure.

3.3.5 Coordination

Verify final installed insulation thicknesses comply with thicknesses indicated and with the approved insulation submittal(s).

3.4 INSTALLATION ON WALLS

3.4.1 Installation using Furring Strips

Install insulation between members as recommended by insulation manufacturer.

3.4.2 Installation on Masonry Walls

Apply board directly to masonry with adhesive or fasteners as recommended by the insulation manufacturer. Fit between obstructions without impaling board on ties or anchors. Apply in parallel courses with joints breaking midway over course below. Place boards in moderate contact with adjoining insulation without forcing and without gaps. Cut and shape as required to fit around wall penetrations, projections or openings to accommodate conduit or other utilities. Seal around cutouts with sealant. Install insulation in wall cavities so that it leaves at least a nominal one inch air space outside of the insulation to allow for cavity drainage.

3.4.3 Adhesive Attachment to Concrete and Masonry Walls

Apply adhesive to wall and completely cover wall with insulation.

c. As recommended by the insulation manufacturer.

d. Use only full back method for pieces of one square foot or less.

e. Butt all edges of insulation and seal edges with tape.

3.4.4 Mechanical Attachment on Concrete and Masonry Walls

Cut insulation to cover walls. Apply adhesive to wall and set clip or other mechanical fastener in adhesive as recommended by manufacturer. After curing of adhesive, install insulation over fasteners and bend split prongs to provide a flush condition with the insulation. Butt all edges of insulation and seal with tape.

3.4.5 Protection Board or Coating Installation

Install protection board or coating in accordance with manufacturer's printed instructions. Install protection over all exterior exposed insulation and to one foot below grade.

3.5 PERIMETER AND UNDER SLAB INSULATION

Install perimeter thermal insulation where heated spaces are adjacent to exterior walls, slab edges in slab-on-grade, or floating slab construction.

3.5.1 Manufacturer's Instructions

Layout insulation, tape edges, provide vapor retarder and other required accessories to protect against vermin, insects, and damage in accordance with manufacturer's printed instructions.

3.5.2 Insulation on Vertical Surfaces

Provide thermal insulation on exterior of foundation walls partially below grade and on edges of slabs-on-grade. Fasten insulation with mechanical fasteners.

3.5.3 Protection of Insulation

Protect insulation from damage during construction and back filling by application of protection board or a coating. Do not leave installed vertical insulation unprotected overnight. Protect installed insulation from weather, including rain and ultraviolet light, from mechanical abuse, compression, and dislocation. Extend protection at least one foot below grade.

3.6 VAPOR RETARDER

Apply vapor retarder continuous across all surfaces. Overlap all joints at least 6 inches and seal with pressure sensitive tape. Seal at sills, header, windows, doors and utility penetrations. Repair punctures or tears with pressure sensitive tape.

3.7 ACCESS PANELS AND DOORS

Attach insulation to all access panels greater than one square foot and all access doors in insulated floors and ceilings. Use insulation with same R-Value as that for the floor or ceiling in which each panel occurs.

-- End of Section --

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SECTION 07 21 16

MINERAL FIBER BLANKET INSULATION
08/23

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C665	(2023) Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
ASTM C930	(2019) Standard Classification of Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories
ASTM D4397	(2016) Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
ASTM D5359	(1998; R 2021) Standard Specification for Glass Cullet Recovered from Waste for Use in Manufacture of Glass Fiber
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E96/E96M	(2022a; E 2023) Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
ASTM E136	(2022) Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

GREEN SEAL (GS)

GS-36	(2013) Adhesives for Commercial Use

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2023; ERTA 7 2023; TIA 23-15) National Electrical Code

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY (TAPPI)

TAPPI T803 OM	(2010) Puncture Test of Container Board

U.S. DEPARTMENT OF ENERGY (DOE)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.134	Respiratory Protection

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2022) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Blanket Insulation; G

Recycled Content for Insulation Materials; S

Energy Star Label for Insulation Materials; S

Vapor Retarder

Accessories

SD-07 Certificates

Indoor Air Quality for Insulation Materials; SIndoor Air Quality for Adhesives; S

SD-08 Manufacturer's Instructions

Insulation

1.3 CERTIFICATIONS

Submit required indoor air quality certifications and validations in one submittal package.

1.3.1 Insulation Products

Provide product certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification by other third-party programs. Provide current product certification from certification body.

1.3.2 Adhesives and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party programs that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

Deliver materials to site in original sealed wrapping bearing manufacturer's name and brand designation, specification number, type, grade, R-value, and class. Store and handle to protect from damage. Do not allow insulation materials to become wet, soiled, crushed, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storing, and protecting of materials before and during installation.

1.4.2 Storage

Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling.

1.5 SAFETY PRECAUTIONS

1.5.1 Respirators

Provide installers with dust/mist respirators, training in their use, and protective clothing, all approved by National Institute for Occupational Safety and Health (NIOSH)/Mine Safety and Health Administration (MSHA) in accordance with 29 CFR 1910.134.

1.5.2 Other Safety Concerns

Consider other safety concerns and measures as outlined in ASTM C930.

PART 2 PRODUCTS

2.1 BLANKET INSULATION

ASTM C665, Type I, blankets without membrane coverings and II, blankets with non-reflecting coverings and III, blankets with reflective coverings; Class A, membrane-faced surface with a flame spread of 25 or less B, membrane-faced surface with a flame propagation resistance; critical radiant flux of 0.11 Btu/ft2 or greater, except a flame spread rating of 25 or less and a smoke developed rating of 150 or less when tested in accordance with ASTM E84.

Provide insulation with R-Value as indicated on drawings

2.1.1 Recycled Materials

Provide insulation materials containing the following minimum percentage of recycled material content by weight:

a. Fiberglass: 20 percent glass cullet complying with ASTM D5359

b. Mineral wool: 75 percent recovered materials content from slag

Provide data identifying percentage of recycled content for insulation materials.

2.1.2 Energy Star

Provide insulation materials that are Energy Star labeled. Provide data identifying Energy Star label for insulation materials.

2.1.3 Prohibited Materials

Do not provide asbestos-containing materials.

2.1.4 Reduced Volatile Organic Compounds (VOC) for Insulation Materials

Provide certification of indoor air quality for insulation materials.

2.2 BLOCKING

Wood, metal, unfaced mineral fiber blankets in accordance with ASTM C665, Type I, or other approved materials. Use only non-combustible materials meeting the requirements of ASTM E136 for blocking around chimneys and heat producing devices.

2.3 VAPOR RETARDER

a. 6 mil thick polyethylene sheeting conforming to ASTM D4397 and having a water vapor permeance of one perm or less when tested in accordance with ASTM E96/E96M.

b. Membrane with the following properties:

Water Vapor Permeance: ASTM E96/E96M: 1 perm

Maximum Flame Spread: ASTM E84: 25

Combustion Characteristics: Passing ASTM E136

Puncture Resistance: TAPPI T803 OM: 15

2.4 ACCESSORIES

2.4.1 Adhesive

As recommended by the insulation manufacturer. Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) that meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide aerosol adhesives used on the interior of the building that meet either emissions requirements of CDPH SECTION 01350 (use the office or classroom requirements, regardless of space type) or VOC content requirements of GS-36. Provide certification or validation of indoor air quality for adhesives.

2.4.2 Mechanical Fasteners

Corrosion resistant fasteners as recommended by the insulation manufacturer.

2.4.3 Wire Mesh

Corrosion resistant and as recommended by the insulation manufacturer.

2.5 Wire Mesh

Corrosion resistant and as recommended by the insulation manufacturer.

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

Before installing insulation, ensure that surfaces that will be in contact with the insulation are dry and free of projections which could cause voids, compressed insulation, or punctured vapor retarders. If moisture or other conditions are found that do not allow the workmanlike installation of the insulation, do not proceed but notify Contracting Officer of such conditions.

3.2 PREPARATION

3.2.1 Blocking at Attic Vents and Access Doors

Prior to installation of insulation, install permanent blocking to prevent insulation from slipping over, clogging, or restricting air flow through soffit vents at eaves. Install permanent blocking to maintain accessibility to equipment or controls that require maintenance or adjustment.

3.2.2 Blocking Around Heat Producing Devices

Install non-combustible blocking around heat producing devices to provide the following clearances:

a. Recessed lighting fixtures, including wiring compartments, ballasts, and other heat producing devices, unless these are certified by the

manufacturer for installation surrounded by insulation: 3 inches from outside face of fixtures and devices or as required by NFPA 70 and, if insulation is to be placed above fixture or device, 24 inches above fixture.

3.3 INSTALLATION

3.3.1 Insulation

Install and handle insulation in accordance with manufacturer's instructions. Keep material dry and free of extraneous materials. Any materials that show visual evidence of biological growth due to presence of moisture must not be installed on the building project. Ensure personal protective clothing and respiratory equipment is used as required. Observe safe work practices.

3.3.1.1 Electrical wiring

Do not install insulation in a manner that would sandwich electrical conductors, that are not installed in conduit, between two layers of insulation.

3.3.1.2 Continuity of Insulation

Install blanket insulation to butt tightly against adjoining blankets and to studs, rafters, joists, sill plates, headers and any obstructions. Where insulation required is thicker than depth of joist, provide full width blankets to cover across top of joists. Provide continuity and integrity of insulation at corners, wall to ceiling joints, roof, and floor. Avoid creating thermal bridges.

3.3.1.3 Installation at Bridging and Cross Bracing

Insulate at bridging and cross bracing by splitting blanket vertically at center and packing one half into each opening. Butt insulation at bridging and cross bracing; fill in bridged area with loose or scrap insulation.

3.3.1.4 Cold Climate Requirement

Place insulation to the outside of pipes.

3.3.1.5 Insulation without Affixed Vapor Retarder

Provide snug friction fit to hold insulation in place. Stuff pieces of insulation into cracks between trusses, joists, studs and other framing, such as at attic access doors, door and window heads, jambs, and sills, band joists, and headers.

3.3.1.6 Sizing of Blankets

Provide only full width blankets when insulating between trusses, joists, or studs. Size width of blankets for a snug fit where trusses, joists or studs are irregularly spaced.

3.3.1.7 Special Requirements for Ceilings

Place insulation under electrical wiring occurring across joists. Pack insulation into narrowly spaced framing. Do not block flow of air through

soffit vents. Attach insulation to attic door by adhesive or staples.

3.3.1.8 Installation of Sill Sealer

Size sill sealer insulation and place insulation over top of masonry or concrete perimeter walls or concrete perimeter floor slab on grade. Fasten sill plate over insulation.

3.3.2 Installation of Separate Vapor Retarder

Apply continuous vapor retarder as indicated. Overlap joints at least 6 inches and seal with pressure sensitive tape. Seal at sill, header, windows, doors and utility penetrations. Repair punctures or tears with pressure sensitive tape.

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SECTION 07 22 00

ROOF AND DECK INSULATION
08/23

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7	(2017) Minimum Design Loads for Buildings and Other Structures

ASTM INTERNATIONAL (ASTM)

ASTM C578	(2022) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C1278/C1278M	(2017) Standard Specification for Fiber-Reinforced Gypsum Panel
ASTM C1289	(2023) Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials

FM GLOBAL (FM)

FM 4450	(1989) Approval Standard for Class 1 Insulated Steel Deck Roofs
FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2021) International Building Code

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2022) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Insulation Board Layout and Attachment; G

SD-03 Product Data

Insulation; G

Cover Board; G

Fasteners; G

Recycled Content For Insulation; S

SD-05 Design Data

Wind Resistance; G

SD-06 Test Reports

Flame Spread Rating; G

SD-07 Certificates

Installer Qualifications; G

Certificates Of Compliance For Felt Materials; G

Indoor Air Quality For Insulation; S

Acceptable Foam Blowing Agents; S

SD-08 Manufacturer's Instructions

Nails and Fasteners; G

Roof Insulation; G

1.3 SHOP DRAWINGS

Submit insulation board layout and attachment indicating methods of attachment and spacing of fasteners on each board, transitions, tapered components, thicknesses of materials, and closure and termination conditions. Show locations of ridges, valleys, crickets, interface with, and slope to, roof drains. Base shop drawings on verified field measurements..

1.4 PRODUCT DATA

Include data for material descriptions, recommendations for product shelf life, requirements for cover board or coatings, and precautions for flammability and toxicity. Include data to verify compatibility of

sealants with insulation.

1.5 MANUFACTURER'S INSTRUCTIONS

Include field of roof, perimeter, and corner attachment requirements.

Provide a complete description of installation sequencing for each phase of the roofing system. Include weatherproofing procedures.

1.6 QUALITY CONTROL

Provide certification of installer qualifications from the insulation manufacturer confirming the specific installer has the required qualifications for installing the specific roof insulation system(s) indicated.

Provide certificates of compliance for felt materials.

1.7 WIND RESISTANCE REQUIREMENTS

The complete roof system assembly must be rated and installed to resist wind loads calculated in accordance with ASCE 7 and validated by uplift resistance testing in accordance with Factory Mutual (FM) test procedures. Coordinate with roof covering attachment requirements and submit wind resistance test certification, attachment patterns for field, perimeter, and corner roof areas along with perimeter and corner boundary dimensions.

1.8 FIRE PERFORMANCE REQUIREMENTS

1.8.1 Insulation in Roof Systems

Comply with the requirements of ICC IBC or FM 4450. Roof insulation must have a flame spread rating of 75 or less when tested in accordance with ASTM E84. Additional documentation of compliance with flame spread rating is not required when insulation of the type used for this project as part of the specific roof assembly is listed and labeled as FM Class 1 approved. Only roof assemblies that pass FM 4450 are permitted.

1.8.2 Thermal Barrier Requirements

Separate polyurethane or polystyrene insulation from a steel deck with a thermal barrier of glass mat gypsum roof board or other approved barrier material in accordance with the requirements of the ICC IBC or FM 4450. Only roof assemblies that pass FM 4450 are permitted.

1.8.3 Fire Resistance Ratings for Roofs

Provide in accordance with ICC IBC Chapter 7 and Table 721.1(3) Min Fire and Smoke Protection For Floor and Roof Systems.

1.9 CERTIFICATIONS

Provide products certified to meet indoor air quality requirements by UL 2818(Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification by other third-party programs. Provide current product certification documentation from certification body.

1.10 DELIVERY, STORAGE, AND HANDLING

1.10.1 Delivery

Deliver materials to the project site in manufacturer's unopened and undamaged standard commercial containers bearing the following legible information:

a. Name of manufacturer

b. Brand designation

c. Specification number, type, and class, as applicable, where materials are covered by a referenced specification

Deliver materials in sufficient quantity to allow continuity of the work.

1.10.2 Storage and Handling

Store and handle materials in accordance with manufacturer's printed instructions. Protect from damage, exposure to open flame or other ignition sources, wetting, condensation, and moisture absorption. Keep materials wrapped and separated from off-gassing materials (such as drying paints and adhesives). Do not use materials that have visible moisture or biological growth. Store in an enclosed building or trailer that provides a dry, adequately ventilated environment. Replace damaged material with new material.

1.11 ENVIRONMENTAL CONDITIONS

As per manufacturer's recommendations or Government's instructions, do not install roof insulation during inclement weather or when air temperature is below 40 degrees F and interior humidity is 45 percent or greater, or when there is visible ice, frost, or moisture on the roof deck.

1.12 PROTECTION

1.12.1 Completed Work

Cover completed work with cover board for the duration of construction. Avoid traffic on completed work particularly when ambient temperature is above 80 degrees F. Replace crushed or damaged insulation prior to roof surface installation.

PART 2 PRODUCTS

2.1 INSULATION

2.1.1 Insulation Types

Provide one, or an assembly of a maximum of three, of the following roof insulation materials. Provide roof insulation that is compatible with attachment methods for the specified insulation and roof membrane.

a. Polyisocyanurate Board: Provide in accordance with ASTM C1289 REV A Type I, foil faced both sides or Type II, fibrous felt or glass mat membrane both sides, except minimum compressive strength of 25 pounds per square inch (psi).

b. Extruded Polystyrene (XPS) Board: In accordance with ASTM C578 REV A, Type IV or X.
c. Composite Boards: Provide in accordance with ASTM C1289 REV A, Type V, oriented strand board or waferboard on one side and fibrous felt or glass fiber mat membrane or aluminum foil on opposite side (Polyisocyanurate-perlite).

2.1.2 Recycled Materials

Provide thermal insulation materials containing recycled content. Unless specified otherwise, the minimum required recycled content for listed materials are:

Perlite Composition Board:	23 percent postconsumer paper
Polyisocyanurate/polyurethane:	9 percent recovered material
Cellular Glass Insulation:	60 percent recovered content
Fiberglass Insulation:	25 percent recovered content
Fiber (felt) or Fiber composite:	75 percent recovered content

Provide data identifying percentage of recycled content for insulation.

2.1.3 Indoor Air Quality

Provide certification of indoor air quality for insulation.

2.1.4 Prohibited Materials

Products that contain high ozone depleting or high Global Warming Potential (GWP) blowing agents are prohibited. For a list of acceptable substitute foam blowing agents for the type of insulation used see https://www.epa.gov/snap/foam-blowing-agents. Provide validation of acceptable foam blowing agents that no prohibited materials are used.

2.1.5 Insulation Thickness

As necessary to provide the thermal resistance (R-value) indicated for average thickness of tapered system. Base calculation on the R-value for aged insulation. For insulation over steel decks, satisfy both specified R-value and minimum thickness for width of rib opening recommended in insulation manufacturer's published literature.

2.1.6 Tapered Roof Insulation

One layer of the tapered roof insulation assembly must be factory tapered to a slope of not less than one in 24 1/4 inch per foot. Factory fabricate mitered joints from two diagonally cut boards or one board shaped to provide required slopes.

2.2 COVER BOARD

For use as a thermal barrier (underlayment), fire barrier (overlayment), or cover board for hot-mopped, torched-down, or adhesive-applied roofing

membrane over roof insulation.

2.2.1 Fiber-Reinforced Gypsum Board Panels

Provide non-glass-faced fiber-reinforced gypsum board panels in accordance with ASTM C1278/C1278M.

2.3 FASTENERS

Provide flush-driven fasteners through flat round or hexagonal steel or plastic plates. Provide zinc-coated steel plates, flat round not less than 1 3/8 inch diameter, hexagonal not less than 28 gage. Provide high-density plastic plates, molded thermoplastic with smooth top surface, reinforcing ribs and not less than 3 inches in diameter. Fully recess fastener head into plastic plate after it is driven. Form plates to prevent dishing. Do not use bell or cup shaped plates. Provide fasteners in accordance with insulation manufacturer's recommendations for holding power when driven, or a minimum of 120 pounds each in steel deck, whichever is the higher minimum. Provide fasteners for steel or concrete decks in accordance with FM APP GUIDE (https://www.approvalguide.com/) for Class I roof deck construction, and spaced to withstand uplift pressure of 90 pounds per square foot.

2.3.1 Fasteners for Steel Decks

Approved hardened penetrating fasteners or screws in accordance with FM 4450 and listed in FM APP GUIDE for Class I roof deck construction. Quantity and placement to withstand a minimum uplift pressure of 90 psf in accordance with FM APP GUIDE.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

3.1.1 Surface Inspection

Ensure surfaces are clean, smooth, and dry prior to application. Ensure surfaces receiving vapor retarder are free of projections that might puncture the vapor retarder. Check roof deck surfaces, including surfaces sloped to roof drains and outlets, for defects before starting work.

The Contracting Officer will inspect and approve the surfaces immediately before starting installation. Prior to installing vapor retarder , perform the following:

3.1.2 Surface Preparation

To correct defects and inaccuracies in roof deck surface to eliminate poor drainage from hollow or low spots, perform the following:

a. Provide wood nailers of the same thickness as the insulation at eaves, edges, curbs, walls, and roof openings for securing of cant strips, gravel stops, gutters, flashing flanges, and curbs.

b. Cover steel decks with a layer of insulation board of sufficient width to span the width of a deck rib opening, and in accordance with fire safety requirements. Secure with piercing or self-drilling, self-tapping fasteners of quantity and placement in accordance with

FM APP GUIDE. Locate insulation joints parallel to ribs of deck on solid bearing surfaces only, not over open ribs.

3.2 INSULATION INSTALLATION

Apply insulation in two layers with staggered joints when total required thickness of insulation exceeds 1/2 inch. Lay insulation so that continuous longitudinal joints are perpendicular to direction of roofing, as specified in Section 07 22 00, and end joints of each course are staggered with those of adjoining courses. When using multiple layers of insulation, provide joints of each succeeding layer that are parallel and offset in both directions with respect to the layer below. Keep insulation 1/2 inch clear of vertical surfaces penetrating and projecting from roof surface. Verify required slopes to each roof drain.

3.2.1 Special Precautions for Installation of Foam Insulation

3.2.1.1 Polyisocyanurate Insulation

Where polyisocyanurate foam board insulation is provided, install cover board over top surface of foam board insulation. Stagger joints of insulation with respect to foam board insulation below.

3.2.1.2 Polystyrene Insulation

a. Over the top surface of non-composite polystyrene board, install 1/2 inch thick high density wood fiberboard, 3/4 inch thick expanded perlite board insulation, glass mat gypsum roof board, or other overlayment approved by roofing sheet manufacturer. Tightly butt and stagger joints of field applied overlayment board at least 6 inches with respect to the polystyrene board below. Apply 6 inch wide glass fiber roofing tape centered over joints and edges of overlayment board.

b. Where composite boards consisting of polystyrene insulation are provided, apply 6 inch wide glass fiber roofing tape centered over joints and edges of composite board. Apply joint strips as recommended by roofing sheet manufacturer.

3.2.2 Cant Strips

Where indicated, provide cant strips at intersections of roof with walls, parapets, and curbs extending above roof. Wood cant strips must bear on and be anchored to wood blocking. Fit cant strips flush to vertical surfaces. Where possible, nail cant strips to adjoining surfaces. Where cant strips are installed against non-nailable materials, install in an approved adhesive.

3.2.3 Tapered Edge Strips

Where indicated, provide edge strips in the right angle formed by the juncture of roof and wood nailing strips that extend above the level of the roof. Install edge strips flush to vertical surfaces of wood nailing strips. Where possible, nail edge strips to adjoining surfaces. Where installed against non-nailable materials, install in an approved adhesive.

3.3 PROTECTION

3.3.1 Protection of Applied Insulation

Completely cover each day's installation of insulation with finished roofing specified in 07 61 14.00 20 on same day. Phased construction is not permitted. Protect open spaces between insulation and parapets or other walls and spaces at curbs, scuttles, and expansion joints, until permanent roofing and flashing are applied. Storing, walking, wheeling, or trucking directly on insulation or on roofed surfaces is not permitted. Provide smooth, clean board or plank walkways, runways, and platforms near supports, as necessary, to distribute weight in accordance with indicated live load limits of roof construction . Protect exposed edges of insulation with cutoffs at the end of each workday or whenever precipitation is imminent. Cutoffs must be two layers of bituminous-saturated felt set in plastic bituminous cement or EPDM membrane set in roof cement. Fill all profile voids in cutoffs to prevent trapping moisture below the membrane. Remove cutoffs when work resumes.

3.3.2 Damaged Work and Materials

Restore work and materials that become damaged during construction to original condition or replace with new materials.

3.4 INSPECTION

Establish and maintain inspection procedures to assure compliance of the installed roof insulation with Contract requirements. Remove, replace, correct in an approved manner, any work found not in compliance. Quality control must include, but is not limited to, the following:

a. Observation of environmental conditions; number and skill level of insulation workers; start and end time of work.

b. Verification of certification, listing or label compliance with FM Data Sheets.

c. Verification of proper storage and handling of insulation and vapor retarder materials before, during, and after installation.

d. Inspection of vapor retarder application, including edge envelopes and mechanical fastening.

e. Inspection of mechanical fasteners; type, number, length, and spacing.

f. Coordination with other materials, cants, sleepers, and nailing strips.

g. Inspection of insulation joint orientation and laps between layers, joint width and bearing of edges of insulation on deck.

h. Installation of cutoffs and proper joining of work on subsequent days.

i. Continuation of complete roofing system installation to cover insulation installed same day.

j. Verification of required slope to each roof drain.

-- End of Section --

SECTION 07 27 10

BUILDING AIR BARRIER SYSTEM
08/23

PART 1 GENERAL

1.1 SUMMARY

This Section specifies the construction and quality control of the installation of an air barrier system. Construct the air barrier system indicated, taking responsibility for the means, methods, and workmanship of the installation of the air barrier system. The air barrier must be contiguous and connected across all surfaces of the enclosed air barrier envelope indicated. The maximum leakage requirements of individual air barrier components and materials are specified in the other specification sections covering these items.

This section also defines the maximum allowable leakage of the final air barrier system. The workmanship must be adequate to meet the maximum allowable leakage requirements of this specification. Test the assembled air barrier system to demonstrate that the building envelope is properly sealed and insulated. Passing the air barrier system leakage test and thermography test will result in system acceptance. Conform air barrier system leakage and thermography testing and reporting to the requirements of Section 01 91 19 BUILDING ENCLOSURE COMMISSIONING.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referenced within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D4541	(2022) Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM E96/E96M	(2022a; E 2023) Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
ASTM E2178	(2021a) Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials
ASTM E2357	(2018) Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 285	(2023) Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible

Components

1.3 DEFINITIONS

The following terms as they apply to this section:

1.3.1 Air Barrier Accessory

Products designated to maintain air tightness between air barrier materials, air barrier assemblies and air barrier components, to fasten them to the structure of the building, or both (e.g., sealants, tapes, backer rods, transition membranes, fasteners, strapping, primers).

1.3.2 Air Barrier Assembly

The combination of air barrier materials and air barrier accessories that are designated and designed within the environmental separator to act as a continuous barrier to the movement of air through the environmental separator.

1.3.3 Air Barrier Component

Pre-manufactured elements such as windows, doors, dampers and service elements that are installed in the environmental separator.

1.3.4 Air Barrier Envelope

The combination of air barrier assemblies and air barrier components, connected by air barrier accessories that are designed to provide a continuous barrier to the movement of air through an environmental separator. There may be more than one air barrier envelope in a single building. Also known as Air Barrier System.

1.3.5 Air Barrier Material

A building material that is designed, tested or produced to provide the primary resistance to airflow through an air barrier assembly of a building enclosure.

1.3.6 Air Barrier System

Same as AIR BARRIER ENVELOPE.

1.3.7 Air Leakage Rate

The rate of airflow (CFM) driven through a unit surface area (sq.ft.) of an assembly or system by a unit static pressure difference (Pa) across the assembly. (example: 0.25 CFM/sq.ft. @ 75 Pa)

1.3.8 Air Leakage

The total airflow (CFM) driven through the air barrier system by a unit static pressure difference (Pa) across the air barrier envelope. (example: 6500 CFM @ 75 Pa)

1.3.9 Air Permeance

The tested rate of airflow (CFM) through a unit area (sq.ft.) of a material driven by unit static pressure difference (Pa) across the

material (example: 0.004 CFM/sq.ft. @ 75 Pa) as established by ASTM E2178.

1.3.10 Environmental Separator

The parts of a building that separate the controlled interior environment from the uncontrolled exterior environment, or that separate spaces within a building that have dissimilar environments. Also known as the Control Layer.

1.3.11 Vapor Permeance

Vapor permeance is separated into three classes based on the water vapor permeance of a material as tested via ASTM E96/E96M

Class I Vapor Barrier/Retarder	0.1 perm or less
Class II Vapor Barrier/Retarder	0.1 perm to 1.0 perm
Class III Vapor Barrier/Retarder	1.0 perm to 10 perm

1.4 PREPARATORY PHASE OR PRECONSTRUCTION CONFERENCE

Organize pre-construction conferences between the air barrier inspector and the sub-contractors involved in the construction of, or penetration of, the air barrier system to discuss where the work of each sub-contractor begins and ends, the sequence of installation, and each sub-contractor's responsibility to ensure airtight joints, junctures, penetrations and transitions between materials. Discuss the products, and assemblies of products specified in the different sections to be installed by the different sub-contractors.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Air Barrier System Shop Drawings; G, Manufacturer produced warranted air barrier system

SD-03 Product Data

Air Barrier System Product Data; G

SD-04 Samples

Mock-Up; G

Material Samples For Air Barrier System; G

SD-05 Design Data

Design Data And Calculations For The Air Barrier System; G

SD-06 Test Reports

Design Review Report; G

Testing and Inspection; G

SD-07 Certificates

Air Barrier Inspector; G

1.6 AIR BARRIER ENVELOPE SURFACE AREA AND LEAKAGE REQUIREMENTS

The building air barrier systems must meet the following leakage requirements. The allowable leakage rate and the maximum leakage are at a differential test pressure of 75 Pa.

Air Barrier Envelope 1	
Surface Area	30,011 square feet
Architectural Only Test:	
Allowable leakage rate	0.40 CFM/sq.ft
Maximum leakage	12,004.4 total CFM
Architectural Plus HVAC System Test:	
Allowable leakage rate	0.45 CFM/sq.ft
Maximum leakage	13,504.95 total CFM

Air Barrier Envelope 2	
Surface Area	square feet
Architectural Only Test:	
Allowable leakage rate	0.40 CFM/sq.ft
Maximum leakage	3,441.6 total CFM
Architectural Plus HVAC System Test:	
Allowable leakage rate	0.45 CFM/sq.ft
Maximum leakage	3,871.8 total CFM

1.7 AIR BARRIER INSPECTOR

Employ a designated Air Barrier Inspector on this project. The Air Barrier Inspector performs a Design Review, oversees quality control testing specified in these specifications, performs quality control air barrier inspection as specified, interfaces with the designer and product manufacturer's representatives to assure installation requirements are met, and verifies that the constructed work is in accordance with both the manufacturer's recommendations for products used, the content of this specification and other Contract drawings or documents. Qualifications for the Air Barrier Inspector are as follows:

a. Training and certification as an Air Barrier Auditor from the Air Barrier Association of America (ABAA) or other third-party air barrier association.

b. Or, provide documentation in resume format that demonstrates that the individual proposed has the experience, knowledge, skills and abilities to fulfill the above stated duties as the air barrier inspector.

c. It is acceptable that this individual be employed by the firm performing the building pressurization test or another independent third-party entity, provided they meet the above requirements but must not be a member of the installing Contractor or firm.

Provide copies of Air Barrier Inspector qualifications 30 days after Notice to Proceed.

1.8 DESIGN REVIEW

Review the Contract Plans and Specifications and advise the Contracting Officer of any deficiencies that would prevent the construction of an effective air barrier system. Provide a Design Review Report individually listing each deficiency and the corresponding proposed corrective action necessary for a proper air barrier system. Provide copies of the Design Review Report not later than 14 days after approval of the Air Barrier Inspector Qualifications. Submit design data and calculations for the Air Barrier System for a manufacturer produced and warranted air barrier system.

PART 2 PRODUCTS

2.1 AIR BARRIER

Provide air barrier system of compatible parts from one or several manufacturers coordinated by the Contractor or provide a single warranted system provided by a primary manufacturer. The air barrier system as part of a tested exterior wall assembly must meet the conditions of acceptance as tested in accordance with NFPA 285. Materials used for roof assembly air barrier must conform to the appropriate UL and FM wind and fire requirements for the specified roof assemblies.

If a complete air barrier system from a single manufacturer is utilized, whether warranted or not warranted, the air barrier system must conform to ASTM E2357.

Materials in the following categories, as used in the air barrier system or assembly of the exterior wall system, are tested and are required to

conform to ASTM E2178: Self-adhered sheet membranes, fluid applied membranes, spray polyurethane foam, mechanically fastened commercial building wrap, factory bonded membranes to sheathing, and adhesive backed commercial building wrap and accessory products.

Other materials used as an air barrier such as concrete, glass, wood, metal or gypsum board may or may not conform to ASTM E2178 but are acceptable provided that when integrated into the air barrier system or assemblies they are not subject to material or environmental induced degradation in their final produced state once incorporated in the permanent construction.

All materials used must be identifiable through manufacturer testing data or literature to be compatible with all the attached or adjoining materials or substrates used in the system.

Provide Air Barrier System Shop Drawings, Material Samples for Air Barrier System and Air Barrier System Product Data.

PART 3 EXECUTION

3.1 QUALITY CONTROL

3.1.1 Documentation and Reporting

Document the entire installation process on daily job site reports. These reports include information on the Installer, substrates, substrate preparation, products used, ambient and substrate temperature, the location of the air barrier installation, the results of the quality control procedures, and testing results.

3.1.2 Construction Mock-Up

Build mock-up prior to building envelope construction.

a. Prepare a construction mock-up to demonstrate proper installation of the air barrier assemblies and components. Include air barrier system connections between floor and wall, wall and window, and wall and roof. Also, include the sealing method between membrane joints at transitions from one material or component to another, at pipe or conduit penetrations of the wall and roof, and at duct penetration of the wall and roof. Work must not begin until the mock-up is satisfactory to the Contracting Officer.

b. Size the mock-up to approximately 8 feet long by 8 feet high. The mock-up must be representative of primary exterior wall assemblies and glazing components including backup wall and typical penetrations as acceptable to the Contracting Officer. A corner of the actual building may be used as the mock-up.

c. Mock-Up Tests for Adhesion: Test the mock-up of materials for adhesion in accordance with manufacturer's recommendations. Perform the test after the curing period recommended by the manufacturer. Record the mode of failure and the area which failed in accordance with ASTM D4541. When the air barrier material manufacturer has established a minimum adhesion level for the product on the particular substrate, the inspection report must indicate whether this requirement has been met. Where the manufacturer has not declared a minimum adhesion value for their product/substrate combination, simply record the value.

3.1.3 Quality Control Testing And Inspection

Conduct the following tests and inspections as applicable in the presence of the Contracting Officer during installation of the air barrier system, and submit quality control reports as indicated below.

a. Provide a Daily Report of Observations with a copy to the Contracting Officer.

b. Inspect to assure continuity of the air barrier system throughout the building enclosure and that all gaps are covered, the covering is structurally sound, and all penetrations are sealed allowing for no infiltration or exfiltration through the air barrier system.

c. Inspect to assure structural support of the air barrier system to withstand design air pressures.

d. Inspect to assure masonry surfaces receiving air barrier materials are smooth, clean, and free of cavities, protrusions and mortar droppings, with mortar joints struck flush or as required by the manufacturer of the air barrier material.

e. Inspect and test to assure site conditions for application temperature, and dryness of substrates are within guidelines.

f. Inspect to assure substrate surfaces are properly primed, if applicable, and in accordance with manufacturer's instructions. Priming must extend at least 2 inches beyond the air barrier material to make it obvious that the primer was applied to the substrate before the air barrier material.

g. Inspect to assure laps in materials are at least a 2-inch minimum, shingled in the correct direction or mastic applied in accordance with manufacturer's recommendations, and with no fishmouths.

h. Inspect to assure that a roller has been used to enhance adhesion. Identify any defects such as fishmouths, wrinkles, areas of lost adhesion, and improper curing. Note the intended remedy for the deficiencies.

i. Measure application thickness of liquid applied materials to assure that manufacturer's specifications for the specific substrate are met.

j. Inspect to assure that the correct materials are installed for compatibility.

k. Inspect to assure proper transitions for change in direction and structural support at gaps.

l. Inspect to assure proper connection between assemblies (membrane and sealants) for cleaning, preparation and priming of surfaces, structural support, integrity and continuity of seal.

m. Perform adhesion tests for fluid-applied and self-adhered air barrier membranes to assure that the manufacturer's specified adhesion strength properties are met. Determine the bond strength of coatings to substrate in accordance with ASTM D4541.

n. Provide cohesion tests for spray polyurethane foam (SPF). Perform the tests in accordance with the specification sections which specify these materials. Perform adhesion tests as follows: Using a coring tool remove a sample and determine the relative adhesion quality of the foam. If the foam is hard to remove and leaves small bits of foam on the substrate it is called cohesive foam failure and is considered the best adhesion. If the foam comes away from the substrate with some force but is clean, it is called a mechanical bond. If it comes away easily from the substrate, the adhesion is poor. Cohesive foam failure and a good mechanical bond are acceptable.

o. Provide written test reports of all tests performed.

3.2 REPAIR AND PROTECTION

Upon completion of inspection, testing, sample removal and similar services, repair damaged construction and restore substrates, coatings and finishes. Protect construction exposed by or for quality control service activities, and protect repaired construction.

-- End of Section --

SECTION 07 27 26

FLUID-APPLIED MEMBRANE AIR BARRIERS
08/23

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR BARRIER ASSOCIATION OF AMERICA (ABAA)

ABAA Accreditation	Accreditation
ABAA QAP	Quality Assurance Program

ASTM INTERNATIONAL (ASTM)

ASTM C1305/C1305M	(2016) Standard Test Method for Crack Bridging Ability of Liquid-Applied Waterproofing Membrane
ASTM D412	(2016; R 2021) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D4263	(1983; R 2018) Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
ASTM D4541	(2022) Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM D5590	(2017; R 2021) Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay
ASTM E96/E96M	(2022a; E 2023) Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
ASTM E283/E283M	(2019) Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E331	(2000; R 2023) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E2178	(2021a) Standard Test Method for

	Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials
ASTM E2357	(2018) Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 285	(2023) Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components

1.2 RELATED REQUIREMENTS

Coordinate the requirements of Section 07 27 10 BUILDING AIR BARRIER SYSTEM and other building enclosure sections to provide a complete building air barrier system. Submit all materials, components and assemblies of the air barrier system together as one complete submittal package.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Qualifications of Manufacturer; G

Qualifications of Installer; G

SD-02 Shop Drawings

Fluid-Applied Membrane Air Barrier Shop Drawings; G

SD-03 Product Data

Fluid-Applied Membrane Air Barrier; G

Transition Membrane; G

Primers, Adhesives, and Mastics; G

Reinforcement; G

Safety Data Sheets; G

SD-04 Samples

Fluid-Applied Membrane Air Barrier Mockup; G

SD-06 Test Reports

Capillary Moisture Test; G

Field Peel Adhesion Test; G

Flame Propagation of Wall Assemblies; G

Site Inspections Reports; G

SD-08 Manufacturer's Instructions

Fluid-Applied Membrane Air Barrier Manufacturer's Printed Instructions; G

Primers, Adhesives, and Mastics Printed Manufacturer's Instructions; G

1.4 MISCELLANEOUS REQUIREMENTS

For fluid-applied membrane air barriers provide the following:

1.4.1 Shop Drawings

Submit fluid-applied membrane air barrier shop drawings showing locations and extent of barrier assemblies, transition membranes, details of all typical conditions, intersections with other envelope assemblies and materials, and membrane counterflashings. Show details for bridging of gaps in construction, treatment of inside and outside corners, expansion joints, methods of attachment of materials covering the self-adhered barrier without compromising the barrier. Indicate how miscellaneous penetrations such as conduit, pipes, electric boxes, brick ties, and similar items will be sealed.

1.4.2 Product Data

Submit manufacturer's technical data indicating compliance with performance and environmental requirements. Submit fluid-applied membrane air barrier manufacturer's printed instructions for evaluating, preparing, and treating substrates, temperature and other limitations of installation conditions, safety requirements for installation, and Safety Data Sheets. Also, submit primers, adhesives and mastics printed manufacturer's instructions for installation conditions and safety requirements. Indicate flame and smoke spread ratings for all products.

1.4.3 Mockup

Provide a mockup of the fluid-applied membrane air barrier. Apply product in an area designated by the Contracting Officer. Apply an area of not less than 54 square feet. Include all components specified as representative of the complete system. Notify the Contracting Officer a minimum of 48 hours prior to the test application. Select a test area representative of conditions to be covered including window or door openings, wall to ceiling transitions, flashings, and penetrations, as applicable.

1.4.4 Test Reports

Submit test reports indicating that capillary moisture tests and field peel adhesion tests on all substrate materials have been performed and the

changes made, if required, in order to achieve successful and lasting adhesion. Submit test reports for flame propagation of wall assemblies tested in accordance with NFPA 285.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery

Deliver and store materials in sufficient quantity to allow for uninterrupted flow of work. Inspect materials delivered to the site for damage and store out of weather. Deliver materials to the jobsite in their original unopened packages, clearly marked with the manufacturer's name, brand designation, description of contents, and shelf life of containerized materials. Store and handle to protect from damage.

1.5.2 Storage

Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling. Protect stored materials from direct sunlight.

1.6 CAPILLARY MOISTURE TEST

Perform a capillary moisture test by plastic sheet method in accordance with ASTM D4263 on the construction mockup and substrate materials. Perform test after curing period as recommended by the air barrier manufacturer. Record mode of failure and area which failed in accordance with ASTM D4263. Once the air barrier material manufacturer has established a minimum adhesion or moisture level for the product on the particular substrate, indicate on the inspection report whether this requirement has been met. Where the manufacturer has not declared a minimum adhesion or moisture value for their product and substrate combination, the inspector must record actual values.

1.7 FIELD PEEL ADHESION TEST

Perform a field peel adhesion test on a construction mockup. Test the applied product for adhesion in accordance with manufacturer's recommendations. Perform test after curing period recommended by the manufacturer. Record mode of failure and area which failed in accordance with ASTM D4541. When the manufacturer has established a minimum adhesion level for the product on the particular substrate, the inspection report must indicate whether this requirement has been met. Where the manufacturer has not declared a minimum adhesion value for their product/substrate combination, the inspector must record actual values.

1.8 AIR BARRIER TESTING

Perform air barrier testing in accordance with Section 07 27 10 BUILDING AIR BARRIER SYSTEM.

1.9 QUALITY ASSURANCE

1.9.1 Qualifications of Manufacturer

Submit documentation verifying that manufacturer of fluid-applied membrane air barrier is currently accredited by the Air Barrier Association of America (ABAA Accreditation https://www.airbarrier.org/).

1.9.2 Qualifications of Installer

Submit documentation verifying that installers of the fluid-applied membrane air barrier are currently certified in accordance with the ABAA QAP Quality Assurance Program (https://www.airbarrier.org/qap/).

1.10 PRECONSTRUCTION MEETING

Conduct a preconstruction meeting a minimum of two weeks prior to commencing work specified in this specification Section. Agenda must include, at a minimum, construction and testing of construction mock-up, sequence of construction, coordination with substrate preparation, materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and details of construction. Attendance is required by representatives of related trades including covering materials, substrate materials, adjacent materials, and materials and components of the fluid-applied membrane air barrier.

1.11 ENVIRONMENTAL CONDITIONS

1.11.1 Temperature

Install fluid-applied membrane air barrier within the range of ambient and substrate temperatures as recommended in writing by the fluid-applied membrane air barrier manufacturer. Do not apply fluid-applied membrane air barrier to a damp or wet substrate. Do not apply during inclement weather or when ice, frost, surface moisture, or visible dampness is present on surfaces to be covered, or when precipitation is imminent.

1.11.2 Exposure to Weather

Protect fluid-applied membrane air barrier products from direct exposure to rain, snow, sunlight, mist, and other extreme weather conditions. Replace, at no additional cost to the Government, barrier products that have been exposed to ultraviolet (sun)light longer than allowed by manufacturer's written requirements.

PART 2 PRODUCTS

2.1 FLUID-APPLIED MEMBRANE AIR BARRIER

Provide a fluid-applied, vapor permeable, air barrier. This barrier must exhibit no visible water leakage when tested in accordance with ASTM E331 and must perform as a liquid water drainage plane with thru-wall flashing to discharge incidental condensation and water penetration to the exterior of the building enclosure. Provide products suitable for use within temperature ranges specified by manufacturer for the location of the project.

2.1.1 Physical Properties

a. Air Permeance (ASTM E2178): less than 0.004 CFM per sf at 1.57 psf.

b. Air Leakage (ASTM E2357, ASTM E283/E283M): Less than 0.04 CFM per sf at 1.57 psf at one inch.

c. Water Vapor Permeance (Vapor Permeable Membrane) (ASTM E96/E96M, desiccant method A): 10.0 perms.

d. Pull Adhesion (ASTM D4541): Not less than 15 psi.

e. Elongation (ASTM D412): Not less than 300 percent.

f. Low temperature Flexibility and Crack Bridging (ASTM C1305/C1305M): Pass at minus 15 degrees F.

g. Solids by Volume: minimum 50 percent.

h. Flame propagation of wall assemblies (NFPA 285): Pass

i. Resistance to Mold, Mildew and Fungal Growth (ASTM D5590): 0, No growth.

2.2 PRIMERS, ADHESIVES, AND MASTICS

Provide primers, adhesives, mastics, sealants and other accessories as recommended by manufacturer of fluid-applied membrane air barrier for a complete installation.

2.3 SHEET METAL FLASHING

Provide as specified in Section 07 60 00 FLASHING AND SHEET METAL.

2.4 JOINT SEALANTS

Provide as specified in Section 07 92 00 JOINT SEALANTS.

2.5 REINFORCEMENT

Provide fiberglass mesh tape, or fluid-applied air barrier manufacturer's approved comparable equivalent product, reinforcement at seams, edges, projections and penetrations. Reinforce all joints exceeding 1/4 inch with fiberglass mesh.

PART 3 EXECUTION

3.1 EXAMINATION

Before installing fluid-applied membrane air barrier, examine substrates, areas, and conditions under which fluid-applied membrane air barrier assemblies will be applied, with installer present, for compliance with requirements. Ensure the following conditions are met:

a. Surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the membranes.

b. Concrete and masonry surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions. Do not proceed with installation until after minimum concrete curing period recommended by fluid-applied membrane air barrier manufacturer.

c. Fill voids, gaps and spalled areas in substrate to provide an even plane. Strike masonry joints full flush.

d. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method in accordance with

ASTM D4263 and take suitable measures until substrate passes moisture test.

e. Verify sealants used in substrates, and in joints between substrates, are compatible with fluid-applied membrane air barrier.

3.2 PREPARATION

Clean, prepare, and treat substrate in accordance with manufacturer's written instructions. Ensure clean, dust-free, and dry substrate for fluid-applied membrane air barrier application.

a. Remove dust, dirt and other contaminants from joints and cracks before coating surfaces.

b. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through fluid-applied membrane air barrier.

c. At changes in substrate plane, provide transition material (bead of sealant, mastic, extruded silicone sealant, membrane counterflashing or other material recommended by manufacturer) under transition membrane to eliminate all sharp 90-degree inside corners and to make a smooth transition from one plane to another.

d. Provide mechanically fastened non-corrosive metal sheet to span gaps in substrate plane and to make a smooth transition from one plane to the other. Continuously support membrane with substrate.

e. For exterior sheathing substrates, ensure that exterior sheathing is stabilized, with corners and edges fastened with appropriate screws. Treat all joints in accordance with the air barrier manufacturer's instructions prior to application of air barrier material. Allow sufficient time for joint treatments to fully cure before application of transition membranes and fluid-applied membrane air barrier.

f. For concrete and masonry substrates, fill all voids and holes, particularly in mortar joints, with non-shrinking grout.

g. Mask off and cover adjacent surfaces to protect from spillage and overspray.

3.3 INSTALLATION

3.3.1 Installation of Transition Membrane

Install transition membrane materials in accordance with the details on the drawings, Section 07 13 53 ELASTOMERIC SHEET WATERPROOFING, and the following:

a. Install transition membrane at all required locations (such as at any voids, gaps, or interstitial spaces that the fluid-applied air barrier cannot adequately protect) prior to installation of the fluid-applied membrane air barrier.

b. Verify transition membrane is fully adhered to substrate and that its surface is clean, dry and wrinkle free prior to installation of the fluid-applied membrane air barrier.

c. Verify transition membrane completely covers all transition areas and provides continuity of the finished fluid-applied membrane air barrier without gaps or cracks.

3.3.2 Installation of Flashing

Counterflash upper edge of thru-wall flashing and fluid-applied air barrier. Counter flashing is specified in Section 07 60 00 FLASHING AND SHEET METAL. See applicable wall-type Sections for thru-wall flashing requirements.

3.3.3 Installation of Fluid-Applied Membrane Air Barrier

Install materials in accordance with manufacturer's recommendations and the following:

a. Apply fluid-applied membrane air barrier in single or dual coat application by spray or roller. Apply fluid-applied membrane air barrier within manufacturer's recommended temperature range for application.

b. Apply fluid-applied membrane air barrier in manner and at rate and wet film thickness recommended by manufacturer to yield a finished dry film thickness of not less than 90 mils or as otherwise required by the manufacturer for the application substrate material and surface roughness.

c. Apply fluid-applied membrane air barrier around all penetrations ensuring a complete and continuous air barrier. Lap fluid-applied membrane air barrier a minimum of 3 inch over transition membrane to seal leading edge.

d. Seal membrane terminations, heads of mechanical fasteners, masonry tie fasteners, around penetrations, HVAC assemblies, plumbing and electrical assemblies, doors, windows, louvers, and other assemblies penetrating the fluid-applied membrane air barrier with a termination sealant recommended by the fluid-applied membrane air barrier manufacturer.

e. Notify the Contracting Officer and Testing Agency upon completion of fluid-applied membrane air barrier installation. Air barrier materials and assemblies must remain exposed until tested and inspected in accordance with the ABAA protocol.

f. Do not allow materials to come in contact with chemically incompatible materials.

3.3.4 Installation of Reinforcement

Install reinforcement at projections, corners, joints, and penetrations where applicable.

3.4 FIELD QUALITY CONTROL

3.4.1 Site Inspections and Testing

Provide site inspections and testing in accordance with the manufacturer's instructions, Section 07 27 10 BUILDING AIR BARRIER SYSTEM and this Section.

a. Conduct inspections and testing at 5, 50, and 95 percent completion of this scope of work. Forward written inspection reports to the Contracting Officer within five working days of the inspection and test being performed.

b. If the inspections reveal defects, promptly remove and replace defective work at no additional expense to the Government.

3.5 PROTECTION AND CLEANING

3.5.1 Protection

Protect fluid-applied membrane air barrier assemblies from damage during application and remainder of construction in accordance with manufacturer's written instructions.

Coordinate installation, testing, and inspection procedures to ensure exposure period does not exceed that recommended by the product manufacturer. Remove and replace, at no additional cost to the government, membrane products that exceed manufacturer's allowed exposure limits.

3.5.2 Cleaning of Adjacent Surfaces

Clean excess product from adjacent construction using cleaning agents and procedures as recommended in writing by the manufacturer of each type of affected construction and as acceptable to same.

3.6 CLEANUP OF SPILLS

Conduct cleanup of uncured product spillage in accordance with manufacturer's written safe handling instructions.

-- End of Section --

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SECTION 07 27 36

SPRAY FOAM AIR BARRIERS
08/23

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR BARRIER ASSOCIATION OF AMERICA (ABAA)

ABAA Accreditation	Accreditation

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP Z9.2	(2018) Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems
ASSP Z88.2	(2015) American National Standard Practices for Respiratory Protection

ASTM INTERNATIONAL (ASTM)

ASTM C518	(2021) Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
ASTM C1029	(2020) Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation
ASTM C1060	(2011a; R 2015) Standard Practice for Thermographic Inspection of Insulation Installations in Envelope Cavities of Frame Buildings
ASTM C1303/C1303M	(2022) Standard Test Method for Predicting Long-Term Thermal Resistance of Closed-Cell Foam Insulation
ASTM C1338	(2019) Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings
ASTM D1621	(2016) Standard Test Method for Compressive Properties of Rigid Cellular Plastics
ASTM D1622	(2020) Apparent Density of Rigid Cellular Plastics
ASTM D1623	(2017) Standard Test Method for Tensile

	and Tensile Adhesion Properties of Rigid Cellular Plastics
ASTM D6226	(2021) Standard Test Method for Open Cell Content of Rigid Cellular Plastics
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E96/E96M	(2022a; E 2023) Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials
ASTM E283/E283M	(2019) Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E2178	(2021a) Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials
ASTM E2357	(2018) Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies

INTERNATIONAL CODE COUNCIL (ICC)

ICC 1100	(2019) Standard for Spray-applied Polyurethane Foam Plastic Insulation
ICC IBC	(2021) International Building Code

INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ISEA)

ANSI/ISEA Z87.1	(2020) Occupational and Educational Personal Eye and Face Protection Devices

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10	(2022; ERTA 1 2021) Standard for Portable Fire Extinguishers
NFPA 70	(2023; ERTA 7 2023; TIA 23-15) National Electrical Code
NFPA 211	(2019) Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances
NFPA 268	(2022) Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source
NFPA 285	(2023) Standard Fire Test Method for Evaluation of Fire Propagation

	Characteristics of Exterior Wall Assemblies Containing Combustible Components

SPRAY POLYURETHANE FOAM ALLIANCE (SPFA)

SPFA TechDocs	(2015) SPFA Technical Documents Library, four categories: General, Insulation, Roofing, Specialty

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-600-01	(2016; with Change 6, 2021) Fire Protection Engineering for Facilities

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.132	Personal Protective Equipment
29 CFR 1910.133	Eye and Face Protection
29 CFR 1910.134	Respiratory Protection

UNDERWRITERS LABORATORIES (UL)

UL 723	(2020) UL Standard for Safety Test for Surface Burning Characteristics of Building Materials

1.2 RELATED REQUIREMENTS

Coordinate the requirements of Section 07 27 10 BUILDING AIR BARRIER SYSTEM and other building envelope sections to provide a complete air barrier system. Submit all materials, components, and assemblies of the air barrier system together as one complete submittal package.

1.3 DEFINITIONS

1.3.1 Long Term Thermal Resistance (LTTR)

The thermal resistance value of a closed cell foam insulation product measured using accelerated aging ASTM C1303/C1303M equivalent to the time-weighted average thermal resistance value over 15 years. Loss in thermal resistance is attributable to changes in cell gas composition caused by diffusion of air into and blowing agent out of the foam cells.

1.3.2 SPFA TechDocs

Reformatted documents, named SPFA TechDocs (https://www.sprayfoam.org/SPFA_techdocs), is a repository of technical information containing common definitions used in this Section. The site is organized in four categories for easy reference and identification: Roofing, Insulation, Specialty and General.

Spray Polyurethane Foam: Thermal and air/vapor barrier system consisting of sprayed polyurethane foam (SPF).

1.4 SUBMITTALS

Government approval is required for submittals with a "G"classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Qualification of Manufacturer; G

Qualification of Installer; G

Quality Control Plan; G

Safety Plan; G

Fire Prevention Plan; G

Respiratory Protection Plan; G

SD-02 Shop Drawings

Spray Foam Air Barrier System Shop Drawings

Fire-Rated Assemblies; G

SD-03 Product Data

Blowing Agents; G

Open Cell SPF; G

Primers, Adhesives, and Mastics; G

Sealants; G

Safety Data Sheets; G

Thermal Barrier Materials; G

Ignition Barrier Coatings; G

Recycled Content for Open Cell Spray Foam Air Barrier; SSD-04 Samples

Spray Foam Air Barrier Mockup; G

SD-06 Test Reports

Mockup Peel Adhesion Test; G

Thermographic Test; G

Air Barrier Test; G

Fire-Ratings Of Thermal Barrier Materials; G

Flame Spread and Smoke Developed Index Ratings of SPF Products; G

Flame Propagation of Wall Assemblies; G

Site Inspections Reports; G

SD-07 Certificates

Indoor Air Quality for Spray Foam Air Barrier; S

SD-08 Manufacturer's Instructions

SPF Handling, Storage, and Spray Procedures; G

Substrate Preparation; G

Thermal Barrier; G

Manufacturer's Printed Installation Instructions for Primers, Adhesives, and Mastics; G

SD-09 Manufacturer's Field Reports

Core Samples; G

Daily Work Record; G

Visual Inspection and Thermal Scanning; G

1.5 MISCELLANEOUS REQUIREMENTS

For the spray foam air barrier system provide the following:

1.5.1 Shop Drawings

Submit spray foam air barrier system shop drawings showing locations, detailing, and extent of spray foam air barrier assemblies. Provide details of all typical conditions, intersections with other envelope assemblies and materials, membrane counter-flashings. Provide details for fire-rated assemblies and indicate materials for thermal barriers. Show details for bridging of gaps in construction, treatment of inside and outside corners, expansion joints, methods of attachment of materials covering the SPF without compromising the barrier. Indicate how miscellaneous penetrations such as conduit, pipes, electric boxes, brick ties, and similar items will be sealed.

1.5.2 Product Data

Submit manufacturer's technical data indicating compliance with performance and environmental requirements, manufacturer's printed instructions for evaluating, preparing, and treating substrates, temperature and other limitations of installation conditions, safety requirements for installation, and Safety Data Sheets. Indicate flame and smoke spread ratings for all products. Submit thermal barrier literature including material description, physical properties, fire-ratings, and manufacturer's printed installation instructions. Also include manufacturer's printed installation instructions for primers, adhesives, and mastics.

1.5.3 Mockup

Provide a spray foam air barrier mockup of each foam system specified. Apply foam in an area designated by the Contracting Officer. Apply an area of not less than 50 square feet. Include all components specified for the finished assembly including primers, support components, expansion and contraction joints, thermal barriers, and other accessories as representative of the complete system. Isolate the area and protect workers as required by 29 CFR 1910.132, 29 CFR 1910.133 and 29 CFR 1910.134. Notify the Contracting Officer a minimum of 48 hours prior to the test application. Select a test area representative of conditions to be sprayed including window or door openings, wall to ceiling transitions, flashings, and penetrations, as applicable.

1.5.4 Test Reports

Submit test reports indicating that mockup peel adhesion tests on all materials have been performed and the changes made, if required, in order to achieve successful and lasting adhesion. Submit test reports for flame spread and smoke developed index ratings of SPF products tested in accordance with ASTM E84 or UL 723. Submit test reports for flame propagation of wall assemblies tested in accordance with NFPA 285. Submit test reports for fire-ratings of thermal barrier materials tested in accordance with ASTM E84 or UL 723.

1.6 DELIVERY, STORAGE, AND HANDLING

1.6.1 Delivery

Deliver and store materials in sufficient quantity to allow for uninterrupted flow of work. Inspect materials delivered to the site for damage; unload and store out of weather. Deliver materials to the jobsite in their original unopened packages, clearly marked with the manufacturer's name, brand designation, description of contents, and shelf life of containerized materials. Store and handle to protect from damage. Submit SPF Handling, Storage, and Spray Procedures in accordance with submittal procedures.

1.6.2 Storage

Store materials in clean, dry areas, away from excessive heat, sparks, and open flame. Maintain temperatures in the storage area below the materials' flash point(s) and within limits recommended by the manufacturer's printed instructions. Provide ventilation in accordance with ASSP Z9.2 to prevent build-up of flammable gases. Store all chemicals in locations that limit the risk of contact with water, acids, caustics (such as lye), alcohols, and strong oxidizing and reducing agents.

1.6.3 Handling

Handle materials and containers safely and in accordance with manufacturer's recommendations. Store liquids in airtight containers and keep containers closed except when removing materials. Do not use equipment or containers containing remains of dissimilar materials. Do not expose foam component containers to direct sunlight. Containers exposed to long periods of cold may also exhibit separation and poor performance. Do not use materials from containers with content temperatures exceeding limits specified in the manufacturers installation

instructions.

Mark and remove from job site all chemicals which have been contaminated with moisture, that exceed shelf life limits, or that have been exposed to temperature extremes.

1.6.3.1 Venting and Handling of Material Containers

Partially unscrew material container and drum caps to gradually vent the containers prior to opening. Do not inhale vapors. Follow drum decontamination and disposal procedures recommended by the manufacturer or the American Chemistry Council's Center for the Polyurethanes Industry.

1.7 AIR BARRIER TESTING

Perform air barrier testing in accordance with Section 07 27 10 BUILDING AIR BARRIER SYSTEM.

1.8 SAFETY PROVISIONS

1.8.1 Fire Prevention

Provide a written fire prevention plan for the SPF application. Address specific fire hazards such as spontaneous combustion from exothermic heat build-up of SPF components during curing. Provide a continuous fire watch during mixing and spraying of SPF and for a minimum of 30 minutes after completion of work at the end of each day. Maintain fire watch for additional time as required to ensure no potential ignition conditions exist.

1.8.1.1 Fire Extinguishers

Provide two fire extinguishers of minimum 15 pounds capacity each, in accordance with NFPA 10, in the immediate vicinity of the work. CAUTION: Do not discharge high pressure carbon dioxide extinguishers where explosive vapors exist since the discharge can cause a spark which will ignite the vapors.

1.8.2 Respiratory Protection Plan

Provide a written respiratory protection plan in accordance with OSHA regulation 29 CFR 1910.134 that protects installers during application and addresses separation of the area to prevent other workers from entering the work area during spraying.

1.8.3 Isolation

Isolate the work area as recommended by spray foam manufacturer's written requirements. Prevent workers without respiratory, skin, and eye Personal Protective Equipment (PPE) or training from entering the work area or otherwise being exposed to airborne chemicals from off-gassing of the insulation in excess of permissible exposure limits. Display appropriate warning signage at all work area entry points. Provide negative pressure ventilation of the spray area to minimize chemical exposure for all workers.

1.8.4 Respirators and Eye Protection

Respiratory protective devices (respirators) must meet the requirements of

ASSP Z88.2. Eye and face protective equipment must meet the requirements of ANSI/ISEA Z87.1. Additionally, sprayers and workers in the immediate vicinity of the spray during indoor installation of high-pressure SPF must wear NIOSH-approved, full-face, supplied air respirators (SAR) or hoods operated in positive pressure or continuous flow mode. Workers not in the immediate vicinity of the sprayer must wear air purifying respirators (APR) with an organic gas / P100 particulate cartridge. During outdoor installation of high-pressure SPF, sprayers and workers in the immediate vicinity of the spray must wear air purifying respirators (APR) with an organic gas / P100 particulate cartridge.

Instruct personnel in the use of personal protective equipment. Maintain such equipment and inspect regularly. All workers using respirators are required to have undergone pulmonary function testing and fit testing and must provide certification that they have done so. Change APR cartridges in accordance with manufacturer's written recommendations.

1.8.5 Clothing and Gloves

Sprayers and workers must wear protective clothing and gloves in accordance with OSHA requirements during materials application. Disposable, chemically-resistant coveralls must be worn and must cover all exposed skin. Sprayers and workers must wear fabric gloves coated with nitrile, neoprene, butyl or PVC.

1.8.6 Additional Requirements

Require personnel to review the Health, Safety and Environmental Aspects of Spray Polyurethane Foam and Coverings published by the Spray Polyurethane Foam Alliance (SPFA) (https://www.sprayfoam.org/) and the American Chemistry Council Center for the Polyurethanes Industry. Verify compliance prior to allowing personnel on site for installation work.

1.9 QUALITY CONTROL

1.9.1 Qualification of Manufacturer

Submit documentation verifying that the manufacturer of the SPF is currently accredited by the Air Barrier Association of America (ABAA Accreditation https://www.airbarrier.org/) or by the Spray Polyurethane Foam Alliance (SPFA) Professional Certification Program (PCP).

1.9.2 Qualification of Installer

Submit documentation verifying that installers of the spray foam air barrier are currently certified to properly install SPF materials. Acceptable certifications include those provided by the approved product manufacturer, by ABAA/BPQI (Building Performance Quality Institute) or by the Spray Polyurethane Foam Alliance (SPFA) Professional Certification Program (PCP). Installers must provide photo identification certification cards for inspection upon request.

1.9.3 General Quality Requirements

Provide all products and installation in accordance with the approved product manufacturer's installation instructions. SPFA TechDocs requirements (https://www.sprayfoam.org/SPFA_techdocs) may be used if manufacturers installation instructions do not address specific applications and documented best practices.

1.10 PRECONSTRUCTION MEETING

Conduct a preconstruction meeting after approval of submittals and a minimum of two weeks prior to commencing work specified in this Section. Attendance is required by the Contracting Officer's designated personnel, Contractor, and representatives of related trades including covering materials, substrate materials, adjacent materials, and materials and components of the air/vapor/thermal barrier system. Agenda must include, at a minimum, the following items:

a. Drawings, specifications and submittals related to the SPF work;

b. Sequence of construction;

c. Coordination with substrate preparation work and responsibility of repairing defects in substrates. Determine method of ensuring SPF work does not begin until substrates have been inspected and accepted;

d. Ensure that all penetrations of the substrate by other trades are completed prior to SPF air barrier installation where possible; responsibility of sealing penetrations after SPF air barrier installation should be addressed.

e. Compatibility of materials;

f. Construction and testing of construction mockup;

g. Application of self-adhering air barrier transition strips and primer as required for sealing the spray foam air barrier system at openings including but not limited to windows, doors and louvers;

h. Spray foam air barrier system installation; including methods to be used to provide a continuous barrier at thru-wall flashing, penetrations, and covering of embed items;

i. Quality control plan including methods of applying the product so that a consistent thickness across the face of the substrate is achieved.

j. Procedures for SPF manufacturer's technical representative's onsite inspection and acceptance of substrates, contact info for the representative, frequency of visits, and distribution of copies of inspection reports. Determine where core samples will be taken and review procedures for daily documentation of SPF application.

k. Property protection measures, including isolation of the work, and prevention of overspray and clean-up should overspray occur.

l. Safety requirements, including review of PPE, fire prevention, safety plan, respirator plan, ventilation and separation of the work area, fall protection, and posting of warning signs. Provide a complete schedule and a detailed, written fire protection plan including temporary isolation of the product and the work area until permanent isolation or thermal barrier is in place.

1.11 PROJECT/SITE CONDITIONS

1.11.1 Temperature and Weather

Install SPF within the range of ambient and substrate surface temperatures in accordance with manufacturer's written instructions. Do not apply SPF to damp or wet substrates. Do not apply SPF during inclement weather or when ice, frost, surface moisture, or visible dampness is present on surfaces to be covered, or when precipitation is imminent. Do not apply SPF to exterior building surfaces when wind speeds exceed 25 miles per hour. Use moisture measuring methods and equipment to verify that the moisture conditions of substrate surfaces are in accordance with SPF manufacturer requirements prior to application. Substrate temperatures must be within limits recommended by the manufacturer's printed instructions.

1.11.2 Conditions for Primers

Follow manufacturer's printed application and curing instructions regarding ambient temperature minimum limits.

1.11.3 Conditions for Ignition Barriers

Ensure that sprayed surfaces comply with manufacturer's written requirements for application coverage, thickness, and curing prior to application of ignition barrier coatings.

1.11.4 Temporary Ventilation

Provide temporary ventilation for work of this Section in accordance with manufacturer's written instructions and with OSHA requirements for this type of application.

1.12 FOAM SPRAY EQUIPMENT

1.12.1 Applicator

Install spray foam with a plural-component proportioner, hoses and spray gun system approved by the spray foam manufacturer

Use a foam spray gun approved by the foam manufacturer that does not require a flushing solvent during the spray operation.

1.12.2 Equipment Calibration

Fully calibrate the foam metering equipment to monitor each liquid component to within 2 percent of the SPF manufacturer's required metering ratio. Calibrate spray equipment each day at the start of operations, after each restart if spraying operations have been terminated for more than one hour, whenever there is a change in fan pattern or pressure, whenever slow curing areas are noticed, whenever a change is made in hose length or working height, and after changeover between materials. Calibration consists of demonstrating that the equipment is adjusted to deliver components in proper mix and proportion. Conduct calibration tests on cardboard or plywood on a wall adjacent to the area to be sprayed.

1.12.3 Metering Equipment Requirements

Use foam metering equipment capable of developing and maintaining the SPF

manufacturer's required liquid component pressures and temperatures. Foam metering equipment must have gages for visual monitoring. Equipment must provide temperature control of foam components to within the temperature ranges recommended by the foam manufacturer's printed instructions.

1.12.4 Moisture Protection

Protect surfaces of supply containers and tanks used to feed foam metering equipment from moisture.

1.12.5 Compressed Air

Supply compressed air that is in contact with SPF during mixing or atomization through moisture traps that are continuously bled.

1.12.6 Dispense Excess Materials

Do not deposit materials used for cleaning of equipment or materials dispensed for calibration purposes and establishment of spray gun pattern onto the ground. Dispense such materials into scrap containers or onto plastic film, or cardboard, and dispose of in accordance with safety requirements and jobsite regulations.

PART 2 PRODUCTS

2.1 SPRAY FOAM AIR BARRIER

2.1.1 General

Provide an open cell sprayed in place, SPF that forms a continuous air /thermal barrier at the building enclosure. Provide in accordance with ASTM C1029, with the requirements of UFC 3-600-01, ICC IBC Chapter 26, ICC 1100, and NFPA 285. In the event of a conflict, the most stringent requirement applies. Provide all system components necessary for a complete, code compliant installation, whether indicated or not, including material support components, expansion and contraction joints, ignition barrier coatings,thermal barrier materials, and accessories.

2.1.2 Physical Properties

Provide an open cell product with the following characteristics:

a. Density (ASTM D1622): 0.4 to 1.5 lb per cf, nominal

b. Thermal Resistance (ASTM C518)

(1) Initial R-value per inch thickness: 4 sf·degrees F·h per Btu)

(2) Aged R-value per inch thickness (180 days at 76 degrees F): 3.8 sf·degrees F·h per Btu

c. Material Air Permeance (ASTM E2178): In accordance with Section 07 27 10 BUILDING AIR BARRIER SYSTEM at the minimum installed thickness.

d. Assembly Air Leakage (ASTM E2357, ASTM E283/E283M): In accordance with Section 07 27 10 BUILDING AIR BARRIER SYSTEM and Section 01 91 19 BUILDING ENCLOSURE COMMISSIONING the minimum installed thickness.

e. Compressive Strength (ASTM D1621): 3-5 psi

f. Tensile Strength (ASTM D1623): minimum 1 psi

g. Water Vapor Permeance (ASTM E96/E96M, water method): Maximum 22 Perms at 2 inch thickness

h. Surface Burning Characteristics (ASTM E84 or UL 723) 4 inch thickness:

(1) Flame Spread (FS) Index Rating less than 75.

(2) Smoke Developed (SD) Index Rating less than 150. SPF with an SD rating greater than 150 but less than 450 may be used when fully encapsulated. Approval of SPF product is contingent upon approval of encapsulation products and assemblies.

i. Open Cell Content (ASTM D6226): Greater than 92 percent

j. Fungi Resistance (ASTM C1338): Pass, with no growth

k. Recycled Content: minimum 9 percent (pre- and post-consumer). Provide data identifying percentage of recycled content for open cell spray foam air barrier.

2.1.3 Expansion and Contraction

Provide an assembly that allows for relative movement due to temperature, moisture, and air pressure changes. Provide expansion and contraction measures as required by the manufacturer's written recommendations.

2.1.4 Fire-ratings, Flame Spread and Smoke Developed Index Ratings

Where fire-rated materials are indicated, provide products with the appropriate markings of a qualified testing agency on the containers. Submit fire-rating test reports. Fire-rating test reports must include flame spread (FS) and smoke developed (SD) index data. Where FS and SD values of foam products do not meet requirements, provide code-compliant thermal barrier products or alternate assemblies and verify complete encapsulation of the spray foam air barrier through product data or on shop drawings. Submit for approval in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

2.1.5 Prohibited Materials

Products that contain hexabromocyclododecane (HBCD) flame retardants are prohibited. Products that contain hydrochlorofluorocarbons (HCFCs), chlorofluorocarbons (CFCs), or other hydrofluorocarbons (HFCs), or other blowing agents with Ozone Depletion Potential (ODP) greater than 0.015 or Global Warming Potential (GWP) above 16 are prohibited. For a list of foam blowing agents with ODP and GWP values see https://www.epa.gov/snap/substitutes-rigid-polyurethane-spray. Provide validation of indoor air quality for spray foam air barrier that no prohibited materials are used.

2.1.6 Thermal Barrier

2.1.6.1 SPF at Exterior Wall Assemblies

At exterior walls which do not meet the exceptions listed in ICC IBC

Chapter 26, separate the SPF from interior side of the wall assembly with continuous thermal barrier of 1/2 inch glass mat gypsum wallboard (GWB) in accordance with ICC IBC Chapter 26 requirements. Provide assembly tested in accordance with NFPA 285 for fire propagation and no sustained ignition when tested in accordance with NFPA 268.

2.2 PRIMERS, ADHESIVES, AND MASTICS

Provide primers, adhesives, mastics and other accessory materials as recommended by spray foam manufacturer's printed literature.

2.3 JOINT SEALANTS

As specified in Section 07 92 00 JOINT SEALANTS. Verify compatibility with other system products.

PART 3 EXECUTION

3.1 EXAMINATION

Before installing the spray foam air barrier and with the installer present, examine substrates, areas, and conditions under which SPF will be applied, for compliance with requirements. Ensure that surfaces are structurally sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants. Ensure that concrete surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions. Correct defects that adversely affect the spray foam application or performance. Verify that work by other trades is in place and complete prior to application of spray foam.

3.2 PREPARATION

3.2.1 Substrate Preparation

Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for spray foam application.

a. Prepare surfaces by brushing, scrubbing, scraping, or grinding to remove loose mortar, dust, oil, grease, oxidation, mill scale and other contaminants which will affect adhesion of the SPF.

b. Wipe down metal surfaces to remove release agents or other non-compatible coatings, using clean sponges or rags soaked in a solvent compatible with the SPF.

3.2.2 Protection

Protect adjacent areas and surfaces from spray applied materials in accordance with the following:

a. Mask and cover adjacent areas to protect from overspray.

b. Ensure required foam stops and back up materials are in place to achieve a complete seal.

c. Seal off ventilation equipment. Install temporary ducting and fans to provide required negative-pressure exhaust of spray fumes. Provide make-up air as required.

d. Erect barriers, isolate area, and post warning signs to notify non-protected personnel of the requirement to avoid the spray area.

3.2.3 Blocking Around Heat Producing Devices

Install non-combustible blocking around heat producing devices to provide the following clearances:

a. Recessed light fixtures, including wiring compartments, ballasts, and other heat producing devices, unless certified for installation surrounded by insulation: Minimum of 3 inches from outside face of fixtures and devices and in accordance with NFPA 70 and, if insulation is to be placed above fixture or device, 24 inches above fixture.

a. Vents and vent connectors used for venting products of combustion, flues, and chimneys other than masonry chimneys: Minimum clearances in accordance with NFPA 211.

3.2.4 Fire and Explosion Hazards

Prohibit open flames, sparks, welding, and smoking in the application area. Provide and maintain fire extinguishers of appropriate type, size and distance, as required by NFPA, in the application area. Apply SPF according to manufacturer's instructions regarding maximum pass thickness and curing time. Mix batches in small enough quantities to avoid spontaneous combustion from exothermic heat build-up of SPF components during curing.

3.2.5 Warning Signs

Post warning signs at ground level adjacent to the work area and a minimum of 150 feet from the application area stating the area is off limits to unauthorized persons and warning of potential hazards. Place clearly visible and legible warning sign at entrance to primary road leading to the project facility warning of presence of combustible materials, irritating fumes, and potential of overspray damage.

3.2.6 Prime Substrate

Provide as recommended by the manufacturer for each substrate to be primed. Use primers at full strength. Do not dilute primers unless required and as recommended in writing by the manufacturer. Do not use cleaning solvents for thinning primers or other materials. Ensure that diluted primer(s) meet VOC requirements.

3.3 INSTALLATION

3.3.1 Sequencing and Coordination

Sequence the work to prevent access to the work area by other trades during foam application and curing. Limit access of non-essential workers during application. Notify the Contracting Officer 24 hours in advance of spraying operations. Sequence spray foam work with other trades to permit continuous self-flashing of the spray foam air barrier. Ensure expansion and control joints are provided as detailed on the manufacturer's shop

drawings to accommodate the expansion of each layer of the air/vapor /thermal envelope. Provide temporary fire protection of uncured foam, and isolate the work area, until foam application is covered with a permanent thermal or ignition barrier.

3.3.2 Installation of Spray Foam Air Barrier

Install materials in accordance with paragraph SAFETY PROVISIONS, in accordance with manufacturer's recommendations, and in accordance with the following:

a. Use spray equipment that complies with foam manufacturer's recommendations for the specific type of application, and as specified herein. Record equipment settings on the Daily Work Record. Each proportioned unit can supply only one spray gun.

b. Apply only when surfaces and environmental conditions are within limits prescribed by the material manufacturer.

c. Continuously connect the spray foam air barrier between walls, roof, floor, and below grade assemblies to form a continuous integrated air barrier system around the entire building enclosure. Extend the spray foam air barrier into rough openings such as doors, windows, louvers, and other exterior penetrations. Use self-adhering air barrier transition strips if necessary to achieve full extension and continuity of the barrier at these locations. Seal edges of barrier at junctures with rough openings.

d. Install within manufacturer's tolerances, but not more than minus 1/4 inch or plus 1/2 inch.

e. Sequence work to completely seal all penetrations resulting from pipes, vents, wires, conduit, electrical fixtures, structural members, or other construction. If penetrations through the spray foam air barrier are made after the initial SPF application, reapply in accordance with manufacturer's written instructions for such remedial work.

f. Do not install SPF within 3 inches of heat emitting devices such as light fixtures and chimneys.

g. Finished surface of SPF must be free of voids and embedded foreign objects.

h. Remove masking materials and overspray from adjacent areas immediately after foam surface has hardened. Ensure cleaning methods do not damage work performed by other sections.

i. Trim, as required, any excess thickness that would interfere with the application of cladding and covering system by other trades.

j. Clean and restore surfaces soiled or damaged by work of other trades. Before cleaning and restoring damaged work, consult with other trades for appropriate and approved methods for cleaning and restoration to prevent further damage.

k. Complete connections to other components and repair any gaps, holes or other damage using material approved by the SPF manufacturer.

l. Provide expansion joints in the SPF application aligned with expansion joints in the building enclosure, where substrate materials change, and in accordance with manufacturer's recommendations.

m. Provide a continuous fire watch in accordance with paragraph SAFETY PROVISIONS.

3.4 FIELD QUALITY CONTROL

3.4.1 General Site Inspections and Testing

Provide site inspections and testing in accordance with the manufacturer's instructions, Section 07 27 10 BUILDING AIR BARRIER SYSTEM, and this Section.

a. Conduct inspections and testing at 5, 50, and 95 percent of completion of this scope of work. Forward written inspection reports to the Contracting Officer within 5 working days of the inspection and test being performed.

b. If inspections reveal defects, promptly remove and replace defective work at no additional expense to the Government.

3.4.2 Manufacturer Site Inspections

Manufacturer's technical representative must visit the site during the installation process to ensure the SPF and accessories are being applied in compliance with requirements. At a minimum, manufacturer's technical representative must be present at work startup and perform field inspection of the first day's completed application and at substantial completion, prior to demobilization. After each inspection, submit an inspection report signed by the manufacturer's technical representative, to the Contracting Officer within five working days. The inspection report must note overall quality of work, deficiencies, and recommended corrective actions in detail. Notify the Contracting Officer a minimum of two working days prior to site visits by manufacturer's technical representative.

3.4.3 Contractor's Site Inspections

Establish and maintain an inspection procedure to ensure compliance of the foam installation with Contract requirements. Conduct inspections and testing at 5, 50, and 95 percent completion of application. Forward written inspection reports to the Contracting Officer within five working days of the inspection and test being performed. Work not in compliance must be promptly removed and replaced or corrected, in an approved manner, at no additional cost to the Government. Quality control must include, but is not limited to, the following:

a. Observation of environmental conditions; number and skill level of insulation workers.

b. Verification of certification, listing, or label.

c. Verification of proper storage and handling of materials before, during, and after installation.

d. Inspection of SPF, support structure, primer, expansion joints, thermal barrier, vapor retarder, and accessories.

3.4.4 Peel Adhesion Test

Conduct in accordance with test protocol indicated in Part 1 paragraph MOCKUP PEEL ADHESION TEST.

3.4.5 Visual Inspection and Thermal Scanning

Following completion of installation, inspect the SPF surface or cavity using infrared (IR) scanning as specified in ASTM C1060,. Where the IR inspection indicates construction inconsistencies including wet insulation, remove inconsistent portions of the assembly and replace insulation to correct thermal anomalies. Reinspect and document corrections to the satisfaction of the Contracting Officer.

3.4.5.1 Thermographic Test Report

Include thermographs in color and a color temperature scale to define the temperature indicated by the various colors. Identify the high temperature reading, the outdoor air temperature, the building indoor air temperature, and the wind speed and direction. Note areas of compromise in the building enclosure, and note actions required and taken to correct those areas. Final thermography test report must demonstrate that the problem areas have been corrected. Submit the complete test and analysis.

3.5 CORRECTION OF DEFICIENCIES

Upon completion of inspection, testing, or sample taking, repair damaged construction, restore substrates and finishes, and protect repaired construction. Deficiencies found during inspection must be corrected within 5 working days following notification.

3.6 CLEANUP OF SPILLS

Conduct cleanup of uncured product spillage in accordance with paragraph SAFETY PROVISIONS and the manufacturer's written safe handling instructions and SDS. In the event of a conflict, the most stringent requirement governs.

3.7 PROTECTION AND CLEANING

3.7.1 Protection of Installed Work

Protect SPF installation from damage during application and remainder of construction period in accordance with manufacturer's written instructions. Repair damaged areas to new condition.

3.7.2 Cleaning of Adjacent Surfaces

Clean overspray from adjacent construction using cleaning agents and procedures as recommended in writing by the manufacturer of each type of affected construction and as acceptable to same.

-- End of Section --

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SECTION 07 42 63

FABRICATED WALL PANEL ASSEMBLIES
05/11, CHG 4: 08/20

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 501.1	(2017) Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 341	(2016) Seismic Provisions for Structural Steel Buildings

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI S100	(2012) North American Specification for the Design of Cold-Formed Steel Structural Members

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7-16	(2017; Errata 2018; Supp 1 2018) Minimum Design Loads and Associated Criteria for Buildings and Other Structures

AMERICAN WELDING SOCIETY (AWS)

AWS A5.1/A5.1M	(2012) Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding
AWS D1.1/D1.1M	(2020; Errata 1 2021) Structural Welding Code - Steel
AWS D1.2/D1.2M	(2014; Errata 1 2014; Errata 2 2020) Structural Welding Code - Aluminum

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A606/A606M	(2023) Standard Specification for Steel Sheet and Strip, High-Strength, Low-Alloy,

	Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance
ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A755/A755M	(2018) Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products
ASTM A780/A780M	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A924/A924M	(2022a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM A1008/A1008M	(2023) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
ASTM C273/C273M	(2020) Standard Test Method for Shear Properties of Sandwich Core Materials
ASTM C553	(2013; R 2019) Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
ASTM C612	(2014; R 2019) Standard Specification for Mineral Fiber Block and Board Thermal Insulation
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM D522/D522M	(2017) Mandrel Bend Test of Attached Organic Coatings
ASTM D1056	(2020) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D1621	(2016) Standard Test Method for Compressive Properties of Rigid Cellular Plastics
ASTM D1622/D1622M	(2014) Apparent Density of Rigid Cellular Plastics
ASTM D1667	(2022) Standard Specification for Flexible Cellular Materials - Poly (Vinyl Chloride) Foam (Closed-Cell)

ASTM D6226	(2021) Standard Test Method for Open Cell Content of Rigid Cellular Plastics
ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E283	(2019) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E331	(2000; R 2023) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E1592	(2017) Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference

METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)

MBMA MBSM	(2018) Metal Building Systems Manual

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM AMP 500	(2006) Metal Finishes Manual

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1793	(2012) Architectural Sheet Metal Manual, 7th Edition

UNDERWRITERS LABORATORIES (UL)

UL 580	(2006; Reprint Mar 2019) UL Standard for Safety Tests for Uplift Resistance of Roof Assemblies
UL Bld Mat Dir	(updated continuously online) Building Materials Directory

1.2 DEFINITIONS

Fabricated Wall Panel Assembly: Metal wall and liner panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories shop fabricated or field assembled for a complete weather-tight wall system.

1.3 DESCRIPTION OF FABRICATED WALL PANEL ASSEMBLY SYSTEM

Factory color finished, galvanized metal wall panel system with concealed fastening attachment. Panel profile must be smooth facestriated. Interior finish of panel assembly to be manufacturer's standard.

1.3.1 Metal Wall Panel General Performance

Comply with performance requirements, conforming to AISI S100, without failure due to defective manufacture, fabrication, installation, or other defects in construction. Wall panels and accessory components must conform to the following standards:

ASTM A1008/A1008M
ASTM A123/A123M
ASTM A36/A36M
ASTM A653/A653M
ASTM A606/A606M
ASTM A755/A755M for metallic coated steel sheet for exterior coil pre-painted applications.
ASTM A780/A780M for repair of damage or uncoated areas of hot-dipped galvanized coating.
ASTM A924/A924M for metallic coated steel sheet
ASTM C273/C273M
ASTM D522/D522M for applied coatings
UL Bld Mat Dir

1.3.2 Structural Performance

Maximum calculated fiber stress must not exceed the allowable value in the AISI or AA manuals; a one third overstress for wind is allowed. Midspan deflection under maximum design loads is limited to L/180. Contract drawings show the design wind loads and the extent and general assembly details of the metal siding. Contractor must provide design for members and connections not shown on the drawings. Siding panels and accessories must be the products of the same manufacturer.

Provide metal wall panel assemblies complying with the load and stress requirements in accordance with ASTM E1592. Wind Load force due to wind action governs the design for panels.

Wall systems and attachments are to resist the wind loads as determined by UL 580 and ASCE 7-16 in the geographic area where the construction will take place, in pounds per square foot. Submit five copies of wind load tests and seismic tests to the Contracting Officer.

Provide metal wall panel assembly for seismic conditions complying with the applicable requirements of AISC 341.

1.3.3 Air Infiltration

Air leakage must conform to the limits through the wall assembly area when tested according to ASTM E283.

1.3.4 Water Penetration Under Static Pressure

No water penetration when tested according to ASTM E331.

1.3.5 Water Penetration Under Dynamic Pressure

No evidence of water leakage when tested according to AAMA 501.1.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Qualification of Manufacturer

Qualification of Installer

Qualifications for Welding Work

SD-02 Shop Drawings

Fabrication and Installation drawings for the following items are to indicate completely dimensioned structural frame and erection layouts, openings in the wall, special framing details, and construction details at corners, building intersections and flashing, location and type of mastic and metal filler strips.

Wall Panel Assemblies

Flashing and Accessories

Anchorage Systems

SD-03 Product Data

Submit Manufacturer's data indicating percentage of recycle material in wall panels to verify sustainable acquisition compliance.

Submit Manufacturer's catalog data for the following items:

Factory Color Finish

Sub-girts and Formed Shapes

Closure Materials

Insulation

Pressure Sensitive Tape

Sealants and Caulking

Rated Wall Assembly

Galvanizing Repair Paint

Accessories

SD-04 Samples

Submit as required each of the following samples:

Wall Panel Assemblies, 12 inches long by actual panel width

Fasteners

Metal Closure Strips, 10 inches long of each type

Insulation, approximately 8 by 11 inches

Submit manufacturer's color charts and chips, approximately 4 by 4 inches, showing full range of colors, textures and patterns available for wall panels with factory applied finishes.

SD-05 Design Data

Wind Design Analysis

SD-06 Test Reports

Submit test reports for the following in accordance with the referenced articles in this section.

Leakage Tests

Wind Load Tests

Seismic Tests

Coatings and base metals of metal wall type of test as specified in paragraphs STEEL SHEET MATERIALS and in various referenced standards in this section.

Factory Color Finish Performance Requirements

SD-07 Certificates

Submit certificates for the following items showing conformance with referenced standards contained in this section:

Fasteners

Galvanizing Repair Paint

Provide evidence that products used within this specification are manufactured in the United States.

Submit the wall system assembly wind load and fire rating classification listings.

SD-08 Manufacturer's Instructions

Installation of Wall Panels

Include detailed application instructions and standard manufacturer drawings altered as required by these specifications. Explicitly identify in writing, differences between manufacturer's instructions and the specified requirements.

SD-11 Closeout Submittals

Warranty

Instructions To:

Government and/or Contractor Personnel

Safety Data Sheets

Submit 20 year "No-Dollar-Limit" Warranty for labor and materials.

1.5 QUALITY ASSURANCE

1.5.1 Pre-Installation Conference

After submittals are received and approved but before wall panel and insulation work, including associated work, is performed, the Contracting Officer will hold a pre-siding conference to review the following:

a. The drawings, including Fabrication and Installation drawings,showing complete Wall Panel Assemblies, and specifications.
Include details for the following for review:

flashing and accessories
anchorage systems
manufacturer's catalog data
Factory Color Finish

Submit manufacturer's color charts and chips, approximately 4 by 4 inches, showing full range of colors, textures and patterns available for wall panels with factory applied finishes.

Sub-girts and Formed Shapes
Closure Materials, including metal closure strips.
Insulation
Pressure Sensitive Tape
Rated Wall Assembly test data
Accessories
Fasteners

b. Finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

c. Methods and procedures related to metal wall panel installation, including manufacturer's written instructions for Installation of Wall panels, and verification of wall system assembly wind load and fire rating classification listings.

d. Support conditions for compliance with requirements, including alignment between and attachment to structural members. Provide details of wind design analysis including wind speed, exposure category, co-efficient, importance factor, designates type of facility, negative pressures for each zone, methods and requirements of attachment. Wind design analysis to include wall plan delineating dimensions and attachment patterns for each zone. Wind design analysis to be prepared and sealed by Licensed Project Engineer in the

geographic area where the construction will take place.

e. Flashing, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.

f. Governing regulations and requirements for insurance, certificates, tests and inspections if applicable. Include certification for sustainable acquisition and wall system assembly wind load and fire rating classification. Safety plan review must include applicable Safety Data Sheets for maintenance/repair materials.

g. Temporary protection requirements for metal wall panel assembly during and after installation.

h. Wall panel observation and repair procedures after metal wall panel installation. Include review of sample Galvanizing Repair Paint.

i. Sample 20 year "No-Dollar-Limit" warranty.

1.5.2 Manufacturer's Technical Representative

The representative must have authorization from manufacturer to approve field changes and be thoroughly familiar with the products and installations in the geographical area where construction will take place.

1.5.3 Qualification of Manufacturer

Metal wall panel system manufacturer must have:

a. A minimum of five (5) years experience in manufacturing metal wall system and accessory products.

b. Provide engineering services by an authorized engineer; currently licensed in the geographical area where construction will take place, having a minimum of four (4) years experience as an engineer knowledgeable in wind load design analysis, protocols and procedures for the MBMA MBSM; ASCE 7-16, and ASTM E1592.

c. Provide certified engineering calculations using the products submitted for:

Wind load requirements in accordance with FM Wind Design Guide and ASCE 7-16.

1.5.4 Qualification of Installer

The installation contractor must be approved and certified by the wall panel manufacturer prior to beginning the installation of the metal wall system.

1.5.4.1 Qualifications for Welding Work

Welding procedures must conform to AWS A5.1/A5.1M, AWS D1.1/D1.1M for steel or AWS D1.2/D1.2M for aluminum.

1.5.5 Single Source

Obtain each type of metal wall and liner panels, clips, closures and other accessories from the standard products of the single source from a single

manufacturer to operate as a complete system for the intended use.

1.5.6 Surface-Burning Characteristics

Provide metal wall panels having insulation core material with the following surface-burning characteristics as determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450 or less.

1.5.7 Fabrication

Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

Fabricate metal wall panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weather-tight and minimize noise from movements within panel assembly.

1.5.7.1 Sheet Metal Accessories

Fabricate flashing and trim to comply with recommendations in SMACNA 1793 that apply to the design, dimensions, metal, and other characteristics of item indicated:

a. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

b. End Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

c. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

d. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

e. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA or by metal wall panel manufacturer for application, but not less than thickness of metal being secured.

1.5.8 Finishes

Comply with NAAMM AMP 500 for recommendations for applying and designating finishes.

Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are

acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

1.6 DELIVERY, HANDLING, AND STORAGE

Deliver and package components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed and protected during transportation and handling.

Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.

Stack and store metal wall panels horizontally on platforms or pallets, covered with suitable weather-tight and ventilated covering to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.

Retain strippable protective covering on metal wall panel for period of metal wall panel installation.

Protect foam-plastic insulation as follows:

a. Do not expose to sunlight, except to extent necessary for period of installation and concealment.

b. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.

Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.7 PROJECT CONDITIONS

Weather Limitations: Proceed with installation preparation only when existing and forecasted weather conditions permit Work to proceed without water entering into existing walling system or building.

Field Measurements: Verify locations of wall framing and opening dimensions by field measurements before metal wall panel fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

Furnish manufacturer's no-dollar-limit warranty for the metal wall panel system. The warranty period is to be no less than twenty (20) years from the date of Government acceptance of the work. The warranty is to be issued directly to the Government. The warranty is to provide that if within the warranty period the metal wall panel system shows evidence of corrosion, perforation, rupture or excess weathering due to deterioration of the wall panel system resulting from defective materials and correction of the defective workmanship is to be the responsibility of the metal wall panel system manufacturer. Repairs that become necessary because of defective materials and workmanship while metal wall panel system is under warranty are to be performed within 24 hours after notification, unless additional time is approved by the Contracting Officer. Failure to perform repairs within 24 hours of notification will constitute grounds for having emergency repairs performed by others and not void the warranty.

PART 2 PRODUCTS

2.1 PANEL MATERIALS

2.1.1 Foam-Insulation Core Wall Panel

Provide factory-formed steel wall panel assembly fabricated from two sheets of metal with modified polyisocyanurate or polyurethane foam insulation core foamed-in-place during fabrication with joints between panels designed to form weather-tight seals. Include accessories required for weather-tight installation.

a. Closed-Cell Content: 90 percent when tested according to ASTM D6226.

b. Density: 2.0 to 2.6 lb/cu. ft. when tested according to ASTM D1622/D1622M.

c. Compressive Strength: Minimum 20 psi when tested according to ASTM D1621.

d. Shear Strength: 26 psi when tested according to ASTM C273/C273M.

2.1.2 Insulated Panel Construction

Shop fabricate or field assemble insulated panel construction with specified exterior and interior steel sheet in accordance with manufacturer's printed instructions.

Insulation to be rock-wool-fiber conforming to ASTM C553 and ASTM C612 of thickness and density as required for the geographical area where construction will take place. Glass-Fiber and Mineral-Wool-Fiber are materials listed in the EPA's Comprehensive Procurement Guidelines (CPG) (http://www.epa.gov/cpg/).

Insulation fasteners to be adhesively attached, plate welded to projecting spindle anchors; capable of holding insulation of thickness indicated, secured in position with self-locking washer and complying with the following requirements:

a. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.

b. Spindle: Copper-coated, low carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.

c. Insulation-Retaining Washers: Self-locking washers formed from 0.016 inch thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.

d. Anchor adhesive to be a product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

2.2 MISCELLANEOUS METAL FRAMING

2.2.1 General

Cold-formed metallic-coated steel sheet conforming to ASTM A653/A653M and

specified in Division 05 Section 05 40 00 "Cold-Formed Metal Framing" unless otherwise indicated.

2.3 FASTENERS

2.3.1 General

Type, material, corrosion resistance, size and sufficient length to penetrate the supporting member a minimum of 1 inch with other properties required to fasten miscellaneous metal framing members to substrates in accordance with the wall panel manufacturer's and ASCE 7-16 requirements.

2.3.2 Exposed Fasteners

Fasteners for wall panels to be corrosion resistant coated steel, aluminum, stainless steel, or nylon capped steel compatible with the sheet panel or flashing and of a type and size recommended by the manufacturer to meet the performance requirements and design loads. Fasteners for accessories to be the manufacturer's standard. Provide an integral metal washer matching the color of attached material with compressible sealing EPDM gasket approximately 3/32 inches thick.

2.3.3 Screws

Screws to be corrosion resistant coated steel, aluminum and/or stainless steel being the type and size recommended by the manufacturer to meet the performance requirements.

2.3.4 Rivets

Rivets to be closed-end type, corrosion resistant coated steel, aluminum or stainless steel where watertight connections are required.

2.3.5 Attachment Clips

Fabricate clips from steel hot-dipped galvanized in accordance with ASTM A653/A653M, or Series 300 stainless steel. Size, shape, thickness and capacity as required meeting the insulation thickness and design load criteria specified.

2.4 ACCESSORIES

2.4.1 General

All accessories to be compatible with the metal wall panels. Sheet metal flashing, trim, metal closure strips, caps and similar metal accessories must not be less than the minimum thickness specified for the wall panels. Exposed metal accessories/finishes to match the panels furnished, except as otherwise indicated. Molded foam rib, ridge and other closure strips to be non-absorbent closed-cell or solid-cell synthetic rubber or pre-molded neoprene to match configuration of the panels.

2.4.2 Rubber Closure Strips

Closed-cell, expanded cellular rubber conforming to ASTM D1056 and ASTM D1667; extruded or molded to the configuration of the specified wall panel and in lengths supplied by the wall panel manufacturer.

2.4.3 Metal Closure Strips

Factory fabricated steel closure strips to be the same thickness, color, finish and profile of the specified wall panel.

2.4.4 Joint Sealants

2.4.4.1 Sealants and Caulking

Sealants are to be an approved gun type for use in hand- or air-pressure caulking guns at temperatures above 40 degrees F (or frost-free application at temperatures above 10 degrees F) with minimum solid content of 85 percent of the total volume. Sealant is to dry with a tough, durable surface skin which permits it to remain soft and pliable underneath, providing a weather-tight joint. No migratory staining is permitted on painted or unpainted metal, stone, glass, vinyl, or wood.

Prime all joints to receive sealants with a compatible one-component or two-component primer as recommended by the wall panel manufacturer.

2.4.4.2 Shop-Applied

Sealant for shop-applied caulking must be an approved gun grade, non-sag one component polysulfide or silicone conforming to ASTM C920, Type II, and with a curing time to ensure the sealant's plasticity at the time of field erection.

2.4.4.3 Field-Applied

Sealant for field-applied caulking must be an approved gun grade, non-sag one component polysulfide or two-component polyurethane with an initial maximum Shore A durometer hardness of 25, and conforming to ASTM C920, Type II. Color to match panel colors.

2.4.4.4 Tape Sealant

Pressure sensitive, 100 percent solid with a release paper backing; permanently elastic, non-sagging, non-toxic and non-staining as approved by the wall panel manufacturer.

2.5 SHEET METAL FLASHING AND TRIM

2.5.1 Fabrication

Shop fabricate sheet metal flashing and trim where practicable to comply with recommendations in SMACNA 1793 that apply to design, dimensions, metal, and other characteristics of item indicated. Obtain field measurements for accurate fit before shop fabrication.

Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

2.6 REPAIR OF FINISH PROTECTION

Repair paint for color finish enameled wall panel must be compatible paint of the same formula and color as the specified finish furnished by the wall panel manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of the Work.

B. Examine primary and secondary wall framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal wall panel manufacturer, UL, ASTM, ASCE 7-16 and as required for the geographical area where construction will take place.

C. Examine solid wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.

D. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.

E. Submit to the Contracting Officer a written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.

B. Miscellaneous Framing: Install sub-purlins, girts, angles, furring, and other miscellaneous wall panel support members and anchorage according to metal wall panel manufacturer's written instructions.

3.3 WALL PANEL INSTALLATION

Provide metal wall panels of full length from sill to eave as indicated, unless otherwise indicated or restricted by shipping limitations. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement in accordance with MBMA Metal Building Systems Manual.

a. Steel Wall Panels: Use stainless-steel fasteners for exterior surfaces and galvanized steel fasteners for interior surfaces.

b. Aluminum Wall Panels: Use aluminum or stainless-steel fasteners for exterior surfaces and aluminum or galvanized steel fasteners for interior surfaces.

c. Anchor Clips: Anchor metal wall panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturer's written instructions.

d. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying

rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal wall panel manufacturer.

e. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.

Erect wall panel system in accordance with the approved erection drawings, the printed instructions and safety precautions of the manufacturer.

Sheets are not to be subjected to overloading, abuse, or undue impact. Bent, chipped, or defective sheets shall not be applied.

Sheets must be erected true and plumb and in exact alignment with the horizontal and vertical edges of the building, securely anchored, and with the indicated eave, and sill.

Work is to allow for thermal movement of the wall panel, movement of the building structure, and to provide permanent freedom from noise due to wind pressure.

Field cutting metal wall panels by torch is not permitted.

3.4 FASTENER INSTALLATION

Anchor metal wall panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturer's written instructions.

3.5 FLASHING, TRIM AND CLOSURE INSTALLATION

3.5.1 General Requirements

Comply with performance requirements, manufacturer's written installation instructions, and SMACNA 1793. Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

Sheet metalwork is to be accomplished to form weather-tight construction without waves, warps, buckles, fastening stresses or distortion, and allow for expansion and contraction. Cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades is to be performed by sheet metal mechanics.

3.5.2 Metal Flashing

Exposed metal flashing is to be installed at building corners, sills and eaves, junctions between metal siding and walling.

Exposed metal flashing is to be the same material, color, and finish as the specified metal wall panel.

Flashing is to be fastened at not more than 8 inches on center, except where flashing are held in place by the same screws that secure covering sheets.

Flashing is to be furnished in at least 8 foot lengths. Exposed flashing is to have 1 inch locked and blind-soldered end joints, and expansion joints at intervals of not more than 16 feet.

Exposed flashing and flashing subject to rain penetration to be bedded in the specified joint sealant.

Flashing which is in contact with dissimilar metals to be isolated by means of the specified asphalt mastic material to prevent electrolytic deterioration.

Drips to be formed to the profile indicated, with the edge folded back 1/2 inch to form a reinforced drip edge.

3.5.3 Closures

Install metal closure strips at open ends of corrugated or ribbed pattern walls, and at intersection of wall and wall unless open ends are concealed with formed eave flashing; and in other required areas.

Install mastic closure strips at intersection of the wall with metal walling; top and bottom of metal siding; heads of wall openings; and in other required locations.

3.6 WORKMANSHIP

Make lines, arises, and angles sharp and true. Free exposed surfaces from visible wave, warp, buckle, and tool marks. Fold back exposed edges neatly to form a 1/2 inch hem on the concealed side. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction.

Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections which might affect the application. For installation of items not shown in detail or not covered by specifications conform to the applicable requirements of SMACNA 1793. Provide sheet metal flashing in the angles formed where roof decks abut walls, curbs, ventilators, pipes, or other vertical surfaces and wherever indicated and necessary to make the work watertight.

3.7 ACCEPTANCE PROVISIONS

3.7.1 Erection Tolerances

Erect metal wall panels straight and true with plumb vertical lines correctly lapped and secured in accordance with the manufacturer's written instructions. Horizontal lines must not vary more than 1/8 inch in 40 feet.

3.7.2 Leakage Tests

Inspect and test finished application of metal wall panels when directed to do so by the Contracting Officer. Inspection and tests must be conducted without cost to the Government.

Inspection and testing is to be made promptly after erection to permit correction of defects and the removal and replacement of defective materials.

3.7.3 Repairs to Finish

Scratches, abrasions, and minor surface defects of finish may be repaired with the specified repair materials. Finished repaired surfaces must be uniform and free from variations of color and surface texture.

Repaired metal surfaces that are not acceptable to the project requirements are to be immediately removed and replaced with new material.

3.7.4 Paint-Finish Metal Siding

Paint-finish metal siding will be tested for color stability by the Contracting Officer during the manufacturer's specified guarantee period.

Panels that indicate color changes, fading, or surface degradation, determined by visual examination, must be removed and replaced with new panels at no expense to the Government.

New panels will be subject to the specified tests for an additional year from the date of their installation.

3.8 CLEAN-UP AND DISPOSAL

Clean all exposed sheet metal work at completion of installation. Remove metal shavings, filings, nails, bolts, and wires from work area. Remove grease and oil films, excess sealants, handling marks, contamination from steel wool, fittings and drilling debris and scrub the work clean. Exposed metal surfaces to be free of dents, creases, waves, scratch marks, solder or weld marks, and damage to the finish coating.

Collect and place scrap/waste materials in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site; transport demolished materials from government property and legally dispose of them.

-- End of Section --

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SECTION 07 60 00

FLASHING AND SHEET METAL
08/23

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A792/A792M	(2022) Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
ASTM D2244	(2021) Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D4214	(2007; R 2015) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D4586/D4586M	(2007; R 2018) Asphalt Roof Cement, Asbestos-Free

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

NRCA 0429	(2022) The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control and Reroofing

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1793	(2012) Architectural Sheet Metal Manual, 7th Edition

SINGLE PLY ROOFING INDUSTRY (SPRI)

ANSI/SPRI RD-1	(2019) Performance Standard for Retrofit Drains

1.2 GENERAL REQUIREMENTS

Finished sheet metal assemblies must form a weathertight enclosure without waves, warps, buckles, fastening stresses or distortion, while allowing for expansion and contraction without damage to the system. The sheet

metal installer is responsible for cutting, fitting, drilling, and other operations in connection with sheet metal modifications required to accommodate the work of other trades. Coordinate installation of sheet metal items used in conjunction with roofing with roofing work to permit continuous, uninterrupted roofing operations.

1.2.1 General Material Requirements

All materials specified in this Section installed in conjunction with the roofing system must be provided by the roofing system manufacturer, or by a manufacturer approved by the roofing system manufacturer for use in the roofing system, and must form a part of the Warranty as required by the applicable roofing system Section.

1.3 SUBMITTALS

Government approval is required for submittals with a "G"classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Exposed Sheet Metal Coverings; G

Gutters; G

Downspouts; G

Gravel Stops and fascia; G

Flashing for Roof Drains; G

Copings; G

Recycled Content; S

SD-04 Samples

Finish Samples; G

SD-07 Certificates

Warranty on Finishes; G

SD-08 Manufacturer's Instructions

Instructions for Installation; G

Quality Control Plan; G

SD-10 Operation and Maintenance Data

Cleaning and Maintenance; G

1.4 MISCELLANEOUS REQUIREMENTS

1.4.1 Product Data

Indicate thicknesses, dimensions, fastenings, anchoring methods, expansion joints, and other provisions necessary for thermal expansion and contraction. Scaled manufacturer's catalog data may be submitted for factory fabricated items.

1.4.2 Finish Samples

Submit two color charts and two finish sample chips from manufacturer's standard color and finish options for each type of finish indicated.

1.4.3 Operation and Maintenance Data

Submit detailed instructions for installation and quality control during installation, cleaning and maintenance, for each type of assembly indicated.

1.5 DELIVERY, HANDLING, AND STORAGE

Package and protect materials during shipment. Uncrate and inspect materials for damage, dampness, and wet-storage stains upon delivery to the job site. Remove from the site and replace damaged materials that cannot be restored to like-new condition. Handle sheet metal items to avoid damage to surfaces, edges, and ends. Store materials in dry, weather-tight, ventilated areas until installation.

PART 2 PRODUCTS

2.1 RECYCLED CONTENT

Provide products with recycled content. Provide data for each product with recycled content, identifying percentage of recycled content.

2.2 MATERIALS

Use any metal listed by NRCA 0429 or SMACNA 1793 for a particular item, unless otherwise indicated. Provide materials and configurations in accordance with NRCA 0429 or SMACNA 1793 for each material, while also meeting the minimum thickness requirements specified in this Section. Different items need not be of the same metal, except that contact between dissimilar metals must be avoided.

Provide sheet metal items in 8 to 10 foot lengths. Single pieces less than 8 feet long may be used to connect to factory-fabricated inside and outside corners, and at ends of runs. Factory fabricate corner pieces with minimum 12 inch legs. Provide accessories and other items essential to complete the sheet metal installation. Provide accessories made of the same or compatible materials as the items to which they are applied. Fabricate sheet metal items of the materials specified below and to the gage, thickness, or weight shown in Table I at the end of this section. Provide sheet metal items with mill finish unless specified otherwise. Where more than one material is listed for a particular item in Table I, each is acceptable and may be used, except as follows:

2.2.1 Exposed Sheet Metal Items

Provide exposed sheet metal items of the same material. Consider the following as exposed sheet metal: gutters, including hangers; downspouts; gravel stops and fascia; cap, valley, steeped, base, and eave flashings and related accessories.

2.2.2 Drainage

Do not use copper for an exposed item if drainage from that item will pass over exposed masonry, stonework or other metal surfaces. In addition to the metals listed in Table I, lead-coated copper may be used for such items.

2.2.3 Steel Sheet, Zinc-Coated (Galvanized)

Provide in accordance with ASTM A653/A653M, a minimum of 24 gauge, and a minimum zinc coat weighting of 90 ounces per square feet.

2.2.4 Steel Sheet, Aluminum Zinc-Coated

Provide in accordance with ASTM A792/A792M, a minimum of 24 gauge.

2.2.5 Finishes

Provide exposed exterior sheet metal and aluminum with a baked on, factory applied coil fluoropolymer color coating or approved equal siliconized polyester coating. Dry film thickness of coatings must be 0.8 to 1.3 mils. Color to be selected from as indicated on the Drawings. Field applications of color coatings are prohibited and will be rejected.

2.2.5.1 Warranty on Finishes

Provide a manufacturer's warranty to repair, or replace, sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within 20 years from date of project substantial completion. Deterioration includes the following:

a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.

b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2.2.6 Copings

Unless otherwise indicated, provide copings in copper sheets, 8 or 10 feet long, joined by a 3/4 inch locked and soldered seam.

2.2.7 Bituminous Plastic Cement

Provide in accordance with ASTM D4586/D4586M, Type I.

2.2.8 Fasteners

Use the same metal as, or a metal compatible with the item fastened. Use

stainless steel fasteners to fasten. Confirm compatibility of fasteners and items to be fastened to avoid galvanic corrosion due to dissimilar materials.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Metal Roofing

3.1.2 Workmanship

Make lines and angles sharp and true. Free exposed surfaces from visible wave, warp, buckle, and tool marks. Fold back exposed edges neatly to form a 1/2 inch hem on the concealed side. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction.

Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections. For installation of items not shown in detail or not covered by specifications conform to the applicable requirements of SMACNA 1793, Architectural Sheet Metal Manual. Provide sheet metal flashing in the angles formed where roof decks abut walls, curbs, ventilators, pipes, or other vertical surfaces and wherever indicated and necessary to make the work watertight. Join sheet metal items together as shown in Table II.

3.1.3 Cleats

Provide cleats for sheet metal 18 inches and over in width. Space cleats evenly not over 12 inches on center unless otherwise specified or indicated. Unless otherwise specified, provide cleats of 2 inches wide by 3 inches long and of the same material and thickness as the sheet metal being installed. Secure one end of the cleat with two nails and the cleat folded back over the nailheads. Lock the other end into the seam. Pre-tin cleats for soldered seams.

3.1.4 Bolts, Rivets, and Screws

Install bolts, rivets, and screws where indicated or required. Provide compatible washers where required to protect surface of sheet metal and to provide a watertight connection. Provide mechanically formed joints in aluminum sheets 0.040 inches or less in thickness.

3.1.5 Seams

Straight and uniform in width and height with no solder showing on the face.

3.1.5.1 Lap Seams

Finish soldered seams not less than one inch wide. Overlap seams not soldered, not less than 3 inches.

3.1.5.2 Loose-Lock Expansion Seams

Not less than 3 inches wide; provide minimum one inch movement within the joint. Completely fill the joints with the specified sealant, applied at not less than 1/8 inch thick bed.

3.1.5.3 Flat Seams

Make seams in the direction of the flow.

3.1.6 Protection from Contact with Dissimilar Materials

3.1.6.1 Metal Surfaces

Paint surfaces in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.

3.1.6.2 Wood or Other Absorptive Materials

Paint surfaces that may become repeatedly wet and in contact with metal with two coats of aluminum paint or a coat of heavy-bodied bituminous paint.

3.1.7 Expansion and Contraction

Provide expansion and contraction joints at not more than 32 foot intervals for aluminum and at not more than 40 foot intervals for other metals. Provide an additional joint where the distance between the last expansion joint and the end of the continuous run is more than half the required interval. Space joints evenly. Join extruded aluminum gravel stops and fascia by expansion and contraction joints spaced not more than 12 feet apart.

3.1.8 Gutters

The hung type of shape indicated and supported on underside by brackets that permit free thermal movement of the gutter. Provide gutters in sizes indicated complete with mitered corners, end caps, outlets, brackets, and other accessories necessary for installation. Bead with hemmed edge or reinforce the outer edge of gutter with a stiffening bar not less than 3/4 by 3/16 inch of material compatible with gutter. Fabricate gutters in sections not less than 8 feet. Lap the sections a minimum of one inch in the direction of flow or provide with concealed splice plate 6 inches minimum. Join the gutters, other than aluminum, by riveted and soldered joints. Join aluminum gutters with riveted sealed joints. Provide expansion-type slip joints midway between outlets. Install gutters below slope line of the roof so that snow and ice can slide clear. Support gutters on adjustable hangers spaced not more than 30 inches on center. Adjust gutters to slope uniformly to outlets, with high points occurring midway between outlets. Fabricate hangers and fastenings from compatible metals.

3.1.9 Downspouts

Space supports for downspouts according to the manufacturer's recommendation for the substrate. Types, shapes and sizes are indicated. Provide complete including elbows and offsets. Provide downspouts in approximately 10 foot lengths. Provide end joints to telescope not less than 1/2 inch and lock longitudinal joints. Provide gutter outlets with wire ball strainers for each outlet. Provide strainers to fit tightly into outlets and be of the same material used for gutters. Keep downspouts not less than one inch away from walls. Fasten to the walls at top, bottom, and at an intermediate point not to exceed 5 feet on center with leader straps or concealed rack-and-pin type fasteners. Form straps

and fasteners of metal compatible with the downspouts.

3.1.9.1 Terminations

Neatly fit into the drainage connection the downspouts terminating in drainage lines and fill the joints with a portland cement mortar cap sloped away from the downspout. Provide downspouts terminating in splash blocks with elbow-type fittings. Provide splash pans as specified.

3.1.10 Flashing for Roof Drains

Provide a 30 inches square sheet indicated. Taper insulation to drain from 24 inches out. Set flashing on finished felts in a full bed of asphalt roof cement, ASTM D4586/D4586M. Heavily coat the drain flashing ring with asphalt roof cement. Clamp the roof membrane, flashing sheet, and stripping felt in the drain clamping ring. Secure clamps so that felts and drain flashing are free of wrinkles and folds. Retrofit roof drains must conform to ANSI/SPRI RD-1.

3.1.11 Copings

Provide coping with locked and soldered seam. Terminate outer edges in edge strips. Install with sealed cover plate joints as indicated.

3.2 PAINTING

Touch ups in the field may be applied only after metal substrates have been cleaned and pretreated in accordance with manufacturer's written instructions and products.

Field-paint dissimilar sheet metals in contact to separate and deter galvanic interactions.

3.3 CLEANING

Clean exposed sheet metal work at completion of installation. Remove grease and oil films, handling marks, contamination from steel wool, fittings and drilling debris, and scrub-clean. Free the exposed metal surfaces of dents, creases, waves, scratch marks, and solder or weld marks.

3.4 REPAIRS TO FINISH

Scratches, abrasions, and minor surface defects of finish may be repaired in accordance with the manufacturer's printed instructions and as approved. Repair damaged surfaces caused by scratches, blemishes, and variations of color and surface texture. Replace items which cannot be repaired.

3.5 FIELD QUALITY CONTROL

Establish and maintain a Quality Control Plan for sheet metal used in conjunction with roofing to assure compliance of the installed sheet metalwork with the Contract requirements. Remove work that is not in compliance with the Contract and replace or correct. Include quality control, but not be limited to, the following:

a. Observation of environmental conditions; number and skill level of sheet metal workers; condition of substrate.

b. Verification that specified material is provided and installed.

c. Inspection of sheet metalwork, for proper size(s) and thickness(es), fastening and joining, and proper installation.

3.5.1 Procedure

Submit for approval prior to start of roofing work. Include a checklist of points to be observed. Document the actual quality control observations and inspections. Provide a copy of the documentation to the Contracting Officer at the end of each day.

TABLE I. SHEET METAL WEIGHTS, THICKNESSES, AND GAGES					
Sheet Metal Items					Zinc-Coated Steel, U.S. Std. Gage
	16	.032	.015	.015	24
	16	-	.015	.015	-
	20	.040	.018	.018	-
Downspouts and leaders	16	.032	.015	.015	24
Downspout clips and anchors	-	.040 clip .125 anchor	-	-	-
Downspout straps, 2-inch	48 (a)	.060	.050	-	-
	16	.032	.015	.015	-
	20	.032	.015	.015	-
	No. 9 gage	.144 diameter	.109 diameter	-	
Flashings:					
	20	.040	.018	.018	24

TABLE I. SHEET METAL WEIGHTS, THICKNESSES, AND GAGES					
Sheet Metal Items					Zinc-Coated Steel, U.S. Std. Gage
	16	.032	.015	.015	26
	16	-	.015	.015	24
	10	-	.010	.010	-
	16	-	.015	.015	-
	16	.032	.015	.015	-
	16	.032	.015	.015	-
	16 (b)				
Coping	16	-	-	-	-
	-	.075	-	-	-
	16	.032	.015	.015	-
	20	.050	.018	.018	24
	24	.050	.025	-	-
Gutters:					
	16	.032	.015	.015	24
	16	.032	.015	.015	24
	1 inch by 1/8 inch (a)	1 inch by .(inch (c)	1 inch by .0: inch	-	-
	16	.032	.015	.015	24
	10	-	.010	.010	-
	16	.040	.018	.018	-

TABLE I. SHEET METAL WEIGHTS, THICKNESSES, AND GAGES					
Sheet Metal Items					Zinc-Coated Steel, U.S. Std. Gage
(a) Brass.					
(b) May be lead weighing 4 pounds per square foot.					
(c) May be polyvinyl chloride.					
(d) 2.5 pound minimum lead sleeve with 4 inch flange. Where lead sleeve is impractical, refer to paragraph SINGLE PIPE VENTS for optional material.					

TABLE II. SHEET METAL JOINTS			
TYPE OF JOINT			
Item Designation	Copper, Terne-Coated Stainless Steel, Zinc-Coated Steel and Stainless Steel	Aluminum	Remarks
Joint cap for building expansion seam, cleated joint at roof	1.25 inch single lock, standing seam, cleated	1.25 inch single lock, standing	--
Flashings			
Base	One inch 3 inch lap for expansion joint	One inch flat locked, soldered; sealed; 3 inch lap for expansion joint	Aluminum manufacturer's recommended hard setting sealant for locked aluminum joints. Fill each metal expansion joint with a joint sealing compound.

TABLE II. SHEET METAL JOINTS			
TYPE OF JOINT			
Item Designation	Copper, Terne-Coated Stainless Steel, Zinc-Coated Steel and Stainless Steel	Aluminum	Remarks
Cap-in reglet	3 inch lap	3 inch lap	Seal groove with joint sealing compound.
Eave	One inch flat locked, cleated. One inch loose locked, sealed expansion joint, cleated.	One inch flat locked, locked, cleated one inch loose locked, sealed expansion joints, cleated	Same as base flashing.
Stepped	3 inch lap	3 inch lap	--
Valley	6 inch lap cleated	6 inch lap cleated	--
Edge strip	Butt	Butt	--
Gravel stops:			
Extrusions	--	Butt with 1/2 inch space	Use sheet flashing beneath and a cover plate
Sheet, smooth	Butt with 1/4 inch space	Butt with 1/4 inch space	Use sheet flashing backup plate.
Sheet, corrugated	Butt with 1/4 inch space	Butt with 1/4 inch space	Use sheet flashing beneath and a cover plate or a combination unit
Gutters	1.5 inch lap, riveted and soldered	One inch flat locked riveted and sealed	Aluminum producers recommended hard setting sealant for locked aluminum joints.
(a) Provide a 3 inch lap elastomeric flashing with manufacturer's recommended sealant.			
(b) Seal Polyvinyl chloride reglet with manufacturer's recommended sealant.			

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SECTION 07 61 14.00 20

STEEL STANDING SEAM ROOFING
08/16, CHG 1: 08/18

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG03-3	(2002; Suppl 2001-2004; R 2008) Cold-Formed Steel Design Manual Set
AISI SG-973	Cold Form Design Manual

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7-05	Minimum Design Loads for Buildings and other Structures

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A792/A792M	(2022) Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
ASTM A1008/A1008M	(2023) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
ASTM A1011/A1011M	(2023) Standard Specification for Steel Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
ASTM B117	(2019) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM D522/D522M	(2017) Mandrel Bend Test of Attached Organic Coatings
ASTM D523	(2014; R 2018) Standard Test Method for

	Specular Gloss
ASTM D714	(2002; R 2017) Standard Test Method for Evaluating Degree of Blistering of Paints
ASTM D968	(2022) Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1654	(2008; R 2016; E 2017) Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D2244	(2021) Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D2247	(2015; R 2020) Standard Practice for Testing Water Resistance of Coatings in 100?Percent Relative Humidity
ASTM D4214	(2007; R 2015) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
ASTM E1592	(2017) Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
ASTM E1980	(2011; R 2019) Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces
ASTM G152	(2013; R 2021) Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G153	(2013; R 2021) Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1793	(2012) Architectural Sheet Metal Manual, 7th Edition

U.S. DEPARTMENT OF ENERGY (DOE)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

1.2 DEFINITIONS

1.2.1 Field-Formed Seam

Seams of panels so configured that when adjacent sheets are installed the seam is sealed utilizing mechanical or hand seamers. Crimped (45 degree bend), roll formed (180 degree bend), double roll formed (2 - 180 degree bends), and roll and lock systems are types of field-formed seam systems.

1.2.2 Pre-Formed

Formed to the final, less field-formed seam, profile and configuration in the factory.

1.2.3 Field-Formed

Formed to the final, less field-formed seam, profile and configuration at the site of work prior to installation.

1.2.4 Roofing System

The roofing system is defined as the assembly of roofing components, including roofing panels, flashing, fasteners, and accessories which, when assembled properly result in a watertight installation.

1.2.5 SSMRS

Standing Seam Metal Roof System (SSMRS) is abbreviation of the entire roof system specified herein with all components and parts coming from a single manufacturer's system.

1.3 SYSTEM DESCRIPTION

1.3.1 Design Requirements

a. Panels must be continuous lengths up to manufacturer's standard longest lengths, with no joints or seams, except where indicated or specified. Ribs of adjoining sheets must be in continuous contact from eave to ridge. Individual panels of snap together type systems must be removable for replacement of damaged material.

b. There must be no exposed or penetrating fasteners except where shown on approved shop drawings. Fasteners into steel must be stainless steel, zinc cast head, or cadmium plated steel screws inserted into predrilled holes. There must be a minimum of two fasteners per clip. Single fasteners will be allowed when supporting structural members are prepunched or predrilled.

c. Snap together type systems must have a capillary break and a positive side lap locking device. Field-formed seam type systems must be mechanically locked closed by the manufacturer's locking tool. The seam must include a continuous factory applied sealant when required by the manufacturer to withstand the wind loads specified.

d. Roof panel anchor clips must be concealed and designed to allow for longitudinal thermal movement of the panels, except where specific fixed points are indicated. Provide for lateral thermal movement in panel configuration or with clips designed for lateral and longitudinal movement.

1.3.2 Design Conditions

Design the system to resist positive and negative loads specified herein in accordance with the AISI SG03-3. Panels must support walking loads without permanent distortion or telegraphing of the structural supports.

1.3.2.1 Wind Uplift

The design uplift pressure calculated in accordance with ASCE 7-05 for the roof system shall be computed and applied using a basic wind speed indicated on the wind pressure diagram on the Structrual Drawings.

The design uplift force for each connection assembly must be that pressure given for the area under consideration, multiplied by the tributary load area of the connection assembly, and multiplied by the appropriate factor of safety, as follows:

a. Single fastener in a connection: 3.0

b. Two or more fasteners in each connection: 2.25

1.3.2.2 Roof Live Loads

Loads must be applied on the horizontal projection of the roof structure. The minimum roof design live load must be 20 psf.

1.3.2.3 1.3.2.3 Dead Loads

The dead load shall be the weight of the SSSMR system. Collateral loads such as sprinklers, mechanical and electrical systems, and ceilings shall not be attached to the panels.

1.3.2.4 1.3.2.4 Concentrated Loads

The panels and anchor clips shall be capable of supporting a 300 pound concentrated load. The concentrated load shall be applied at the panel mid-span and will be resisted by a single standing seam metal roof panel assumed to be acting as a beam. The un-deformed shape of the panel shall be used to determine the section properties.

1.3.2.5 1.3.2.5 Uniform Loads

The panels and concealed anchor clips shall be capable of supporting the minimum uniform live load specified herein. Snow drift loads will be very significant at some locations and drift calculations are required.

1.3.2.6 Thermal Movement

System must be capable of withstanding thermal movement based on a temperature range of120 degrees F

1.3.2.7 Deflection

Panels must be capable of supporting design loads between unsupported spans with deflection of not greater than L/180 of the span. Deflections shall be based on panels being continuous across three or more supports. Deflection shall be calculated and measured along the major ribs of the panels.

a. Steel panels shall be designed in accordance with AISI SG-973.

1.3.2.8 1.3.2.8 Recycled Content

See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total recycled content requirements. Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

1.3.2.9 1.3.2.9 Solar Reflectance Index

Not less than 85 when calculated according to ASTM E1980 based on testing identical products by a qualified testing agency.

1.3.2.10 1.2.1 Local/Regional Materials

See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total local material requirements.

1.3.3 Structural Performance

The structural performance test methods and requirements of the Standing Seam Roofing Systems (SSRS) must be in accordance with ASTM E1592.

1.4 SUBMITTALS

Government approval is required for submittals with a "G"classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Roofing; G

SD-03 Product Data

Roofing Panels; G

Energy Star Label for Steel Roofing Product; S

Recycled Content for Steel Roofing Product; S

Attachment Clips

Closures

Accessories

Fasteners

Sealants

Recycled Content; (LEED)

Documentation indicating percentages by weight of postconsumer

and preconsumer recycled content. Include statement indicating cost for each product having recycled content.

Heat Island Effect; (LEED)

Documentation indicating that roofing materials comply with Solar Reflectance Index requirement.

Local/Regional Materials; (LEED)

Documentation indicating distance between manufacturing facility and the project site. Indicate distance of raw material origin from the project site. Indicate relative dollar value of local/regional materials to total dollar value of products included in project.

Waste Management; (LEED)

Documentation indicating percentages by weight of materials and products that are recycled and/or salvaged nonhazardous construction debris.

Sample Warranty Certificate; G

Submit for materials to be provided. Submit data sufficient to indicate conformance to specified requirements.

SD-04 Samples

Roofing Panel

Submit a 12 inch long by full width section of typical panel.

For color selection, submit 2 by 4 inch metal samples in color, finish and texture specified .

Accessories

Submit each type of accessory item used in the project including, but not limited to each type of anchor clip, closure, fastener, and leg clamp.

Sealants

Intermediate Support Section

Submit full size samples of each intermediate support section, 12 inches long.

SD-05 Design Data

Design Calculations

SD-06 Test Reports

Field Inspection; G

Submit manufacturer's technical representative's field inspection reports as specified in paragraph MANUFACTURER'S FIELD

INSPECTION.

Structural Performance Tests

Finish Tests

SD-07 Certificates

Manufacturer's Technical Representative's Qualifications

Statement of Installer's Qualifications

Submit documentation from roofing manufacturer proving the manufacturer's technical representative meets below specified requirements. Include name, address, telephone number, and experience record.

Submit documentation proving the installer is factory-trained, has the specified experience, and authorized by the manufacturer to install the products specified.

Coil Stock Compatibility; G

Provide certification of coil compatibility with roll forming machinery to be used for forming panels without warping, waviness, and rippling not part of panel profile; to be done without damage, abrasion or marking of finish coating.

SD-08 Manufacturer's Instructions

Installation Manual; G

Submit manufacturers printed installation manual, instructions, and standard details.

SD-11 Closeout Submittals

Information Card

For each roofing installation, submit a typewritten card or photoengraved aluminum card containing the information listed on Form 1 located at the end of this section.

Warranty

1.5 DESIGN CALCULATIONS

Provide design calculations prepared by a professional engineer specializing in structural engineering verifying that system supplied and any additional framing meets design load criteria indicated. Coordinate calculations with manufacturer's test results. Include calculations for:

Wind load uplift design pressure at roof locations specified in paragraph WIND UPLIFT.

Clip spacing and allowable load per clip.

Fastening of clips to structure or intermediate supports.

Intermediate support spacing and framing and fastening to structure when required.

Allowable panel span at anchorage spacing indicated.

Safety factor used in design loading.

Governing code requirements or criteria.

Edge and termination details.

1.6 QUALITY ASSURANCE

1.6.1 Preroofing Conference

After submittals are received and approved but before roofing work, including associated work, is preformed, the Contractor must hold a preroofing conference with the personnel directly responsible for the roofing systems work, as well as the roofing manufacturer's technical representative to review the following:

a. The drawings and specifications

b. Procedure for on site inspection and acceptance of the roofing substrate and pertinent structural details relating to the roofing system.

c. Contractor's plan for coordination of the work of the various trades involved in providing the roofing system and other components secured to the roofing.

d. Conflicts between the proposed roofing system, the design documents, and the scheduling of work/workers (trades) to assure a watertight roofing installation. Resolutions shall be obtained and documented in writing prior to the start of roofing work. A quality assurance/quality control plan shall also be established at this time, inclusive of the roofing manufacturer's recommended testing and inspections procedures, and in accordance with industry standard guidelines.

e. Safety requirements

The preroofing conference must be attended by the Contractor and personnel directly responsible for the roofing installation, mechanical and electrical work, and the roofing manufacturer's technical representative. Conflicts among those attending the preroofing conference must be resolved and confirmed in writing before roofing work, including associated work, is begun. Prepare written minutes of the preroofing conference and submit to the Contracting Officer.

1.6.2 Manufacturer

The SSMRS must be the product of a metal roofing industry recognized manufacturer who has been in the practice of manufacturing SSMRS for a period of not less than 5 years and who has been involved in at least 5 projects similar in size and complexity to this project.

1.6.3 Manufacturer's Technical Representative

The representative must have authorization from manufacturer to approve field changes and be thoroughly familiar with the products and with installations in the geographical area where construction will take place. The manufacturer's representative must be an employee of the manufacturer with at least 5 years experience in installing the roof system. The representative must be available to perform field inspections and attend meetings as required herein, and as requested by the Contracting Officer.

Contractor shall provide the following additional information at the pre-roofing conference: Procedure for the roof manufacturer's technical representative's onsite inspection and acceptance of the roofing substrate, roof insulation, and installation of the roofing in accordance with the roof system warranty, the name of the manufacturer's technical representatives, the frequency of the onsite visits, copies of the roof status reports from the technical representatives to the roof manufacturer, and pertinent structural details to the roofing system.

1.6.4 Installer's Qualifications

The roofing system installer must be factory-trained, approved by the steel roofing system manufacturer to install the system, and must have a minimum of three years experience as an approved applicator with that manufacturer. The applicator must have applied five installations of similar size and scope as this project within the previous 3 years.

1.6.5 Single Source

Roofing panels, clips, closures, and other accessories must be standard products of the same manufacturer; must be the latest design by the manufacturer; and must have been designed by the manufacturer to operate as a complete system for the intended use.

1.6.6 Laboratory Tests For Panel Finish

The term "appearance of base metal" refers to the metal coating on steel. Panels must meet the following test requirements:

a. Formability Test: When subjected to a 180 degree bend over a 1/8 inch diameter mandrel in accordance with ASTM D522/D522M, exterior coating film may show only slight microchecking and no loss of adhesion.

b. Accelerated Weathering Test: Withstand a weathering test for a minimum of 2000 hours in accordance with ASTM G152 and ASTM G153, Method 1 without cracking, peeling, blistering, loss of adhesion of the protective coating, or corrosion of the base metal. Protective coating that can be readily removed from the base metal with a penknife blade or similar instrument will be considered to indicate loss of adhesion.

c. Chalking Resistance: After the 2000-hour weatherometer test, exterior coating may not chalk greater than No. 8 rating when measured in accordance with ASTM D4214 test procedures.

d. Color Change Test:

After the 2000 -hour weatherometer test, exterior coating color change

must not exceed 2 NBS units when measured in accordance with ASTM D2244 test procedure.

e. Salt Spray Test: Withstand a salt spray test for a minimum of 1000 hours in accordance with ASTM B117, including the scribe requirement in the test. Immediately upon removal of the panel from the test, the coating must receive a rating of 8, few blisters in field as determined by ASTM D714; and an average rating of 6, 1/8 inch failure at scribe, as determined by ASTM D1654. Rating Schedule No. 1.

f. Abrasion Resistance Test for Color Coating: When subjected to the falling sand test in accordance with ASTM D968, coating system must withstand a minimum of 80 liters of sand per mil thickness before appearance of base metal.

g. Humidity Test: When subjected to a humidity cabinet test in accordance with ASTM D2247 for 1000 hours, a scored panel must show no signs of blistering, cracking, creepage, or corrosion.

h. Gloss Test: The gloss of the finish must be 30 plus or minus 5 at an angle of 60 degrees, when measured in accordance with ASTM D523.

1.6.7 Shop Drawing Requirements

Submit roofing drawings to supplement the instructions and diagrams. Include design and erection drawings containing an isometric view of the roof showing the design uplift pressures and dimensions of edge, ridge and corner zones; and show typical and special conditions including flashings, materials and thickness, dimensions, fixing lines, anchoring methods, sealant locations, sealant tape locations, fastener layout, sizes, and spacing, terminations, penetrations, attachments, and provisions for thermal movement. Details of installation must be in accordance with the manufacturer's Standard Instructions and details or the SMACNA 1793. Prior to submitting shop drawings, have drawings reviewed and approved by the manufacturer's technical engineering department.

1.7 WARRANTY

Furnish manufacturer's no-dollar-limit materials and workmanship warranty for the roofing system. The warranty period must be not less than 20 years from the date of Government acceptance of the work. The warranty must be issued directly to the Government. The warranty must provide that if within the warranty period the metal roofing system becomes non-watertight or shows evidence of corrosion, perforation, rupture or excess weathering due to deterioration of the roofing system resulting from defective materials or installed workmanship the repair or replacement of the defective materials and correction of the defective workmanship must be the responsibility of the roofing system manufacturer. Repairs that become necessary because of defective materials and workmanship while roofing is under warranty must be performed within 7 days after notification, unless additional time is approved by the Contracting Officer. Failure to perform repairs within the specified period of time will constitute grounds for having the repairs performed by others and the cost billed to the manufacturer. In addition, provide a 2 year contractor installation warranty.

1.8 DELIVERY, STORAGE AND HANDLING

Deliver, store, and handle preformed panels, bulk roofing products and other manufactured items in a manner to prevent damage or deformation.

1.8.1 Delivery

Provide adequate packaging to protect materials during shipment. Crated materials must not be uncrated until ready for use, except for inspection. Immediately upon arrival of materials at the jobsite, inspect materials for damage, dampness, and staining. Replace damaged or permanently stained materials that cannot be restored to like-new condition with satisfactory material. If materials are wet, remove the moisture and re-stack and protect the panels until used.

1.8.2 Storage

Stack materials on platforms or pallets and cover with tarpaulins or other suitable weathertight covering which prevents water trapping or condensation. Store materials so that water which might have accumulated during transit or storage will drain off. Do not store the panels in contact with materials that might cause staining, such as mud, lime, cement, fresh concrete or chemicals. Protect stored panels from wind damage.

1.8.3 Handling

Handle material carefully to avoid damage to surfaces, edges and ends.

PART 2 PRODUCTS

2.1 ROOFING PANELS

Provide panels with interlocking ribs for securing adjacent sheets and with concealed clip fastening system for securing the roof covering to structural framing members. Fasteners must not penetrate the panels except at the ridge, eave, rakes, penetrations, and end laps. Backing plates and ends of panels at end laps must be predrilled or prepunched. Factory prepare ends of panels to be lapped by trimming part of seam, die-setting, or swaging ends of panels. Individual sheets must be sufficiently long to cover the entire length of any unbroken roof slope when such slope is 30 feet or less. Provide panels that extend over two or more spans when length of run exceeds 30 feet. Obtain Contracting Officer (KO) approval for sheets longer than 30 feet before submitting shop drawings. Sheets must provide not less than 12 inches of coverage (width) in place. Provide panels with a minimum corrugation height of 2.0 inches (nominal). Make provisions for expansion and contraction at either ridge or eave, consistent with the type of system to be used. Form panels from coil stock without warping, waviness or ripples not part of the panel profile, and free of damage to the finish coating system.

Provide steel roofing product that is Energy Star labeled. Provide data identifying Energy Star label for steel roofing product.

2.1.1 Material

Zinc-coated steel conforming to ASTM A653/A653M, G90 coating designation or aluminum-zinc alloy coated steel conforming to ASTM A792/A792M, AZ 55 coating. Provide material with a minimum thickness of 0.030 inch (22 gage).

Steel roofing materials must contain a minimum of 30 percent total recycled content. Provide data identifying percentage of recycled content for steel roofing product.

2.1.2 Texture

Smooth with raised intermediate ribs for added stiffness.

2.1.3 Finish

Factory color finish.

2.1.3.1 Factory Color Finish

Provide factory applied, thermally cured coating to exterior and interior of metal roof and wall panels and metal accessories. Provide exterior finish top coat of 70 percent resin polyvinylidene fluoride with not less than 0.8 mil dry film thickness. Provide exterior primer standard with panel manufacturer with not less than 0.8 mil dry film thickness. Interior finish must consist of the same coating and dry film thickness as the exterior coating. Provide exterior and interior coating meeting test requirements specified below. Tests must have been performed on the same factory finish and thickness provided. Provide clear factory edge coating on all factory cut or unfinished edges.

2.2 INTERMEDIATE SUPPORTS

Fabricate panel subgirts, subpurlins, T-bars, Z-bars and tracks from galvanized steel conforming to ASTM A653/A653M, G90, Grade D (16 gage and heavier), Grade A (18 gage and lighter); or steel conforming to ASTM A36/A36M, ASTM A1011/A1011M , or ASTM A1008/A1008M prime painted with zinc-rich primer. Size, shape, thickness and capacity as required to meet the load and deflection criteria specified.

2.3 ATTACHMENT CLIPS

Fabricate clips from ASTM A1011/A1011M, or ASTM A1008/A1008M steel hot-dip galvanized in accordance with ASTM A653/A653M, G 90, or Series 300 stainless steel. Size, shape, thickness and capacity as required to meet the load, insulation thickness and deflection criteria specified.

2.4 ACCESSORIES

Sheet metal flashings, gutters, downspouts, trim, moldings, closure strips, pre-formed crickets, caps, equipment curbs, and other similar sheet metal accessories used in conjunction with preformed metal panels must be of the same material as used for the panels. Provide metal accessories with a factory color finish to match the roofing panels, except that such items which will be concealed after installation may be provided without the finish if they are stainless steel. Metal must be of a thickness not less than that used for the panels. Thermal spacer blocks and other thermal barriers at concealed clip fasteners must be as recommended by the manufacturer except that wood spacer blocks are not allowed. All accessories shall be manufactured or approved by the roof panel manufacturer.

2.4.1 Closures

2.4.1.1 Rib Closures

Corrosion resisting steel, closed-cell or solid-cell synthetic rubber, neoprene or polyvinyl chloride pre-molded to match configuration of rib opening. Material for closures must not absorb water.

2.4.1.2 Ridge Closures

Metal-clad foam or metal closure with foam secondary closure matching panel configuration for installation on surface of roof panel between panel ribs at ridge and headwall roof panel flashing conditions and terminations. Foam material must not absorb water.

2.4.2 Fasteners

Zinc-coated steel, corrosion resisting steel, zinc cast head, or nylon capped steel, type and size specified below or as otherwise approved for the applicable requirements. Design the fastening system to withstand the design loads specified. Provide concealed fasteners for attaching panels to structural supports and to adjoining panels as approved and in accordance with printed manufacturer's recommendations. Exposed fasteners must be gasketed or have gasketed washers on the exterior side of the covering to waterproof the penetration. Washer material must be compatible with the covering; have a minimum diameter of 3/8 inch for structural connections; and gasketed portion of fasteners or washers must be neoprene or other equally durable elastomeric material approximately 1/8 inch thick.

2.4.2.1 Screws

Not smaller than No. 14 diameter if self-tapping type and not smaller than No. 12 diameter if self-drilling and self-tapping.

2.4.2.2 Bolts

Not smaller than 1/4 inch diameter, shouldered or plain shank as required, with proper nuts.

2.4.2.3 Automatic End-Welded Studs

Automatic end-welded studs must be shouldered type with a shank diameter of not smaller than 3/16 inch and cap or nut for holding covering against the shoulder.

2.4.2.4 Explosive Driven Fasteners

Fasteners for use with explosive actuated tools must have a shank diameter of not smaller than 0.145 inch with a shank length of not smaller than 1/2 inch for fastening to steel and not smaller than 1 inch for fastening to concrete.

2.4.2.5 Rivets

Blind rivets must be stainless steel with 1/8 inch nominal diameter shank. Rivets must be threaded stem type if used for other than the fastening of trim. Rivets with hollow stems must have closed ends.

2.4.3 Sealants

Elastomeric type containing no oil or asphalt. Exposed sealant must cure to a rubberlike consistency. Concealed sealant must be the non-hardening type. Seam sealant must be factory-applied, non-skinning, non-drying, and must conform to the roofing manufacturer's recommendations. Silicone-based sealants must not be used in contact with finished metal panels and components unless approved otherwise by the Contracting Officer.

2.4.4 GASKETS AND INSULATING COMPOUNDS

Nonabsorptive and suitable for insulating contact points of incompatible materials. Insulating compounds must be nonrunning after drying.

2.4.5 EPDM Rubber Boots

Flashing devices around pipe penetrations shall be flexible, one-piece devices molded from weather-resistant EPDM rubber. Rubber boot material shall be as recommended by the manufacturer. The boots shall have base rings made of aluminum or corrosion resisting steel that lies flat with all pipe or penetrations centered on the roof panel to form a weather-tight seal.

2.4.6 Roof Curbs

a. Curbs shall be constructed using minimum 0.080, 3003H14 aluminum, or heavier as required to support the load of the equipment, with fully mitered and heli-arc welded corners, integral base plates, with water diverter cricket. Provide factory installed insulation.

b. Minimum height of curb shall be 8 inches above finished roof.

c. Curbs shall be constructed to match slope of roof and provide a level top surface for mounting of equipment.

d. Curb flange shall be constructed to match configuration of roof panel. Side flange shall extend to the next natural seam in the roof panels and conform to seam configurations.

e. Curbs shall be painted to match roof color. Refer to Section 09 90 00 PAINTS AND COATINGS.

2.5 2.5 SNOW AND ICE RETENTION SYSTEM

Snow and Ice Retention System: The snow and ice retention system is required when the roof design snow load is 15 psf or greater, or indicated on roof plan. Snow retention systems shall be designed to resist the vector forces resulting from the full design (balanced) roof snow load. Calculate frequency of devices by using tested ultimate holding values for the device and a 2.0 factor of safety. Methods of attachment must be clamping style, utilizing round-point setscrews or other anchorages that do not gall or penetrate the panel material with fasteners.

a. When pre-painted metal roof panels are used, the snow retention system shall be color matched to the panels using the same material and paint type as the roof panels. Powder coatings and air-dried paints, pigments, or dyes are not acceptable.

b. Contractor submittals are to include snow retention system

frequency calculations specific to the product being submitted and documentation from an independent laboratory with respect to holding strength of the device.

c. Adhesively attached retention systems are not acceptable. Attachment with cup point setscrews is not acceptable.

PART 3 EXECUTION

Do not install building construction materials that show visible evidence of biological growth.

3.1 EXAMINATION

Examine surfaces to receive standing seam metal roofing and flashing. Ensure that surfaces are plumb and true, clean, even, smooth, as dry and free from defects and projections which might affect the installation.

3.2 PROTECTION FROM CONTACT WITH DISSIMILAR MATERIALS

3.2.1 Contact with Wood

Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.3 INSTALLATION

Install in accordance with the approved manufacturer's erection instructions, shop drawings, and diagrams. Panels must be in full and firm contact with attachment clips. Where prefinished panels are cut in the field, or where any of the factory applied coverings or coatings are abraded or damaged in handling or installation, they must, after necessary repairs have been made with material of the same color as the weather coating, be approved before being installed. Seal completely openings through panels. Correct defects or errors in the materials. Replace materials which cannot be corrected in an approved manner with nondefective materials. Provide molded closure strips where indicated and where necessary to provide weathertight construction. Use shims as required to ensure attachment clip line is true. Use a spacing gage at each row of panels to ensure that panel width is not stretched or shortened.

3.3.1 Roof Panels

Apply roofing panels with the standing seams parallel to the slope of the roof. Provide roofing panels in longest practical lengths from ridge to eaves (top to eaves on shed roofs), with no transverse joints except at the junction of ventilators, curbs, skylights, chimneys, and similar openings. Install flashing to assure positive water drainage away from roof penetrations. Locate panel end laps such that fasteners do not engage supports or otherwise restrain the longitudinal thermal movement of panels. Form field-formed seam type system seams in the field with an automatic mechanical seamer approved by the manufacturer. Attach panels to the structure with concealed clips incorporated into panel seams. Clip attachment must allow roof to move independently of the structure, except at fixed points as indicated.

3.3.2 Flashings

Provide flashing, related closures and accessories as indicated and as necessary to provide a weathertight installation. Install flashing to ensure positive water drainage away from roof penetrations. Flash and seal the roof at the ridge, eaves and rakes, and projections through the roof. Place closure strips, flashing, and sealing material in an approved manner that will assure complete weathertightness. Details of installation which are not indicated must be in accordance with the SMACNA 1793, panel manufacturer's approved printed instructions and details, or the approved shop drawings. Allow for expansion and contraction of flashing.

3.3.3 Flashing Fasteners

Fastener spacings must be in accordance with the panel manufacturer's recommendations and as necessary to withstand the design loads indicated. Install fasteners in roof valleys as recommended by the manufacturer of the panels. Install fasteners in straight lines within a tolerance of 1/2 inch in the length of a bay. Drive exposed penetrating type fasteners normal to the surface and to a uniform depth to seat gasketed washers properly and drive so as not to damage factory applied coating. Exercise extreme care in drilling pilot holes for fastenings to keep drills perpendicular and centered. Do not drill through sealant tape. After drilling, remove metal filings and burrs from holes prior to installing fasteners and washers. Torque used in applying fasteners must not exceed that recommended by the manufacturer. Remove panels deformed or otherwise damaged by over-torqued fastenings, and provide new panels.

3.3.4 Rib and Ridge Closure/Closure Strips

Set closure/closure strips in joint sealant material and apply sealant to mating surfaces prior to adding panel.

3.4 PROTECTION OF APPLIED ROOFING

Do not permit storing, walking, wheeling, and trucking directly on applied roofing materials. Provide temporary walkways, runways, and platforms of smooth clean boards or planks as necessary to avoid damage to applied roofing materials, and to distribute weight to conform to indicated live load limits of roof construction.

3.5 CLEANING

Clean exposed sheet metal work at completion of installation. Remove metal shavings, filings, nails, bolts, and wires from roofs. Remove grease and oil films, excess sealants, handling marks, contamination from steel wool, fittings and drilling debris and scrub the work clean. Exposed metal surfaces must be free of dents, creases, waves, scratch marks, solder or weld marks and damage to the finish coating.

3.6 MANUFACTURER'S FIELD INSPECTION

Manufacturer's technical representative must visit the site as necessary during the installation process to assure panels, flashings, and other components are being installed in a satisfactory manner. Manufacturer's technical representative must perform a field inspection during the first 20 squares of roof panel installation and at substantial completion prior to issuance of warranty, as a minimum, and as otherwise requested by the

Contracting Officer. Additional inspections must not exceed one for 100 squares of total roof area with the exception that follow-up inspections of previously noted deficiencies or application errors must be performed as requested by the Contracting Officer. Each inspection visit must include a review of the entire installation to date. After each inspection, submit a report, signed by the manufacturer's technical representative, to the Contracting Officer noting the overall quality of work, deficiencies and any other concerns, and recommended corrective actions in detail. Notify Contracting Officer a minimum of 2 working days prior to site visit by manufacturer's technical representative.

3.7 COMPLETED WORK

Completed work must be plumb and true without oil canning, dents, ripples, abrasion, rust, staining, or other damage detrimental to the performance or aesthetics of the completed roof assembly.

3.8 INFORMATION CARD

For each roof, provide a typewritten card, laminated in plastic and framed for interior display or a photoengraved 0.032 inch thick aluminum card for exterior display. Card to be 8 1/2 by 11 inches minimum and contain the information listed on Form 1 at end of this section. Install card near point of access to roof, or where indicated. Send a photostatic paper copy to .

3.9 FORM ONE

FORM 1 - PREFORMED STEEL STANDING SEAM ROOFING SYSTEM COMPONENTS

1. Contract Number:

2. Building Number & Location:

3. Deck/Substrate Type:

4. Slopes of Deck/Roof Structure:

5. Insulation Type & Thickness:

6. Insulation Manufacturer:

7. Self-adhered underlayment: ( )Yes ( )No

8. Self-adhered underlayment Type:

9. Preformed Steel Standing Seam Roofing Description:

a. Manufacturer (Name, Address, & Phone No.):
b. Product Name:
c. Width:
d. Gage:
e. Base Metal:
f. Method of Attachment:

10. Repair of Color Coating:

a. Coating Manufacturer (Name, Address & Phone No.):
b. Product Name:
c. Surface Preparation:
d. Recoating Formula:
e. Application Method:

11. Statement of Compliance or Exception:_____
_____
_____

12. Date Roof Completed:

13. Warranty Period: From_____ To_____

14. Roofing Contractor (Name & Address):

15. Prime Contractor (Name & Address):

Contractor's Signature _____ Date:

Inspector's Signature _____ Date:

-- End of Section --

SECTION 07 84 00

FIRESTOPPING
05/10, CHG 1: 08/13

PART 1 GENERAL

1.1 SUMMARY

Furnish and install tested and listed firestopping systems, combination of materials, or devices to form an effective barrier against the spread of flame, smoke and gases, and maintain the integrity of fire resistance rated walls and partitions, including through-penetrations and construction joints and gaps.

a. Through-penetrations include the annular space around pipes, tubes, conduit, wires, cables and vents.

b. Construction joints include those used to accommodate expansion, contraction, wind, or seismic movement; do not allow firestopping material to interfere with the required movement of the joint.

c. Gaps requiring firestopping include gapsbetween the top of the fire-rated walls and the roof or floor deck above and at the intersection of shaft assemblies and adjoining fire resistance rated assemblies.

1.2 RELATED SECTIONS

The following sections contain references to firestopping materials and procedures to be provided or performed by the Firestopping installer:

Section 21 13 13.00 10 WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION
Section 21 30 00 FIRE PUMPS
Section 22 00 00 PLUMBING, GENERAL PURPOSE
Section 23 30 00 HVAC AIR DISTRIBUTION
Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS
Section 23 11 20 FACILITY GAS PIPING
Section 23 52 00 HEATING BOILERS
Section 23 64 26 CHILLED WATER PIPING SYSTEMS
Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM
Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM
Section 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials

ASTM E119	(2022) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E814	(2023a) Standard Test Method for Fire Tests of Penetration Firestop Systems
ASTM E1399/E1399M	(1997; R 2022) Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems
ASTM E1966	(2015; R 2019) Standard Test Method for Fire-Resistive Joint Systems

FM GLOBAL (FM)

FM 4991	(2013) Approval of Firestop Contractors
FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

UNDERWRITERS LABORATORIES (UL)

UL 723	(2020) UL Standard for Safety Test for Surface Burning Characteristics of Building Materials
UL 1479	(2015; Reprint May 2021) Fire Tests of Through-Penetration Firestops
UL 2079	(2015; Reprint Jul 2020) Tests for Fire Resistance of Building Joint Systems
UL Fire Resistance	(2014) Fire Resistance Directory

1.4 SEQUENCING

Coordinate the specified work with other trades. Apply firestopping materials, at penetrations of pipes and ducts, prior to insulating, unless insulation meets requirements specified for firestopping. Apply firestopping materials. at building joints and construction gaps, prior to completion of enclosing walls or assemblies. Locate cast-in-place firestop devices and install in place before concrete placement. Install pipe, conduit or cable bundles through cast-in-place device after concrete placement but before area is concealed or made inaccessible. Firestop material must be inspected and approved prior to final completion and enclosing of any assemblies that may conceal installed firestop.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Firestopping System; G

SD-03 Product Data

Firestopping Materials; G

SD-06 Test Reports

Inspection; G

SD-07 Certificates

Firestopping Materials

Installer Qualifications; G

1.6 QUALITY ASSURANCE

1.6.1 Installer

Engage an experienced Installer who is:

a. FM Research approved in accordance with FM 4991, operating as a UL Certified Firestop Contractor, or

b. Certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary staff, training, and a minimum of 3 years experience in the installation of manufacturer's products in accordance with specified requirements. Submit documentation of this experience. A manufacturer's willingness to sell its firestopping products to the Contractor or to an installer engaged by the Contractor does not in itself confer installer qualifications on the buyer. The Installer must be a trained representative of the manufacturer (not distributor or agent) in the proper selection and installation procedures. Obtain and submit installer's written certification of training, and retain proof of certification for duration of firestop installation.

1.6.2 Materials

For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer.

1.6.3 Pre-Installation Conference

A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of special details and flashing.

1.6.4 Schedule Coordination

Schedule work to coordinate with other installers of penetrations through fire rated walls.

1.7 DELIVERY, STORAGE, AND HANDLING

Deliver materials in the original unopened packages or containers showing

name of the manufacturer and the brand name. Store materials off the ground, protected from damage and exposure to elements and temperatures in accordance with manufacturer requirements. Remove damaged or deteriorated materials from the site. Use materials within their indicated shelf life.

PART 2 PRODUCTS

2.1 FIRESTOPPING SYSTEM

Submit detail drawings including manufacturer's descriptive data, typical details conforming to UL Fire Resistance or other details certified by another nationally recognized testing laboratory, installation instructions or UL listing details for a firestopping assembly in lieu of fire-test data or report. For those firestop applications for which no UL tested system is available through a manufacturer, submit a manufacturer's engineering judgment, derived from similar UL system designs or other tests for review and approval prior to installation. Submittal must indicate the firestopping material to be provided for each type of application. When more than a total of 5 penetrations and/or construction joints are to receive firestopping, provide drawings that indicate location, "F" "T" and "L" ratings, and type of application.

Also, submit a written report indicating locations of and types of penetrations and types of firestopping used at each location; record type by UL list printed numbers.

2.2 FIRESTOPPING MATERIALS

Provide firestopping materials, supplied from a single domestic manufacturer, consisting of commercially manufactured, asbestos-free, nontoxic products FM APP GUIDE approved, or UL listed, for use with applicable construction and penetrating items, complying with the following minimum requirements:

2.2.1 Fire Hazard Classification

Provide material that has a flame spread of 25 or less, and a smoke developed rating of 50 or less, when tested in accordance with ASTM E84 or UL 723. Provide an approved firestopping material as listed in UL Fire Resistance or by a nationally recognized testing laboratory.

2.2.2 Toxicity

Provide material that is nontoxic and carcinogen free to humans at all stages of application or during fire conditions and does not contain hazardous chemicals or require harmful chemicals to clean material or equipment.

2.2.3 Fire Resistance Rating

Firestop systems must be UL Fire Resistance listed or FM APP GUIDE approved with "F" rating at least equal to fire-rating of fire wall or floor in which penetrated openings are to be protected. Where required, firestop systems must also have "T" rating at least equal to the fire-rated floor in which the openings are to be protected.

2.2.3.1 Through-Penetrations

Firestopping materials for through-penetrations, as described in paragraph

SUMMARY, must provide "F", "T" and "L" fire resistance ratings in accordance with ASTM E814 or UL 1479. Provide fire resistance ratings as follows:

2.2.3.1.1 Penetrations of Fire Resistance Rated Walls and Partitions

F Rating = Rating of wall or partition being penetrated.

2.2.3.1.2 Penetrations of Fire and Smoke Resistance Rated Walls, Floors, Floor-Ceiling Assemblies, and the ceiling membrane of Roof-Ceiling Assemblies

F Rating = 1 and 2 hour, T Rating = 1 and 2 hour and L Rating = <10 cfm/sf Where L rating is required.

2.2.3.2 Construction Joints and Gaps

Fire resistance ratings of construction joints, as described in paragraph SUMMARY, and gaps must be the same as the construction in which they occur. Provide construction joints and gaps with firestopping materials and systems that have been tested in accordance with ASTM E119, ASTM E1966 or UL 2079 to meet the required fire resistance rating. Systems installed at construction joints must meet the cycling requirements of ASTM E1399/E1399M or UL 2079. Provide a minimum class II movement capability for all joints at the intersection of the top of a fire resistance rated wall and the underside of a fire-rated floor, or roof .

2.2.4 Material Certification

Submit certificates attesting that firestopping material complies with the specified requirements. Provide certification of compliance with UL 1479 for all intumescent firestop materials used in through penetration systems.

PART 3 EXECUTION

3.1 PREPARATION

Areas to receive firestopping must be free of dirt, grease, oil, or loose materials which may affect the fitting or fire resistance of the firestopping system. For cast-in-place firestop devices, formwork or metal deck to receive device prior to concrete placement must be sound and capable of supporting device. Prepare surfaces as recommended by the manufacturer.

3.2 INSTALLATION

Completely fill void spaces with firestopping material regardless of geometric configuration, subject to tolerance established by the manufacturer. Firestopping systems for filling floor voids 4 inches or more in any direction must be capable of supporting the same load as the floor is designed to support or be protected by a permanent barrier to prevent loading or traffic in the firestopped area. Install firestopping in accordance with manufacturer's written instructions. Provide tested and listed firestop systems in the following locations, except in floor slabs on grade:

a. Penetrations of duct, conduit, tubing, cable and pipe through floors and through fire-resistance rated walls, partitions, and ceiling-floor assemblies.

b. Penetrations of vertical shafts such as pipe chases, elevator shafts, and utility chutes.

c. Gaps at the intersection of floor slabs and curtain walls, including inside of hollow curtain walls at the floor slab.

d. Gaps at perimeter of fire-resistance rated walls and partitions, such as between the top of the walls and the bottom of roof decks.

e. Construction joints in floors and fire rated walls and partitions.

f. Other locations where required to maintain fire resistance rating of the construction.

3.2.1 Insulated Pipes and Ducts

Cut and remove thermal insulation where pipes or ducts pass through firestopping, unless insulation meets requirements specified for firestopping. Replace thermal insulation with a material having equal thermal insulating and firestopping characteristics.

3.2.2 Fire Dampers

Install and firestop fire dampers in accordance with Section 23 30 00 HVAC AIR DISTRIBUTION. Firestop installed with fire damper must be tested and approved for use in fire damper system. Firestop installed with fire damper must be tested and approved for use in fire damper system.

3.2.3 Data and Communication Cabling

Seal cabling for data and communication applications with re-enterable firestopping products and devices as indicated.

3.2.3.1 Re-Enterable Devices

Provide firestopping devices that are pre-manufactured modular devices, containing built-in self-sealing intumescent inserts. Allow for cable moves, additions or changes without the need to remove or replace any firestop materials. Devices must be capable of maintaining the fire resistance rating of the penetrated membrane at 0 percent to 100 percent visual fill of penetrants; while maintaining "L" rating of <10 cfm/sf measured at ambient temperature and 400 degrees F at 0 percent to 100 percent visual fill.

3.2.3.2 Re-Sealable Products

Provide firestopping pre-manufactured modular products, containing self-sealing intumescent inserts. Allow for cable moves, additions or changes. Provide devices capable of maintaining the fire resistance rating of the penetrated membrane at 0 percent to 100 percent visual fill of penetrants.

3.3 INSPECTION

For all projects, do not cover or enclose the firestopped areas until inspection is complete and approved by the Contracting Officer. The inspector must inspect the applications initially to ensure adequate preparations (clean surfaces suitable for application, etc.) and periodically during the work to assure that the completed work has been

accomplished according to the manufacturer's written instructions and the specified requirements. Submit written reports indicating locations of and types of penetrations and types of firestopping used at each location; record type by UL listed printed numbers.

3.3.1 Inspection Reports

Submit inspection report stating that firestopping work has been inspected and found to be applied according to the manufacturer's recommendations and the specified requirements.

-- End of Section --

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SECTION 07 92 00

JOINT SEALANTS
08/23

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C509	(2006; R 2021) Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C1193	(2016) Standard Guide for Use of Joint Sealants
ASTM C1311	(2022) Standard Specification for Solvent Release Sealants
ASTM C1521	(2019; R 2020) Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints
ASTM D1056	(2020) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D1667	(2022) Standard Specification for Flexible Cellular Materials - Poly (Vinyl Chloride) Foam (Closed-Cell)

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2022) GREENGUARD Certification Program

For Chemical Emissions For Building
Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Sealants; G

Primers; G

Bond Breakers; G

Backstops; G

Cleaning Solvents; G

SD-06 Test Reports

Field Adhesion; G

SD-07 Certificates

Indoor Air Quality For Interior Sealants; S

Indoor Air Quality For Interior Floor Joint Sealants; S

1.3 PRODUCT DATA

Include storage requirements, shelf life, curing time, instructions for mixing and application, and accessories. Provide manufacturer's Safety Data Sheets (SDS) for each solvent, primer and sealant material proposed.

1.4 CERTIFICATIONS

1.4.1 Indoor Air Quality Certifications

Submit required indoor air quality certifications in one submittal package.

1.4.1.1 Adhesives and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party program that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does

not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

1.5 ENVIRONMENTAL CONDITIONS

Apply sealant when the ambient temperature is between 40 and 90 degrees F.

1.6 DELIVERY AND STORAGE

Deliver materials to the jobsite in unopened manufacturers' sealed shipping containers, with brand name, date of manufacture, color, and material designation clearly marked thereon. Label elastomeric sealant containers to identify type, class, grade, and use. Handle and store materials in accordance with manufacturer's printed instructions. Prevent exposure to foreign materials or subjection to sustained temperatures exceeding 90 degrees F or lower than 0 degrees F. Keep materials and containers closed and separated from absorptive materials such as wood and insulation.

1.7 QUALITY ASSURANCE

1.7.1 Compatibility with Substrate

Verify that each sealant is compatible for use with each joint substrate in accordance with sealant manufacturer's printed recommendations for each application.

1.7.2 Joint Tolerance

Provide joint tolerances in accordance with manufacturer's printed instructions.

1.7.3 Mock-Up

Provide a mock-up of each type of sealant using materials, colors, and techniques approved for use on the project. Approved mock-ups may be incorporated into the Work.

1.7.4 Adhesion

Provide in accordance with ASTM C1193 or ASTM C1521.

PART 2 PRODUCTS

2.1 SEALANTS

Provide sealant products that have been tested, found suitable, and documented as such by the manufacturer for the particular substrates to which they will be applied.

In areas with ambient temperatures that exceed 110 degrees F, do not use polybutene, bituminous, acrylic-latex, polyvinyl acetate latex sealants, polychloroprene (neoprene), polyvinyl chloride (PVC), and polyurethane foams, and neoprene, PVC, and styrene butadiene rubber extruded seals and closure strips due to these materials having maximum recommended surface temperature ranges from 130 to 180 degrees F.

2.1.1 Interior Sealants

Provide ASTM C920, Type S or M, Grade NS, Class 12.5, Use NT. Provide sealant products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for interior sealants. Location(s) and color(s) of sealant for the following (Note, color "as selected" refers to manufacturer's full range of color options):

LOCATION	COLOR
a. Small voids between walls or partitions and adjacent lockers, casework, shelving, door frames, built-in or surface mounted equipment and fixtures, and similar items.	As selected
b. Perimeter of frames at doors, windows, and access panels which adjoin exposed interior concrete and masonry surfaces.	As selected
c. Joints of interior masonry walls and partitions which adjoin columns, pilasters, concrete walls, and exterior walls unless otherwise detailed.	As selected
d. Joints between edge members for acoustical tile and adjoining vertical surfaces.	As selected
e. Interior locations, not otherwise indicated or specified, where small voids exist between materials specified to be painted.	As selected
f. Joints between shower receptors and ceramic tile; joints formed where non-planar tile surfaces meet.	As selected
g. Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occurring where substrates change.	As selected
h. Behind escutcheon plates at valve pipe penetrations and showerheads in showers.	As selected
i. Any other location indicated on the drawings.	As selected

2.1.2 Exterior Sealants

For joints in vertical surfaces, provide single-component, neutral-curing silicone, ASTM C920, Type S or M, Grade NS, Class 50, Use NT. For joints in horizontal surfaces, provide ASTM C920, Type S or M, Grade P, Class 25, Use T. Provide location(s) and color(s) of sealant as follows (Note, color "as selected" refers to manufacturer's full range of color options):

LOCATION	COLOR
a. Joints and recesses formed where frames and subsills of windows, doors, louvers, and vents adjoin masonry, concrete, or metal frames. Use sealant at both exterior and interior surfaces of exterior wall penetrations.	Match adjacent surface color
b. Joints between new and existing exterior masonry walls.	Match adjacent surface color
c. Masonry joints where shelf angles occur.	Match adjacent surface color
d. Joints in wash surfaces of stonework.	Match adjacent surface color
e. Expansion and control joints.	Match adjacent surface color
f. Interior face of expansion joints in exterior concrete or masonry walls where metal expansion joint covers are not required.	Match adjacent surface color
g. Voids where items pass through exterior walls.	Match adjacent surface color
h. Metal reglets, where flashing is inserted into masonry joints, and where flashing is penetrated by coping dowels.	Match adjacent surface color
i. Metal-to-metal joints where sealant is indicated or specified.	Match adjacent surface color
j. Joints between ends of fascia, copings, and adjacent walls.	Match adjacent surface color
k. Any other location indicated on the drawings.	Match adjacent surface color

2.1.3 Floor Joint Sealants

ASTM C920, Type S or M, Grade P, Class 25, Use T. Provide sealant products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for interior floor joint sealants. Provide location(s) and color(s) of sealant as follows (Note, color "as selected" refers to manufacturer's full range of color options):

LOCATION	COLOR
a. Seats of metal thresholds for exterior doors.	Gray
b. Control and expansion joints in floors, slabs, ceramic tile, and walkways.	As selected.

2.2 PRIMERS

Non-staining, quick drying type and consistency as recommended by the sealant manufacturer for the particular application. Provide primers for interior applications that meet the indoor air quality requirements of the paragraph INTERIOR SEALANTS above.

2.3 BOND BREAKERS

Type and consistency as recommended by the sealant manufacturer to prevent adhesion of the sealant to the backing or to the bottom of the joint. Provide bond breakers for interior applications that meet the indoor air quality requirements of the paragraph INTERIOR SEALANTS above.

2.4 BACKSTOPS

Provide glass fiber roving, neoprene, butyl, polyurethane, or polyethylene foams free from oil or other staining elements as recommended by sealant manufacturer. Provide 25 to 33 percent oversized backing for closed cell and 40 to 50 percent oversized backing for open cell material, unless otherwise indicated. Provide backstop material that is compatible with sealant. Do not use oakum or other types of absorptive materials as backstops.

2.4.1 Rubber

Provide in accordance with ASTM D1056, Type 1, open cell, Class A, Grade , cross section for cellular rubber sponge backing.

2.4.2 PVC

Provide in accordance with ASTM D1667, Grade VO 12, open-cell foam, round cross section for polyvinyl chloride (PVC) backing.

2.4.3 Synthetic Rubber

Provide in accordance with ASTM C509, Option I, Type I preformed rods or tubes for synthetic rubber backing.

2.4.4 Neoprene

Provide in accordance with ASTM D1056, closed cell expanded neoprene cord Type 2, Class C, Grade for neoprene backing.

2.4.5 Butyl Rubber Based

Provide in accordance with ASTM C1311, from a single component, with solvent release. color as selected from manufacturer's full range of color choices .

2.5 CLEANING SOLVENTS

Provide type(s) recommended by the sealant manufacturer and in accordance with environmental requirements herein. Protect adjacent aluminum surfaces from solvents. Provide solvents for interior applications that meet the indoor air quality requirements of the paragraph INTERIOR SEALANTS above.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

Perform a field adhesion test in accordance with manufacturer's instructions and ASTM C1193, Method A or ASTM C1521, Method A, Tail Procedure. Remove sealants that fail adhesion testing; clean substrates, reapply sealants, and re-test. Test sealants adjacent to failed sealants. Submit field adhesion test report indicating tests, locations, dates, results, and remedial actions taken.

3.2 SURFACE PREPARATION

Prepare surfaces according to manufacturer's printed installation instructions. Clean surfaces from dirt, frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter that would destroy or impair adhesion. Remove oil and grease with solvent; thoroughly remove solvents prior to sealant installation. Wipe surfaces dry with clean cloths. When resealing an existing joint, remove existing caulk or sealant prior to applying new sealant. For surface types not listed below, provide in accordance with sealant manufacturer's printed instructions for each specific surface.

3.2.1 Steel Surfaces

Remove loose mill scale by sandblasting or, if sandblasting is impractical or would damage finished work, scraping and wire brushing. Remove protective coatings by sandblasting or using a residue free solvent. Remove resulting debris and solvent residue prior to sealant installation.

3.2.2 Aluminum or Bronze Surfaces

Remove temporary protective coatings from surfaces that will be in contact with sealant. When masking tape is used as a protective coating, remove tape and residual adhesive prior to sealant application. For removing protective coatings and final cleaning, use non-staining solvents recommended by the manufacturer of the item(s) containing aluminum or bronze surfaces.

3.2.3 Concrete and Masonry Surfaces

Where surfaces have been treated with curing compounds, oil, or other such materials, remove materials by sandblasting or wire brushing. Remove laitance, efflorescence and loose mortar from the joint cavity. Remove resulting debris prior to sealant installation.

3.3 SEALANT PREPARATION

Do not add liquids, solvents, or powders to sealants. Mix multicomponent elastomeric sealants in accordance with manufacturer's printed

instructions.

3.4 APPLICATION

3.4.1 Joint Width-To-Depth Ratios

Acceptable Ratios:

JOINT WIDTH	JOINT DEPTH	
	Minimum	Maximum
For metal, glass, or other nonporous surfaces:		
1/4 inch (minimum)	1/4 inch	1/4 inch
over 1/4 inch	1/2 of width	Equal to width
For concrete, masonry, or stone. :		
1/4 inch (minimum)	1/4 inch	1/4 inch
over 1/4 inch to 1/2 inch	1/4 inch	Equal to width
over 1/2 inch to 1 inch	1/2 inch	5/8 inch
Over 1 inch	prohibited	

Unacceptable Ratios: Where joints of acceptable width-to-depth ratios have not been provided, clean out joints to acceptable depths and grind or cut to acceptable widths without damage to the adjoining work. Grinding is prohibited at metal surfaces.

3.4.2 Unacceptable Sealant Use

Do not install sealants in lieu of other required building enclosure weatherproofing components such as flashing, drainage components, and joint closure accessories, or to close gaps between walls, floors, roofs, windows, and doors, that exceed acceptable installation tolerances. Remove sealants that have been used in an unacceptable manner and correct building enclosure deficiencies to comply with contract documents requirements.

3.4.3 Masking Tape

Place masking tape on the finished surface on one or both sides of joint cavities to protect adjacent finished surfaces from primer or sealant smears. Remove masking tape within 10 minutes of joint filling and tooling.

3.4.4 Backstops

Provide backstops dry and free of tears or holes. Tightly pack the back or bottom of joint cavities with backstop material to provide joints in specified depths. Provide backstops where indicated and where backstops are not indicated but joint cavities exceed the acceptable maximum depths specified in JOINT WIDTH-TO-DEPTH RATIOS Table.

3.4.5 Primer

Clean out loose particles from joints immediately prior to application of. Apply primer to joints in concrete masonry units, wood, and other porous surfaces in accordance with sealant manufacturer's printed instructions. Do not apply primer to exposed finished surfaces.

3.4.6 Bond Breaker

Provide bond breakers to surfaces not intended to bond in accordance with, sealant manufacturer's printed instructions for each type of surface and sealant combination specified.

3.4.7 Sealants

Provide sealants compatible with the material(s) to which they are applied. Do not use a sealant that has exceeded its shelf life or has jelled and cannot be discharged in a continuous flow from the sealant gun. Apply sealants in accordance with the manufacturer's printed instructions with a gun having a nozzle that fits the joint width. Work sealant into joints so as to fill the joints solidly without air pockets. Tool sealant after application to ensure adhesion. Apply sealant uniformly smooth and free of wrinkles. Upon completion of sealant application, roughen partially filled or unfilled joints, apply additional sealant, and tool smooth as specified. Apply sealer over sealants in accordance with the sealant manufacturer's printed instructions.

3.5 PROTECTION AND CLEANING

3.5.1 Protection

Protect areas adjacent to joints from sealant smears. Masking tape may be used for this purpose if removed 5 to 10 minutes after the joint is filled and no residual tape marks remain.

3.5.2 Final Cleaning

Upon completion of sealant application, remove remaining smears and stains and leave the work in a clean and neat condition.

a. Masonry and Other Porous Surfaces: Immediately remove fresh sealant that has been smeared on adjacent masonry, rub clean with a solvent, and remove solvent residue, in accordance with sealant manufacturer's printed instructions. Allow excess sealant to cure for 24 hours then remove by wire brushing or sanding. Remove resulting debris.

b. Metal and Other Non-Porous Surfaces: Remove excess sealant with a solvent moistened cloth. Remove solvent residue in accordance with solvent manufacturer's printed instructions.

-- End of Section --

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SECTION 08 11 13

STEEL DOORS AND FRAMES
08/20

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2020; Errata 1 2021) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A879/A879M	(2012; R 2017) Standard Specification for Steel Sheet, zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface
ASTM A924/A924M	(2022a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM C578	(2022) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C591	(2022) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C612	(2014; R 2019) Standard Specification for Mineral Fiber Block and Board Thermal Insulation
ASTM D2863	(2019) Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.115	(2016) Hardware Preparation in Steel Doors and Steel Frames

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80	(2022) Standard for Fire Doors and Other Opening Protectives
NFPA 252	(2022) Standard Methods of Fire Tests of Door Assemblies

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR 113	(2023) Standard Practice for Determining the Steady-State Thermal Transmittance of Steel Door and Frame Assemblies
SDI/DOOR A250.6	(2020) Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames
SDI/DOOR A250.8	(2023) Specifications for Standard Steel Doors and Frames
SDI/DOOR A250.11	(2022) Recommended Erection Instructions for Steel Frames

UNDERWRITERS LABORATORIES (UL)

UL 10C	(2016; Reprint May 2021) UL Standard for Safety Positive Pressure Fire Tests of Door Assemblies

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Doors; G

Frames; G

Accessories

Schedule of Doors; G

Schedule of Frames; G

SD-03 Product Data

Doors; G

Recycled Content for Steel Door Product; S

Frames; G

Recycled Content for Steel Frame Product; S

Accessories

Weatherstripping

Submit manufacturer's descriptive literature for doors, frames, and accessories. Include data and details on door construction, panel (internal) reinforcement, insulation, and door edge construction. When "custom hollow metal doors" are provided in lieu of "standard steel doors," provide additional details and data sufficient for comparison to SDI/DOOR A250.8 requirements.

SD-04 SamplesVolatile Organic Compounds (Voc) Contents; S

SD-07 Certificates

Certificates Of Compliance; G

SD-11 Closeout Submittals

Recycled Content For Door Cores; S

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors, frames, and accessories undamaged and with protective wrappings or packaging. Provide temporary steel spreaders securely fastened to the bottom of each welded frame. Store doors and frames on platforms under cover in clean, dry, ventilated, and accessible locations, with 1/4 inch airspace between doors. Remove damp or wet packaging immediately and wipe affected surfaces dry. Replace damaged materials with new.

PART 2 PRODUCTS

2.1 PRODUCT SUSTAINABILITY CRITERIA

For products in this section, where applicable and to extent allowed by performance criteria, provide and document the following:

2.1.1 Reduce Volatile Organic Compounds (VOC) (Low-Emitting Materials)

Reduced VOC content is identified for some products in this section; provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING paragraph REDUCE VOLATILE ORGANIC COMPOUNDS (VOC) (LOW-EMITTING MATERIALS). Other products listed in this section may be available with reduced VOC content; identify those products that meet project requirements for reduced VOC content, and provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING paragraph REDUCE VOLATILE ORGANIC COM-POUNDS (VOC) (LOW-EMITTING MATERIALS).

2.2 STANDARD STEEL DOORS

SDI/DOOR A250.8, except as specified otherwise. Prepare doors to receive door hardware as specified in Section 08 71 00 DOOR HARDWARE. Undercut where indicated. Provide exterior doors with top edge closed flush and sealed to prevent water intrusion. Provide doors at 1-3/4 inch thick, unless otherwise indicated. Provide door material that uses a minimum of 25 percent recycled content. Provide data indicating percentage of

recycled content for steel door product.and certificates of compliance in accordance with Section 01 33 29 SUSTAINABILITY REPORTING.

2.2.1 Classification - Level, Performance, Model

2.2.1.1 Extra Heavy Duty Doors

SDI/DOOR A250.8, Level 3, physical performance Level A, Model 2 with core construction as required by the manufacturer for interior doors, of size(s) and design(s) indicated. Where vertical stiffener cores are required, the space between the stiffeners must be filled with board insulation. Provide Level 3 for interior doors except doors indicated to be Level 4 on the Door Schedule.

2.2.1.2 Maximum Duty Doors

SDI/DOOR A250.8, Level 4, physical performance Level A, Model 2 with core construction as required by the manufacturer for interior doors and for indicated exterior doors, of size(s) and design(s) indicated. Where vertical stiffener cores are required, the space between the stiffeners must be filled with mineral board insulation. Provide Level 4 for exterior doors and for interior doors indicated to be Level 4 on the Door Schedule .

2.3 ACCESSORIES

2.3.1 Astragals

For pairs of exterior steel doors which will not have aluminum astragals or removable mullions, as specified in Section 08 71 00 DOOR HARDWARE provide overlapping steel astragals with the doors.

2.3.2 Moldings

Provide moldings around glass of interior doors and louvers of interior doors. Provide nonremovable moldings on outside of exterior doors and on corridor side of interior doors. Other moldings may be stationary or removable.

2.4 INSULATION CORES

Provide insulating cores at all exterior doors and other specific doors noted in the door schedule, and provide an apparent U-factor of.48 in accordance with SDI/DOOR 113 and conforming to:

a. Rigid Cellular Polyisocyanurate Foam: ASTM C591, Type I or II, foamed-in-place or in board form, with oxygen index of not less than 22 percent when tested in accordance with ASTM D2863; or

b. Rigid Polystyrene Foam Board: ASTM C578, Type I or II; or

c. Mineral board: ASTM C612, Type I.

d. Recycled content for door cores: Provide products with recycled content and provide certificates of compliance in accordance with Section 01 33 29 SUSTAINABILITY REPORTING.

e. Provide insulation cores in compliance with the minimum emissions requirements as specified in 01 33 29 SUSTAINABILITY REPORTING,

Table 3-1 VOLATILE ORGANIC COMPOUNDS (VOC) (LOW-EMITTING MATERIALS) REQUIREMENTS and provide data for volatile organic compounds (voc) contents in accordance with 01 33 29 SUSTAINABILITY REPORTING paragraph REDUCE VOLATILE ORGANIC COMPOUNDS (VOC) (LOW-EMITTING MATERIALS).

2.5 STANDARD STEEL FRAMES

SDI/DOOR A250.8, Levels 3 and 4, except as otherwise specified. Form frames to sizes and shapes indicated, with welded corners. Provide steel frames for doors, unless otherwise indicated. Provide frame product that uses a minimum of 25 percent recycled content. Provide data indicating percentage of recycled content for steel frame productand certificates of compliancein accordance with Section 01 33 29 SUSTAINABILITY REPORTING..

2.5.1 Welded Frames

Continuously weld frame faces at corner joints. Mechanically interlock or continuously weld stops and rabbets. Grind welds smooth.

Weld frames in accordance with the recommended practice of the Structural Welding Code Sections 1 through 6, AWS D1.1/D1.1M and in accordance with the practice specified by the producer of the metal being welded.

2.5.2 Stops and Beads

Provide form and loose stops and beads from 20 gage steel. Provide for glazed and other openings in standard steel frames. Secure beads to frames with oval-head, countersunk Phillips self-tapping sheet metal screws or concealed clips and fasteners. Space fasteners approximately 12 to 16 inch on center. Miter molded shapes at corners. Butt or miter square or rectangular beads at corners.

2.5.3 Anchors

Provide anchors to secure the frame to adjoining construction. Provide steel anchors, zinc-coated not lighter than 18 gage.

2.5.3.1 Wall Anchors

Provide at least three anchors for each jamb. For frames which are more than 7.5 feet in height, provide one additional anchor for each jamb for each additional 2.5 feet or fraction thereof.

a. Masonry: Provide anchors of corrugated or perforated steel straps or 3/16 inch diameter steel wire, adjustable or T-shaped;

b. Stud partitions: Weld or otherwise securely fasten anchors to backs of frames. Design anchors to be fastened to open steel studs by wiring or welding;

2.5.3.2 Floor Anchors

Provide floor anchors drilled for 3/8 inch anchor bolts at bottom of each jamb member.

2.6 FIRE DOORS AND FRAMES

Provide fire doors and frames in accordance with NFPA 80 and this

specification that shall take precedence over details indicated or specified.

2.6.1 Labels

Provide fire doors and frames bearing the label of Underwriters Laboratories (UL), Factory Mutual Engineering and Research (FM), or Warnock Hersey International (WHI) attesting to the rating required. Testing must be in accordance with NFPA 252 or UL 10C. Provide labels that are metal with raised letters, bearing the name or file number of the door and frame manufacturer. Labels must be permanently affixed at the factory to frames and to the hinge edge of the door. Do not paint door and labels.

2.6.2 Astragal on Fire Doors

On pairs of labeled fire doors, conform to NFPA 80 and UL requirements.

WEATHERSTRIPPING

As specified in Section 08 71 00 DOOR HARDWARE.

2.7 EXTERIOR FRAMES

Provide thermal insulation in all exterior frames. Provide frames of a minimum Level 4, with frames of a minimum thickness of 0.067 inch, 14 gage.

2.8 HARDWARE PREPARATION

Drill and tap doors and frames to receive finish hardware. Prepare doors and frames for hardware in accordance with the applicable requirements of SDI/DOOR A250.8 and SDI/DOOR A250.6. For additional requirements refer to ANSI/BHMA A156.115. Drill and tap for surface-applied hardware at the project site. Build additional reinforcing for surface-applied hardware into the door at the factory. Punch door frames, with the exception of frames that will have weatherstripping or gasketing, to receive a minimum of two rubber or vinyl door silencers on lock side of single doors and one silencer for each leaf at heads of double doors. Set lock strikes out to provide clearance for silencers.

2.9 FINISHES

Provide finishes in compliance with the minimum emissions requirements as specified in 01 33 29 SUSTAINABILITY REPORTING, Table 3-1 VOLATILE ORGANIC COMPOUNDS (VOC) (LOW-EMITTING MATERIALS) REQUIREMENTS and provide data for volatile organic compounds (voc) contents in accordance with 01 33 29 SUSTAINABILITY REPORTING paragraph REDUCE VOLATILE ORGANIC COMPOUNDS (VOC) (LOW-EMITTING MATERIALS).

2.9.1 Factory-Primed Finish

Thoroughly clean all surfaces of doors and frames then chemically treat and factory prime with a rust inhibiting coating as specified in SDI/DOOR A250.8.

2.9.2 Hot-Dip Zinc-Coated and Factory-Primed Finish

Fabricate exterior doors and frames from hot dipped zinc coated steel, alloyed type, that complies with ASTM A924/A924M and ASTM A653/A653M. The

coating weight must meet or exceed the minimum requirements for coatings having 0.4 ounces per square foot, total both sides, i.e., A40. Repair damaged zinc-coated surfaces by the application of zinc dust paint. Thoroughly clean and chemically treat to insure maximum paint adhesion. Factory prime as specified in SDI/DOOR A250.8. Provide for exterior doors.

2.9.3 Electrolytic Zinc-Coated Anchors and Accessories

Provide electrolytically deposited zinc-coated steel in accordance with ASTM A879/A879M, Commercial Quality, Coating Class A. Phosphate treat and factory prime zinc-coated surfaces as specified in SDI/DOOR A250.8.

2.10 FABRICATION AND WORKMANSHIP

Provide finished doors and frames that are strong and rigid, neat in appearance, and free from defects, waves, scratches, cuts, dents, ridges, holes, warp, and buckle. Provide molded members that are clean cut, straight, and true, with joints coped or mitered, well formed, and in true alignment. Dress exposed welded and soldered joints smooth. Design door frame sections for use with the wall construction indicated. Corner joints must be well formed and in true alignment. Conceal fastenings where practicable. Design frames in exposed masonry walls or partitions to allow sufficient space between the inside back of trim and masonry to receive caulking compound.

2.11 PROVISIONS FOR GLAZING

Materials are specified in Section 08 81 00, GLAZING.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Frames

Set frames in accordance with SDI/DOOR A250.11. Plumb, align, and brace securely until permanent anchors are set. Anchor bottoms of frames with expansion bolts or powder-actuated fasteners. Build in or secure wall anchors to adjoining construction. Where frames require ceiling struts or overhead bracing, anchor frames to the struts or bracing.Backfill frames with mortar. Coat inside of frames with corrosion-inhibiting bituminous material. For frames in exterior walls, ensure that stops are filled with rigid insulation before grout is placed.

3.1.2 Doors

Hang doors in accordance with clearances specified in SDI/DOOR A250.8. After erection and glazing, clean and adjust hardware.

3.1.3 Fire Doors and Frames

Install fire doors and frames, including hardware, in accordance with NFPA 80.

3.2 PROTECTION

Protect doors and frames from damage. Repair damaged doors and frames prior to completion and acceptance of the project or replace with new, as directed. Wire brush rusted frames until rust is removed. Clean

thoroughly. Apply an all-over coat of rust-inhibitive paint of the same type used for shop coat.

3.3 CLEANING

Upon completion, clean exposed surfaces of doors and frames thoroughly. Remove mastic smears and other unsightly marks.

-- End of Section --

SECTION 08 11 16

ALUMINUM DOORS AND FRAMES
05/17, CHG 2: 11/18

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 90.1 - IP	(2019) Energy Standard for Buildings Except Low-Rise Residential Buildings

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B209M	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
ASTM B221	(2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B221M	(2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
ASTM E283	(2019) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E331	(2000; R 2023) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

NFRC 100	(2020) Procedure for Determining Fenestration Product U-Factors

NFRC 200 (2020) Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

1.2 PERFORMANCE REQUIREMENTS

1.2.1 Structural Calculations

1.2.2 Air Infiltration

When tested in accordance with ASTM E283, air infiltration per door leaf cannot exceed 0.6 cubic feet per minute per square foot of fixed area at a test pressure of 6.24 pounds per square foot.

1.2.3 Water Penetration

When tested in accordance with ASTM E331, there can be no water penetration at a pressure of 2.86 pounds per square foot of fixed area.

1.2.4 Thermal Transmittance, Solar Heat Gain, Visible Light Transmittance

Provide products bearing NFRC Project Label Certificates for Fenestration verifying compliance with requirements for each assembly indicated. An NFRC Bid Report, or approved equal, for field assembled exterior doors may be submitted in lieu of Project Label Certificates for Fenestration if such reports are created in accordance with NFRC CAMP procedures and are provided by the manufacturer. Such alternate reports may be submitted with shop drawings, however, NFRC validated Project Label Certificates for Fenestration are required as a Closeout Submittal. Contact NFRC for information on NFRC 100 and NFRC 200 Compliance and Monitoring Program (CAMP) rating requirements: http://www.nfrc.org/industry/certification/compliance-and-monitoring-program-camp/

1.2.4.1 U-Factor

Provide exterior glazed assemblies, including aluminum entrances doors with greater than 50 percent glazed area, certified by the NFRC as having a whole window U-factor of 0.36 or less as determined in accordance with ASHRAE 90.1 - IP and as verified in accordance with NFRC 100.

1.2.4.2 Solar Heat Gain Coefficient (SHGC)

Provide exterior glazed assemblies, including aluminum entrances doors with greater than 50 percent glazed area, certified by the National Fenestration Rating Council with a whole window SHGC of 0.23 or less as determined in accordance with ASHRAE 90.1 - IP and as verified in accordance with NFRC 200.

1.2.4.3 Visible Light Transmittance (VLT)

Provide exterior glazed assemblies, including aluminum entrances doors with greater than 50 percent glazed area, certified by the NFRC with a whole window VLT of 41 PERCENT or greater as determined in accordance with ASHRAE 90.1 - IP and as verified in accordance with NFRC 200.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" classification.

Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

For Each Type of Door and Frame Assembly; G

SD-03 Product Data

For Each Type of Door and Frame Assembly; G

Recycled Content of Aluminum Material; S

SD-04 Samples

Finish Samples; G

SD-05 Design Data

Design Analysis; G

Structural Calculations for Deflection and Antiterrorism; G

SD-06 Test Reports

Air Infiltration; G

Water Penetration; G

SD-07 Certificates

NFRC Project Label Certificates for Fenestration; G

Certificates Of Compliance; G

SD-08 Manufacturer's Instructions

Installation of Each Type of Door and Frame Assembly; G

SD-10 Operation and Maintenance Data

Adjustments, Cleaning, and Maintenance; G

SD-11 Closeout Submittals

NFRC Project Label Certificates for Fenestration; G

Recycled Content; S

1.4 DELIVERY, STORAGE, AND HANDLING

Inspect materials delivered to the site for damage. Unload and store with minimum handling. Provide storage space in dry location with adequate ventilation, free from dust or water, and easily accessible for inspection and handling. Stack materials on non-absorptive strips or wood platforms. Do not cover doors and frames with tarps, polyethylene film,

or similar coverings. Protect finished surfaces during shipping and handling using manufacturer's standard method. Do not apply coatings or lacquers to surfaces to which caulking and glazing compounds must adhere.

1.5 QUALITY CONTROL

1.5.1 Shop Drawing

Indicate elevations and sections for each type of door and frame assembly. Show sizes and details of each assembly, frame construction,subframe attachment, thickness and gages of metal, details of door and frame construction, proposed method(s) of anchorage, glazing details, provisions for an location of hardware, mullion details, method and materials for flashing and weatherstripping, miscellaneous trim, installation details, and other related items necessary for a complete representation of all components. A qualified blast engineer must perform testing or calculations for door system design resistance to specified blast loads.

1.5.2 Finish Samples

Submit two color charts and two finish sample chips from manufacturer's standard color and finish options for each type of finish indicated.

1.5.3 Design Analysis

Submit design analysis with calculations showing that the design of each different size and type of door unit and its anchorage to the structure meets the minimum antiterrorism standards required by paragraph MINIMUM ANTITERRORISM PERFORMANCE. Calculations verifying the performance of each door proposed for use, under the given loads, must be prepared and signed by a registered Professional Engineer. The door components and anchorage devices to the structure, as determined by the design analysis, must be reflected in the shop drawings.

1.5.4 Operation and Maintenance Data

Submit detailed instructions for installation, adjustments, cleaning, and maintenance of each type of assembly indicated in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.6 QUALITY ASSURANCE

1.6.1 Engineer Qualifications for Blast Design

All blast design calculations must be performed by or under the direct supervision of a registered engineer with a minimum of 5 years' experience performing blast design. The engineering firm performing the blast design must be able to demonstrate experience on similar size projects using similar design methods to meet the requirements outlined in this specification.

PART 2 PRODUCTS

2.1 DOORS AND FRAMES

Provide swing-type aluminum doors and frames of size, design, and location indicated. Provide doors complete with frames, framing members, subframes, transoms, adjoining side lites, trim, and accessories. Coordinate side lites, with and Section 08 41 13 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

RECYCLED CONTENT

Provide products with recycled content and provide certificates of compliance in accordance with Section 01 33 29 SUSTAINABILITY REPORTING.

2.2 MATERIALS

2.2.1 Anchors

Stainless steel or steel with hot-dipped galvanized finish.

2.2.2 Weatherstripping

Continuous wool pile, silicone treated, or type recommended by door manufacturer.

2.2.3 Aluminum Alloy for Doors and Frames

ASTM B221M, ASTM B221, Alloy 6063-T5 for extrusions. ASTM B209M, ASTM B209, alloy and temper best suited for aluminum sheets and strips. Provide aluminum materials that include a minimum of 30 percent recycled content. Provide data indicating percentage of recycled content of aluminum material.

2.2.4 Fasteners

Hard aluminum or stainless steel.

2.2.5 Structural Steel

ASTM A36/A36M.

2.2.6 Aluminum Paint

Aluminum door manufacturer's standard aluminum paint.

2.3 FABRICATION

2.3.1 Aluminum Frames

Extruded aluminum shapes with contours approximately as indicated. Provide removable glass stops and glazing beads for frames accommodating fixed glass. Use countersunk stainless steel Phillips screws for exposed fastenings, and space not more than 12 inches on center. Mill joints in frame members to a hairline fit, reinforce, and secure mechanically.

2.3.2 Aluminum Doors

Of type, size, and design indicated and minimum 1-3/4 inch thick. minimum wall thickness, 0.125 inch, except beads and trim, 0.050 inch. Door sizes shown are nominal; include standard clearances as follows: 0.093 inch at hinge and lock stiles, 0.125 inch between meeting stiles, 0.125 inch at top rails, 0.187 inch between bottom and threshold, and 0.687 inch between bottom and floor. Provide bevel single-acting doors 0.063 or 0.125 inch at lock, hinge, and meeting stile edges.

2.3.2.1 Full Glazed Stile and Rail Doors

Provide doors with wide stiles and rails as indicated. Fabricate from

extruded aluminum hollow seamless tubes or from a combination of open-shaped members interlocked or welded together. Fasten top and bottom rail together by means of welding or by 3/8 or 1/2 inch diameter cadmium-plated tensioned steel tie rods. Provide an adjustable mechanism of jack screws or other methods in the top rail to allow for minor clearance adjustments after installation.

2.3.3 Welding and Fastening

Where possible, locate welds on unexposed surfaces. Dress welds on exposed surfaces smoothly. Select welding rods, filler wire, and flux to produce a uniform texture and color in finished work. Remove flux and spatter from surfaces immediately after welding. Exposed screws or bolts will be permitted only in inconspicuous locations, and must have countersunk heads. Weld concealed reinforcements for hardware in place.

2.3.4 Weatherstripping

Provide on stiles and rails of exterior doors. Fit into slots which are integral with doors or frames. Weatherstripping must be replaceable without special tools, and adjustable at meeting rails of pairs of doors. During installation, verify doors swing freely and close positively. Refer to paragraph AIR INFILTRATION for air leakage requirements and testing.

2.3.5 Anchors

On the backs of subframes, provide anchors of the sizes and shapes indicated for securing subframes to adjacent construction. Anchor transom bars at ends and mullions at head and sill. Where indicated, reinforce vertical mullions with structural steel members of sufficient length to extend up to the overhead structural slab or framing and secure thereto. Place anchors near top and bottom of each jamb and at intermediate points not more than 25 inch apart as required to withstand forces indicated.

2.3.6 Provisions for Hardware

Coordinate with Section 08 71 00 DOOR HARDWARE. Deliver hardware templates and hardware (except field-applied hardware) to the door manufacturer for use in fabrication of aluminum doors and frames. Cut, reinforce, drill, and tap doors and frames at the factory to receive template hardware. Provide doors to receive surface-applied hardware, except push plates, kick plates, and mop plates, with reinforcing only; drill and tap in the field. Provide hardware reinforcements of stainless steel or steel with hot-dipped galvanized finish, and secure with stainless steel screws.

2.3.7 Provisions for Glazing

Provide extruded aluminum snap-in glazing beads on interior side of doors. Provide glazing beads with vinyl insert glazing gaskets. Design glazing beads to receive thickness indicated for each glazed assembly. Coordinate requirements with Section 08 81 00 GLAZING.

2.3.8 Finishes

Provide exposed aluminum surfaces with factory finish of anodic coating or organic coating.

2.3.8.1 Anodic Coating

Clean exposed aluminum surfaces and provide an anodized finish conforming to AA DAF45. Provide clear (natural), designation AA-M10-C22-A41, Architectural Class I 0.7 mil or thicker) finish..

PART 3 EXECUTION

3.1 INSTALLATION

Plumb, square, level, and align frames and framing members to receive doors, transoms, adjoining side lites. Anchor frames to adjacent construction as indicated and in accordance with manufacturer's printed instructions and the approved shop drawings. Install anchorage that complies with applicable structural requirements. Anchor bottom of each frame to rough floor construction with 3/32 inch thick minimum stainless steel angle clips secured to back of each jamb and to floor construction; use stainless steel bolts and expansion rivets for fastening clip anchors. Hang doors to produce clearances specified in paragraph ALUMINUM DOORS. After erection and glazing, adjust doors and hardware to operate properly.

3.2 PROTECTION FROM DISSIMILAR MATERIALS

3.2.1 Dissimilar Metals

Where aluminum surfaces come in contact with metals other than stainless steel, zinc, or small areas of white bronze, protect from direct contact to dissimilar metals.

3.2.1.1 Protection

Provide one of the following systems to protect surfaces in contact with dissimilar metals:

a. Paint the dissimilar metal with one coat of heavy-bodied bituminous paint.

b. Apply elastomeric sealant between aluminum and dissimilar metals in accordance with Section 07 92 00 JOINT SEALANTS.

c. Paint dissimilar metals with one coat of primer and one coat of aluminum paint.

d. Use a non-absorptive tape or gasket in permanently dry locations.

3.2.2 Drainage from Dissimilar Metals

In locations where drainage from dissimilar metals has direct contact with aluminum, provide protective paint to prevent aluminum discoloration.

3.2.3 Masonry and Concrete

Provide aluminum surfaces in contact with mortar, concrete, or other masonry materials with one coat of heavy-bodied bituminous paint.

3.2.4 Wood or Other Absorptive Materials

Provide aluminum surfaces in contact with absorptive materials subject to frequent moisture, and aluminum surfaces in contact with treated wood,

with two coats of aluminum paint or one coat of heavy-bodied bituminous paint. In lieu of painting aluminum, paint the wood or other absorptive surface with two coats of aluminum paint and seal joints with elastomeric sealant.

3.3 SEALING AROUND ASSEMBLIES

Seal all penetrations of the air barrier by sealing around door openings as necessary to achieve compliance with air leakage requirements indicated in the air barrier sections of the specifications, and Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS. Flash all doors with corrosion resistant flashing to prevent water intrusion.

3.4 CLEANING

Upon completion of installation, clean door and frame surfaces in accordance with door manufacturer's written recommended procedure. Do not use abrasive, caustic, or acid cleaning agents.

3.5 PROTECTION

Protect doors and frames from damage and from contamination by other materials such as cement mortar. Prior to completion and acceptance of the work, restore damaged doors and frames to original condition, or replace with new ones.

-- End of Section --

SECTION 08 14 00

WOOD DOORS
08/16, CHG 1: 08/18

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

CALIFORNIA AIR RESOURCES BOARD (CARB)

CARB 93120	(2008) Measure (ATCM) FORFormaldehyde Emissions from Composite Wood Products

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

FOREST STEWARDSHIP COUNCIL (FSC)

FSC STD 01 001	(2015) Principles and Criteria for Forest Stewardship

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 770	Formaldehyde Standards for Composite Wood Products

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

ANSI/WDMA I.S.1A	(2013) Interior Architectural Wood Flush Doors
ANSI/WDMA I.S.6A	(2013) Interior Architectural Stile and Rail Doors

WOODWORK INSTITUTE (WI)

NAAWS 3.1	(2017; 2018 Errata Edition) North American Architectural Woodwork Standards

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Doors; G

Submit drawings or catalog data showing each type of door unit . Indicate within drawings and data the door types and construction,

sizes, thickness, and glazing,.

SD-03 Product Data

Doors; G

Recycled Content for Door Cores; S

Accessories

Water-resistant Sealer

Sample Warranty

Volatile Organic Compounds (Voc) Contents; S

SD-04 Samples

Doors

Prior to the delivery of wood doors, submit a sample section of each type of door which shows the veneer, finish, and core construction.

Door Finish Colors; G

Submit a minimum of three color selection samples , minimum 3 by 5 inches in size representing wood stain .

SD-06 Test Reports

Cycle-Slam

Hinge Loading Resistance

Submit cycle-slam test report for doors tested in accordance with ANSI/WDMA I.S.1A, and hinge loading resistance test report for doors tested in accordance with ANSI/WDMA I.S.6A.

SD-07 Certificates

Certificates of Grade

Certified Sustainably Harvested Flush Wood Doors; S

Indoor Air Quality for Particleboard and Agrifiber Door Cores: S

SD-11 Closeout Submittals

Certified Sustainably Harvested Flush Wood Doors; S

Recycled Content for Door Cores; S

Indoor Air Quality for Particleboard and Agrifiber Door Cores; S

Warranty

1.3 CERTIFICATIONS

1.3.1 Certified Wood Grades

Provide certificates of grade from the grading agency on , acoustical doors, and fire doors.

1.3.2 Certified Sustainably Harvested Wood

Provide wood certified as sustainably harvested by FSC STD 01 001. Provide a letter of Certification of Sustainably Harvested Wood signed by the wood supplier. Identify certifying organization and their third party program name and indicate compliance with chain-of-custody program requirements. Submit sustainable wood certification data; identify each certified product on a line item basis. Submit copies of invoices bearing certification numbers.

1.3.3 Indoor Air Quality Certification

1.3.3.1 Composite Wood, Wood Structural Panel and Agrifiber Products

For purposes of this specification, composite wood and agrifiber products include particleboard, medium density fiberboard (MDF), wheatboard, strawboard, panel substrates, and door cores. Products must contain no added urea-formaldehyde resins. Provide products certified to meet requirements of both 40 CFR 770 and CARB 93120. Provide current product certification documentation from certification body.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver doors to the site in an undamaged condition and protect against damage and dampness. Stack doors flat under cover. Support on blocking, a minimum of 4 inch thick, located at each end and at the midpoint of the door. Store doors in a well-ventilated building so that they will not be exposed to excessive moisture, heat, dryness, direct sunlight, or extreme changes of temperature and humidity. Do not store in a building under construction until concrete, masonry work, and plaster are dry. Replace defective or damaged doors with new ones.

1.5 WARRANTY

Warrant doors free of defects as set forth in the door manufacturer's standard door warranty.

PART 2 PRODUCTS

2.1 Doors

2.1.1 PRODUCT SUSTAINABILITY CRITERIA

For products in this section, where applicable and to extent allowed by performance criteria, provide and document the following:

2.1.2 Recycled Content for Wood Doors

Recycled content is identified for some products in this section; provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING paragraph RECYCLED CONTENT. Other products listed in this section may be

available with recycled content; identify those products that meet project requirements for recycled content, and provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING paragraph RECYCLED CONTENT.

2.1.3 Reduce Volatile Organic Compounds (VOC) (Low-Emitting Materials) for Products

Reduced VOC content is identified for some products in this section; provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING paragraph REDUCE VOLATILE ORGANIC COMPOUNDS (VOC) (LOW-EMITTING MATERIALS). Other products listed in this section may be available with reduced VOC content; identify those products that meet project requirements for reduced VOC content, and provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING paragraph REDUCE VOLATILE ORGANIC COMPOUNDS (VOC) (LOW-EMITTING MATERIALS).

2.1.4 Flush Doors

Conform to ANSI/WDMA I.S.1A for flush doors. Hardwood stile edge bands of doors receives a natural finish, compatible with face veneer. No visible finger joints will be accepted in stile edge bands. When used, locate finger-joints under hardware. Provide certified sustainably harvested flush wood doors.

2.1.4.1 Interior Flush Doors

Provide particleboard core, Type II flush doors conforming to ANSI/WDMA I.S.1A with faces of premium grade White Birch . Hardwood veneers must be rotary cut book matched. Door cores must have a minimum recycled content of 45 percent. Provide data identifying percentage of recycled content for door cores. Provide certification of indoor air quality for particleboard and agrifiber door cores.

Provide interior flush doors in compliance with the minimum emissions requirements as specified in 01 33 29 SUSTAINABILITY REPORTING, Table 3-1 VOLATILE ORGANIC COMPOUNDS (VOC) (LOW-EMITTING MATERIALS) REQUIREMENTS and provide data for volatile organic compounds (voc) contents in accordance with 01 33 29 SUSTAINABILITY REPORTING paragraph REDUCE VOLATILE ORGANIC COMPOUNDS (VOC) (LOW-EMITTING MATERIALS).

2.2 ACCESSORIES

2.2.1 Additional Hardware Reinforcement

Provide the minimum lock blocks to secure the specified hardware. The measurement of top, bottom, and intermediate rail blocks are a minimum 125 mm 5 inch by full core width. Comply with the manufacturer's labeling requirements for reinforcement blocking, but not mineral material similar to the core.

2.3 FABRICATION

2.3.1 Marking

Stamp each door with a brand, stamp, or other identifying mark indicating quality and construction of the door.

2.3.2 Quality and Construction

Identify the standard on which the construction of the door was based and identify doors having a Type I glue bond.

2.3.3 Adhesives and Bonds

ANSI/WDMA I.S.1A. Use Type I bond for exterior doors and Type II bond for interior doors. Provide a nonstaining adhesive on doors with a natural finish.

Provide adhesives and bonds in compliance with the minimum emissions requirements as specified in 01 33 29 SUSTAINABILITY REPORTING, Table 3-1 VOLATILE ORGANIC COMPOUNDS (VOC) (LOW-EMITTING MATERIALS) REQUIREMENTS and provide data for volatile organic compounds (voc) contents in accordance with 01 33 29 SUSTAINABILITY REPORTING paragraph REDUCE VOLATILE ORGANIC COMPOUNDS (VOC) (LOW-EMITTING MATERIALS).

2.3.4 Finishes

Provide finishes in compliance with the minimum emissions requirements as specified in 01 33 29 SUSTAINABILITY REPORTING, Table 3-1 VOLATILE ORGANIC COMPOUNDS (VOC) (LOW-EMITTING MATERIALS) REQUIREMENTS and provide data for volatile organic compounds (voc) contents in accordance with 01 33 29 SUSTAINABILITY REPORTING paragraph REDUCE VOLATILE ORGANIC COMPOUNDS (VOC) (LOW-EMITTING MATERIALS).

2.3.4.1 Factory Finish

Provide doors finished at the factory by the door manufacturer as follows: NAAWS 3.1 Section 1500, specification for System No. 6 catalyzed polyurethane. The coating is NAAWS 3.1 premium, medium rubbed sheen, or closed grain effect. Use stain when required to produce the finish specified for color. Seal edges, cutouts, trim, and wood accessories, and apply two coats of finish compatible with the door face finish. Touch-up finishes that are scratched or marred, or where exposed fastener holes are filled, in accordance with the door manufacturer's instructions. Match color and sheen of factory finish using materials compatible for field application.

2.3.4.2 Color

Provide door finish colors in accordance with Section 09 06 00 SCHEDULES FOR FINISHES.

2.3.5 Water-Resistant Sealer

Provide manufacturer's standard water-resistant sealer compatible with the specified finish.

Provide water-resistant sealer in compliance with the minimum emissions requirements as specified in 01 33 29 SUSTAINABILITY REPORTING, Table 3-1 VOLATILE ORGANIC COMPOUNDS (VOC) (LOW-EMITTING MATERIALS) REQUIREMENTS and provide data for volatile organic compounds (voc) contents in accordance with 01 33 29 SUSTAINABILITY REPORTING paragraph REDUCE VOLATILE ORGANIC COMPOUNDS (VOC) (LOW-EMITTING MATERIALS).

2.4 SOURCE QUALITY CONTROL

Meet or exceed the following minimum performance criteria of stiles of "B" and "C" label fire doors utilizing standard mortise leaf hinges:

a. Cycle-slam: Heavy Duty Doors: 500,000 cycles with no loose hinge screws or other visible signs of failure when tested in accordance with the requirements of ANSI/WDMA I.S.1A Extra Heavy Duty Doors: 1,000,000 cycles with no loose hinge screws or other visible signs of failure when tested in accordance with the requirements of ANSI/WDMA I.S.1A.

b. Hinge loading resistance: Averages of ten test samples not less than Extra Heavy Duty doors: 550 pounds force when tested for direct screw withdrawal in accordance with ANSI/WDMA I.S.6A using a No. 12, 1-1/4 inch long, steel, fully threaded wood screw. Drill 5/32 inch pilot hole, use 1-1/2 inch opening around screw for bearing surface, and engage screw full, except for last 1/8 inch. Do not use a steel plate to reinforce screw area.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

Before installation, seal top and bottom edges of doors with the approved water-resistant sealer. Seal cuts made on the job immediately after cutting using approved water-resistant sealer. Fit, trim, and hang doors with a 1/16 inch minimum, 1/8 inch maximum clearance at sides and top, and a 3/16 inch minimum, 1/4 inch maximum clearance over thresholds. Provide 3/8 inch minimum, 7/16 inch maximum clearance at bottom where no threshold occurs. Bevel edges of doors at the rate of 1/8 inch in 2 inch. Door warp must not exceed 1/4 inch when measured in accordance with ANSI/WDMA I.S.1A.

-- End of Section --

SECTION 08 34 73

SOUND CONTROL DOOR ASSEMBLIES
11/19, CHG 1: 02/21

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A108	(2013) Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
ASTM A568/A568M	(2019a) Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for
ASTM A1008/A1008M	(2023) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
ASTM A1011/A1011M	(2023) Standard Specification for Steel Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
ASTM C143/C143M	(2020) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C476	(2023) Standard Specification for Grout for Masonry
ASTM D6386	(2016a) Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
ASTM E90	(2009; R2016) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
ASTM E336	(2023) Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings

ASTM E413	(2022) Classification for Rating Sound Insulation
ASTM E1289	(2008; R 2022) Standard Specification for Reference Specimen for Sound Transmission Loss

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication Drawings

SD-03 Product Data

Steel Sound Retardant Doors; G

Door Frames; G

Door Hardware; G

Door Frame Sound InfillThresholds; G

SD-06 Test Reports

Acoustical Tests; G

SD-07 Certificates

Steel Sound Retardant Doors; G

Door Frames; G

Door Hardware; G

Thresholds; G

Assembly Test Reports

1.3 QUALITY CONTROL

Ensure work within this section is designed and furnished by one manufacturer, who has been engaged in the manufacture of Sound Retardant Steel Swinging Door systems for at least five years prior to the start of this work.

Provide acoustic assemblies manufactured by a single source specializing in the production of this type work for a minimum of five years.

1.4 DELIVERY, STORAGE, AND HANDLING

Ship all doors in the manufacturer's undamaged individual cartons,

securely bundled and wrapped with moisture-resistant covers and stored in accordance with the manufacturer's printed instructions in a dry, clean, and ventilated area.

Deliver and store steel doors in the building following the installation of concrete, terrazzo, plaster, or other wet materials, and only after the building has dried out and has a roof.

Store all materials on planks in a dry location. Store doors and frames vertically with minimum 1/4 inch airspace between. Store doors on the edge to eliminate any potential damage to the door bottom seal. Cover all material to protect from damage but in a manner to allow proper circulation.

Maintain relative humidity in the building between 30 and 65 percent. Maintain the ambient temperature at 60 degrees F minimum at the time of installation of wood doors.

Perform final adjustment of seals when temperatures and humidity conditions replicate the interior conditions that will exist when the building is occupied.

1.5 WARRANTY

Manufacturer's warranty for 5 years from date of supply, covering material and workmanship. Failures include, but are not limited to, the following:

a. Failure to meet sound rating requirements

b. Faulty operation of sound seals

c. Deterioration of metals, metal finishes, and other materials beyond normal use or weathering.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide sound retardant door assemblies of the thickness, width, and height indicated, complete with perimeter seals, seal housings, gasketing, automatic door bottoms, thresholds, door frames, and astragals as required to conform to the specified STC per ASTM E90 and ASTM E1289.

Submit fabrication drawings for steel Sound Retardant Doors, Door Frames and Door Frame Sound Infill.

Submit certificates showing conformance with the referenced standards in this section, and manufacturer's catalog data including STC ratings and UL fire rating, where applicable, for the following items: ; steel sound retardant doors; door frames; door hardware; and thresholds.

Provide assemblies that are complete with metal frame, steel door(s), sealing system, and Cam-lift hinges (when required).

2.1.1 Design Requirements

2.1.1.1 Door Design

Provide sound Retardant Wood Swinging Doors that are a 1-3/4-inch

thickness construction with sizes as indicated on drawings. No visible seams are permitted on door faces. Provide face gauges, internal sound retardant core and perimeter door edge construction per manufacturer's standard for the specified STC rating. No lead or asbestos is permitted in door construction to achieve STC performance. Provide face veneer species cut and color as selected from manufacturer's full range of available colors and patterns. No lead or asbestos is permitted in door construction to achieve performance requirements.

2.1.1.2 Frame Design

Provide sound Retardant Metal Frames conforming to ASTM A1008/A1008M, not less than 0.0747-inch thick, and free from pitting, scale, stretcher strains, fluting, and surface defects with integral trim and shipped with temporary spreader. Knockdown frames are not acceptable.

Provide frames with 2 inch faces, profiles and dimensions as indicated, with mitered reinforced corners, welded the full depth of frame and trim, with exposed surfaces ground smooth and flush. Close contact edges to hairline joints.

2.1.2 Performance Requirements

2.1.2.1 STC (Sound Transmission Classification) Rating

Provide doors with an STC per the door schedule.

2.2 FABRICATION

Provide doors that are minimum 14 gauge, 1 3/4 inch thick with welded, seamless construction. No visible joints are permitted on the exposed faces or edges. Join door skins at vertical edges by continuous welds, ground and dressed smooth to provide a flush finish. Reinforce top and bottom with 14 gauge continuous inverted steel channels spot welded to both faces. Finish both top and bottom to provide a smooth flush condition. Bevel both vertical edges 1/8 inch in 2 inches.

Clean and sand to smooth finish all doors to remove handling and storage marks, raised grain, minor surface marks and abrasions which are to receive a job site finish.

2.2.1 Hollow Metal Sound Retardant Doors

2.2.1.1 Construction

Conform to ASTM A1008/A1008M for door construction utilizing steel facing sheets. Conform stretcher level flatness to ASTM A568/A568M; not less than 0.0598 inch thick; free from pitting, scale, and surface defects; separated by a core construction designed to meet the required STC; and tested and rated in accordance with ASTM E90.

Provide doors that have flush seamless face sheets and vertical edges, with continuous welded and smooth joints. Provide edges that are flush or rabbeted as required for perimeter seals.

Provide door surfaces that are visually flat and free from warp, waviness, and other surface irregularities and defects. Maximum allowable warp or twist-can not exceed 1/8 inch when measured with a 7 foot straight edge along the diagonal and not exceed 1/16 inch when measured with a 7 foot straight edge in the width or in any position along the length of the door.

Provide hardware reinforcement that is steel drilled, tapped to template requirements and welded in place. Provide minimum thicknesses as follows:

a. Butts, 0.1494 inch

b. Lock strike, 0.1196 inch

c. Surface applied hardware 0.0747 inch

Provide doors, including sound retardant type, to bear the UL label fire rating and the specified STC.

2.2.1.2 Coating

Thoroughly clean all mill scale, rust, oil, grease, dirt, and other foreign materials from surfaces before the application of the shop coat of paint.

After cleaning, provide galvanized surfaces free of paint in accordance with ASTM D6386, Method A, B, C, or D.

Apply to clean prepared dry surfaces one shop coat of rust inhibitive metallic oxide or synthetic resin primer by brush, dipping, or other approved method to provide a continuous minimum dry film thickness (dft) of 0.9 mil.

Shop paint the exposed door surfaces, including surfaces that are galvanized.

Shop paint the concealed exterior door surfaces except galvanized surfaces.

2.3 COMPONENTS

2.3.1 Frames

Construct frames for Sound Retardant Wood Swinging Doors from formed sheet steel or structural shapes and bars. Provide sheet steel that is commercial quality, level, cold rolled steel conforming to ASTM A1008/A1008Mor hot rolled, pickled and oiled steel conforming to ASTM A1011/A1011M. Comply steel shapes with ASTM A36/A36M and steel bars with ASTM A108, Grade 1018.

2.3.2 Door Frame Sound Infill

Grout: Comply with ASTM C476, with a slump of not more than 4 inches as measured according to ASTM C143/C143M.

Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15 mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

Select the appropriate infill material.

2.3.3 Hardware Reinforcements

Factory mortise, reinforce, drill and tap frames for all mortise hardware as required by hardware manufacturer's template. Provide necessary

reinforcement plates as required for surface mounted hardware; installer to perform all field drilling and tapping. Provide dust cover boxes on all frame mortises. Provide minimum thicknesses as follows:

a. Butts, 3/16 inch

b. Lock strike, 0.1196 inch

c. Surface applied hardware 0.0747 inch

2.3.4 Jamb Anchors

Provide number and spacing of anchors as follows:

2.3.4.1 Masonry Type

Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

a) Two anchors per jamb up to 60 inches in height.

b) Three anchors per jamb from 60 to 90 inches in height.

c) Four anchors per jamb from 90 to 96 inches in height.

d) Four anchors per jamb plus one additional anchor per jamb for each 24 inches, or fraction thereof, more than 96 inches in height.

2.3.4.2 Stud-Wall Type

Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

a) Three anchors per jamb up to 60 inches in height.

b) Four anchors per jamb from 60 to 90 inches in height.

c) Five anchors per jamb from 90 to 96 inches in height.

d) Five anchors per jamb plus one additional anchor per jamb for each 24 inches, or fraction thereof, more than 96 inches in height.

e) Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.

2.3.4.3 Post-installed Expansion Type

Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

2.3.5 Door Hardware

Provide the following STC related hardware with the door; cam-lift hinges, perimeter seals, door bottoms and thresholds and .

Include on Fabrication drawings a finish hardware schedule for each door and a hollow metal door frame schedule for each door indicating profile, dimensions, hardware reinforcement, and frame anchorage. Also indicate perimeter seals, door-bottom devices and other hardware items that are

assembled in the shop.

Refer to Section 08 71 00 DOOR HARDWARE for remaining hardware requirements.

2.3.6 Door Bottoms

Neoprene or silicone gasket held in place by metal housing; mortised into bottom edge of door.

2.3.6.1 Automatic Door Bottoms

Neoprene or silicone gasket, held in place by metal housing, that automatically drops to form seal when door is closed; mounted to bottom edge of door with screws.

Mounting: Mortised or semimortised into bottom of door or surface mounted on face of door as required by testing to achieve STC rating indicated.

2.3.7 Thresholds

Provide metal thresholds where indicated. Provide thresholds that are extruded aluminum, 6063-T5 alloy, mill finish, not less than 1/8 inch thick, with integral seal grooves formed to the indicated section.

Provide flat, smooth, unfluted thresholds as recommended by manufacturer; fabricated from stainless steel.

a. Finish: Clear anodic finish.

b. Color: Match Architect's sample.

2.4 TESTS, INSPECTIONS, AND VERIFICATIONS

2.4.1 Sound Transmission Classification

Provide test reports prepared by a nationally recognized, independent laboratory for Acoustical Tests, Air Infiltration Tests, Wind Loading Tests, and Water Leakage Tests indicating that the sound transmission classification (STC) of the proposed door, based on tests at 16 third-octave band frequencies from 125 to 4,000 hertz, is no less than the specified STC when tested in accordance with ASTM E90, and that the door tested is hung in substantially the type of wall and frame as indicated and is fully operable with hardware and perimeter seals installed.

2.4.2 Cam Lift Hinges

When required to achieve STC, manufacturer to furnish laboratory test data certifying hinges have been cycled a minimum of 1,000,000 while supporting a minimum door weight of 350 pounds.

Full-mortise template type that raises the door 1/2 inch when door is fully open; with hardened pin; fabricated from stainless steel.

2.4.3 Guarantee

Provide written guarantee that each door delivered to the project is equal in construction, sound transmission classification (STC), and positive

pressure test rating where applicable, with appropriate labeling and markings, to that of the sample door tested. Clearly state in written guarantee that each door assembly, when installed in accordance with the manufacturer's printed instructions, has an in-place STC within 3 decibels of the specimen tested. Submit the following test data and Certificates with the written Guarantee:

a. Acoustical Tests

PART 3 EXECUTION

3.1 PREPARATION

Upon receipt of material, thoroughly inspect all frames, doors and accessories. Verify quantities and tag numbers according to the packing list provided. Report all discrepancies, deficiencies and/or damages immediately to Contracting Officer.

Prior to installation check all doors and frames for correct size and swing. Verify that frames are plumb, square and aligned without twist in accordance with tolerances published by NAAMM/HMMA and SDI.

3.1.1 Frame Painting and Cleaning

Clean thoroughly all surfaces of all mill scale, rust, oil, grease, dirt, and other foreign materials before the application of the shop coat of paint.

Apply one shop coat of rust inhibitive metallic oxide or synthetic resin primer applied to clean, dry, and prepared surfaces by brush, dipping, or other approved method to provide a continuous minimum dry film thickness of 0.9 mil.

3.2 INSTALLATION

3.2.1 Frame

Install frames plumb and true with not more than 1/32 inch deviation in vertical alignment in 8 feet. Anchor to the wall in accordance with the manufacturer's instructions. Grout frames solid with mortar in masonry, concrete, and plaster wall construction. Spot grout frames in dry wall partitions with mortar at the jamb anchor clips; fill the space between metal frame and stud partition solidly with fiberglass or mineral wool insulation.

3.2.2 Door

Install and adjust all doors, hardware, and seals in accordance with the approved drawings, hardware schedules, and the printed instructions of the door manufacturer.

Install and adjust perimeter seals and automatic door bottom seals to provide positive compression contact with the entire sealing surface with no gaps, openings, or breaks. Hinges or hardware which distort or pinch the perimeter seal during operation of the door will be rejected.

Install door bottom devices to seal the space between the door bottoms and

the finished floor and the space between the seal and seal housing.

Field apply perimeter seal housings with mitered corners and with flush, aligned hairline joints.

Install components to manufacturer's written instructions. Coordinate with wall construction for anchor placement. Set frames plumb, square, level and at correct elevation. Adjust operable parts for correct clearances and function. Install and adjust perimeter and bottom acoustic seals.

3.3 FIELD QUALITY CONTROL

Provide third party testing in accordance with ASTM E336. Verify in writing that installed product performs no less than five (5) ASTC or NIC rating points below the specified laboratory STC rating. Examine, adjust, and retest any installation not meeting that criteria until compliance is obtained.

3.3.1 Testing and Performance

Provide assemblies that are identical to those tested at an independent acoustical laboratory qualified under the National Voluntary Laboratory Accreditation Program (NVLAP) by the National Institute for Science and Technology (NIST) in accordance with ASTM E90 and ASTM E413. For the assembly test reports include the laboratory name, test report number and date of test.

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SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
08/18, CHG 1: 08/18

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 501	(2015) Methods of Test for Exterior Walls
AAMA 800	(2016) Voluntary Specifications and Test Methods for Sealants
AAMA 1503	(2009) Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections
AAMA 2605	(2020) Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7-16	(2017; Errata 2018; Supp 1 2018) Minimum Design Loads and Associated Criteria for Buildings and Other Structures

ASTM INTERNATIONAL (ASTM)

ASTM B221	(2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM E283	(2019) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E330/E330M	(2014; R 2021) Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

ASTM E331	(2000; R 2023) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E783	(2002; R 2018) Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
ASTM E1105	(2015; R 2023) Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference
ASTM E1424	(2022) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure and Temperature Differences Across the Specimen
ASTM E1886	(2019) Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
ASTM F1642/F1642M	(2017) Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.10	(2017) Power Operated Pedestrian Doors

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2021) International Building Code

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS TT-P-645	(Rev C; Notice 1) Primer, Paint, Zinc-Molybdate, Alkyd Type

UNDERWRITERS LABORATORIES (UL)

UL 325	(2017; Reprint Feb 2020) UL Standard for Safety Door, Drapery, Gate, Louver, and Window Operators and Systems

1.2 ADMINISTRATIVE REQUIREMENTS

1.2.1 Pre-Installation Meetings

Conduct a meeting before installation begins to verify the project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

Within 30 days of the Contract Award, submit the following for review and

approval by the Contracting Officer:

a. List of product installations

b. Sample warranty

c. Finish and color samples

d. Manufacturer's catalog data

Concurrently submit certified test reports showing compliance with specified performance characteristics and UL 325 for the following:

a. Wind Load (Resistance) in accordance with AAMA 501

b. Deflection in accordance with ASTM F1642/F1642M

c. Condensation Resistance and Thermal Transmittance Performance Requirements in accordance with AAMA 1503

d. Water Infiltration in accordance with ASTM E331

e. Structural Requirements in accordance with ASTM F1642/F1642M

1.3 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Sample Warranty; G

List of Product Installations; G

SD-02 Shop Drawings

Installation Drawings; G

Fabrication Drawings; G

SD-03 Product Data

Manufacturer's Catalog Data; G

Finish; G

Recycled Content of Aluminum Material; S

SD-04 Samples

Finish and Color Samples; G

SD-06 Test Reports

Certified Test Reports; G

Deflection

Air Infiltration

Condensation Resistance and Thermal Transmittance

Water Infiltration

SD-08 Manufacturer's Instructions

Manufacturer's Instructions

SD-11 Closeout Submittals

Manufacturer's Product Warranty

1.4 QUALITY CONTROL

1.4.1 Qualifications

1.4.1.1 Installer Qualifications

Provide documentation of the installer's experience as determined by the Contractor in performing the work specified in this section.

Ensure that the installers are specialized in work similar to that required for this project, and that they are acceptable to product manufacturer.

1.4.1.2 Manufacturer Qualifications

Ensure that manufacturers meet the requirements specified in this section and project drawings.

Ensure that the manufacturer is capable of providing field service representation during construction, approving acceptable installers and approving application methods.

1.4.2 Single-Source Responsibility

When aluminum entrances are part of a building enclosure system, that includes storefront framing, windows, a curtain wall system, and related products, provide building enclosure system products from a single-source manufacturer.

Use a single source manufacturer with sole responsibility for providing design, structural engineering, and custom fabrication for door portal systems and for supplying components, materials, and products. Do not use products provided from numerous sources for assembly at the site. Ensure that the following work items and components are fabricated or supplied by a single source are:

a. Door assemblies to be installed in door portals as specified in Section 08 11 16 ALUMINUM DOORS AND FRAMES.

b. Glazed walls to be constructed around door portals as specified in this Section.

c. Door operating hardware to be installed on or within door portals as specified in Section 08 71 00 DOOR HARDWARE.

d. Glass as specified in Section 08 81 00 GLAZING.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Ordering

To avoid construction delays, comply with the manufacturer's lead-time requirements and instructions for ordering.

1.5.2 Packing, Shipping, Handling and Unloading

Deliver materials in the manufacturer's original, unopened, undamaged containers with identification labels intact.

1.5.3 Storage and Protection

Store materials in a way that protects them from exposure to harmful weather conditions. Avoid damaging the storefront material and components during handling. Protect storefront material against damage from elements, construction activities, and other hazards before, during, and after storefront installation.

Do not use adhesive papers or sprayed coatings that become firmly bonded when exposed to sunlight. Do not leave coating residue on surfaces.

1.6 PROJECT / SITE CONDITIONS

1.6.1 Field Measurements

Verify actual measurements or openings by taking field measurements before fabrication; record these measurements on shop drawings. To avoid construction delays, coordinate field measurements, and fabrication schedule with construction progress.

1.7 WARRANTY

Provide a written manufacturer's warranty, executed by a company official, warranting against defects in materials and products for 2 years from the date of shipment. Warrant that the door corner construction is for the life of the project.Provide a written installer's warranty, warranting work to be watertight and free from defective materials, defective workmanship, and glass breakage as a result of defective design, and agreeing to replace components that fail within 2 years.

The warranty states the following:

a. Watertight and airtight system installation is completed within specified tolerances.

b. The completed installation remains free of rattles, wind whistles and noise caused by thermal movement and wind pressure.

c. System is structurally sound and free from distortion.

d. Glass and glazing gaskets will not break or "pop" from frames as a

result of design, wind load pressure, movement caused by expansion or contraction, or structural loading.

e. Glazing sealants and gaskets remain free of abnormal deterioration or dislocation as a result of sunlight, weather, or oxidation.

Provide written warranty stating that the organic coating finish will not fade more than 10 percent or show chalking, yellowing, peeling, cracking, pitting, corroding or variations in color, or gloss deterioration beyond the manufacturer's descriptive standards for 20 years from the shipment date and agreeing to promptly correct defects.

Provide a written thermal integrity warranty for 5 years from ship date against thermal barrier system failure resulting from the following:

a. Longitudinal and transverse thermal barrier shrinkage.

b. Thermal barrier cracking.

c. Structural failure of the thermal barrier material.

d. Loss of adhesion or loss of prescribed edge pressure on glazing material, resulting in excessive air and water infiltration.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide aluminum entrances, with glass and glazing, door hardware, and components.

Aluminum entrances include impact resistance entrances; medium stile, 3 1/2 inch vertical face dimension, 2 inch depth, for interior structural silicone glaze, for high-traffic/impact-resistant applications.

2.1.1 Design Requirements for Aluminum (Entrances and Components)

Provide a door portal system designed to withstand the following loads without breakage, loss, failure of seals, product deterioration, or other defects.

a. Dead and Live Loads: Determined by ASCE 7-16 and calculated in accordance with applicable codes.

b. Seismic Loads: Design and install the system to comply with the seismic requirements for the project location in accordance with Section 1613 of the International Building Code, ICC IBC.

c. Wind Loads: Design and install the system so that the effects of wind load acting inward and outward normal to the plane of the wall are in accordance with ASTM E330/E330M.

d. Thermal Loads And Movement:

(1) Ambient Temperature Range: 120degrees F

(2) Material Surfaces Range: 180degrees F

e. Water and Air Resistance: Provide weatherstripping, exterior gaskets, sealants, and other accessories to resist water and air penetration.

f. Impact-Protective Systems Provide an impact-protective system in accordance with ASTM E1886.

2.1.1.1 Material Standard

ASTM B221; 6063-T5 alloy and tempered.

Provide door stile and rail face dimensions of the entrance doors as follows:

Vertical Stile	Top Rail	Bottom Rail
3-1/2 inches	3-1/2 inches	6-1/2 inches

Provide major portions of the door members at 0.125 inches nominal in thickness and glazing molding at 0.050 inches thick.

2.1.1.2 Recycled Content

Provide aluminum framed entrances and storefronts that have a minimum of 20 percent recycled content based upon the aluminum billet used in the original material. Provide data indicating percentage of recycled content of aluminum material.

2.1.1.3 Sealants

Provide either ethylene propylene diene monomer (EPDM) elastomeric extrusions or thermoplastic elastomer glazing gaskets. Structural silicone sealant is required.

Internal Sealants: Provide sealants that according to the manufacturer will remain permanently elastic, tacky, non-drying, non-migrating, and weather tight.

2.1.1.4 Thermal Barrier

Use a rigid, structural thermal barrier to separate all exterior aluminum from interior aluminum. For purposes of this specification, a structural thermal barrier is defined as a system that transfers shear during bending and, therefore, promotes composite action between the exterior and interior extrusions. Do not use a nonstructural thermal barrier. Ensure that the thermal barrier provides a structural connection between the two sides of the door.

2.2 FABRICATION

Provide the following information when submitting fabrication drawings for custom fabrications:

a. Indicate elevations, detailed design, dimensions, member profiles, joint locations, arrangement of units, and member connections.

b. Show the following items:

(1) Details of special shapes.

(2) Reinforcing.

(3) Anchorage system.

(4) Interfacing with building construction.

(5) Provisions for expansion and contraction.

(6) Thermal breaks.

c. Indicate typical glazing details, locations of various types and thickness of glass, emergency breakout locations, and internal sealant requirements as recommended by the sealant manufacturer.

d. Clearly indicate locations of exposed fasteners and joints.

e. Clearly show where and how the manufacturer's system deviates from Contract drawings and these specifications.

2.2.1 Entrance System Fabrication

Provide door corner construction consisting of mechanical clip fastening, SIGMA deep penetration plug welds and 1-1/8 inch long fillet welds inside and outside all four corners. Provide a hook-in type exterior glazing stop with EPDM glazing gaskets reinforced with non-stretchable cord. Provide an interior glazing stop that is mechanically fastened to the door member and that incorporates a silicone-compatible spacer used with silicone sealant.

Accurately fit and secure joints and corners. Make joints hairline in appearance. Remove burrs and smooth edges. Prepare components with internal reinforcement for door hardware. Arrange fasteners and attachments so that they are concealed from view.

Separate dissimilar metals with protective coating or pre-formed separators to prevent contact and corrosion.

2.2.2 Shop Assembly

Fabricate and assemble units with joints only at the intersection of aluminum members with hairline joints; rigidly secure these units, and seal them in accordance with the manufacturer's recommendations.

2.2.2.1 Welding

Conceal welds on aluminum members in accordance with AWS recommendations or methods recommended by the manufacturer. Members showing welding bloom or discoloration on finish or material distortion will be rejected by the Contacting Officer.

2.2.3 Finish

Before fabrication, clean the units and give them a AA-M-10-C22-A42 specified (color) anodized finish in accordance with the requirements of the AA DAF45. The finish thickness is A41, 0.4 mil or greater.

a. Organic Coating (high-performance exterior coating):

(1) Comply with requirements of AAMA 2605.

(2) Clean surfaces and pretreat them with a conversion coating before applying 0.3 mil dry-film thickness of epoxy or acrylic primer according to the recommendations of the finish coat manufacturer.

(3) Apply a finish coat of 70 percentminimum fluoropolymer resin fused to primed surfaces at the temperature recommended by the manufacturer and at a minimum dry film thickness of 1.0 mil.

(4) Use a 2-, 3-, or 4-coat system as required for the color selected.

2.2.4 Fabrication Tolerance

Fabricate and assemble units with joints only at intersection of aluminum members with hairline joints; rigidly secure these units, and seal them in accordance with the manufacturer's recommendations.

Fabricate aluminum entrances in accordance with the entrance manufacturer's prescribed tolerances.

2.2.4.1 Material Cuts

Square to 1/32 inch off square, over largest dimension; proportionate amount of 1/32 inch on the two dimensions.

2.2.4.2 Maximum Offset at Consecutive Members

1/64 inch in alignment between two consecutive members in line, end to end.

2.2.4.3 Joints

Between adjacent members in same assembly: Joints are hairline and square to the adjacent member.

2.2.4.4 Variation

In squaring diagonals for doors and fabricated assemblies: 1/16 inch.

2.2.4.5 Flatness

For doors and fabricated assemblies: plus/minus 1/16 inch of neutral plane.

2.3 MATERIALS

2.3.1 Sealants

Refer to Section 07 92 00 JOINT SEALANTS. Ensure that all sealants conform to AAMA 800.

2.3.2 Glass

Refer to Section 08 81 00 GLAZING.

2.4 ACCESSORIES

2.4.1 Fasteners

Provide stainless steel fasteners in areas where the fasteners are exposed.

Use non-corrosive and compatible fasteners with components being fastened. Do not use exposed fasteners, except where unavoidable for application of hardware.

In areas where fasteners are not exposed, use aluminum, non-magnetic stainless steel, or other materials warranted by the manufacturer.

For exposed locations, provide countersunk Phillips head screws when items with a matching finish are fastened. For concealed locations, provide the manufacturer's standard fasteners.

Provide nuts or washers that have been designed with a means to prevent disengagement; do not deform fastener threads.

2.4.2 Perimeter Anchors

When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

2.4.2.1 Inserts and Anchorage Devices

Provide manufacturer's standard formed or fabricated assemblies, steel or aluminum, of shapes, plates, bars, or tubes. Shop-coat steel assemblies after fabrication with an alkyd zinc chromate primer complying with FS TT-P-645.

2.4.3 Standard Entrance Hardware

2.4.3.1 Weatherstripping

Equip meeting stiles on pairs of doors with an adjustable astragal using wool pile with a polymeric fin.

Provide door weatherstripping on a single-acting offset pivot or butt-hung door and frame (single or pairs) consisting of a thermoplastic elastomer weatherstripping on a tubular shape with a semi-rigid polymeric backing.

Provide sill-sweep strips: Provide an EPDM blade gasket sweep strip in an aluminum extrusion applied to the interior exposed surface of the bottom rail with concealed fasteners. (Provide as necessary to meet specified performance tests.)

2.4.3.2 Threshold

Refer to the door schedule.

2.4.3.3 Offset Pivots

Refer to the door schedule.

2.4.3.4 Panic Device

Refer to the door schedule.

2.4.3.5 Closer

Refer to the door schedule.

2.4.3.6 Security Lock or Dead Lock

Provide Refer to the door schedule..

2.4.3.7 Cylinder(s)/Thumb-turn

Refer to the door schedule.

2.4.3.8 Cylinder Guard

Refer to the door schedule.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Site Verification of Conditions

Verify that the condition of substrate previously installed under other sections is acceptable for product installation in accordance with the manufacturer's instructions.

Verify that openings are sized to receive the storefront system and that the sill plate is level in accordance with the manufacturer's acceptable tolerances.

3.2 PREPARATION

Field-verify dimensions before fabricating components for the door portal assembly.

Coordinate requirements for locations of blockouts for anchorage of door portal columns and other embedded components with Section 03 30 00 CAST-IN-PLACE CONCRETE.

Coordinate the erection of door portal with installation of surrounding glass wall and door assemblies. Ensure that the door portals can provide support and anchorage for assembly components.

Coordinate electrical requirements for automatic door assembliesto ensure proper power source, conduit, wiring, and boxes.

3.2.1 Adjacent Surfaces Protection

Protect adjacent work areas and finish surfaces from damage during product installation.

3.2.2 Aluminum Surface Protection

Protect aluminum surfaces from contact with lime, mortar, cement, acids, and other harmful contaminants.

3.3 INSTALLATION

Submit installation drawings for review and approval.

Install the entrance system in accordance with the manufacturer's instructions and the AAMA storefront and entrance guide specifications manual. Attach the entrance system to the structure, allowing it to be adjusted to accommodate construction tolerances and other irregularities. Provide alignment attachments and shims to permanently fasten the system to the building structure. Align the assembly so that it is plumb and level, and free of warp and twist. Maintain assembly dimensional tolerances aligning with adjacent work.

Set thresholds in a bed of mastic and secure the thresholds. Protect aluminum members in contact with masonry, steel, concrete, or dissimilar materials using nylon pads or a bituminous coating. Shim and brace the aluminum system before anchoring the system to the structure. Verify that weep holes are open, and the metal joints are sealed in accordance with the manufacturer's installation instructions. Seal metal-to-metal joints using a sealant recommended by the system manufacturer.

3.3.1 Tolerances

Ensure that tolerances for wall thickness and other cross-sectional dimensions of entrance members are nominal and in compliance with Aluminum Standards and Data, published by the Aluminum Association.

3.3.2 Adjusting

Adjust operating hardware for smooth operation, and as recommended by the manufacturer.

3.3.3 Related Products Installation Requirements

3.3.3.1 Sealants (Perimeter)

Refer to Section 07 92 00 JOINT SEALANTS.

3.3.3.2 Glass

Refer to Section 08 81 00 GLAZING.

3.4 FIELD QUALITY CONTROL

3.4.1 Air Infiltration

Test air infiltration in accordance with ASTM E783

Submit certified test reports showing compliance with specified performance characteristics as follows:

a. For single-acting offset pivot, butt hung, or continuous geared hinge entrances in the closed and locked position, test the specimen in accordance with ANSI/BHMA A156.10, and ASTM E283 at a pressure

differential of 1.57 psf for pairs of doors; ensure that maximum infiltration for a pair of 7 foot by 8 foot entrance doors and frame is 1.2 cfm/square foot.

b. Ensure the maximum allowable infiltration for a completed storefront system does not exceed 0.06 cfm/square foot when tested in accordance with ASTM E1424 at a differential static pressure of 6.24 psf.

3.4.2 Wind Loads

Provide a completed storefront system capable of withstanding wind pressure loads, normal to the wall plane indicated, as follows:

a. Exterior Walls

(1) Positive Pressure: As indicated in Drawings.

(2) Negative Pressure: As indicated in Drawings.

b. Interior Walls: (pressure acting in either direction) 5 psf

3.4.3 Deflection

Submit certified test reports showing that the maximum allowable deflection in a member when tested in accordance with ASTM E330/E330M with allowable stress is L/175 or 3/4 inches maximum.

3.4.4 Condensation Resistance and Thermal Transmittance

Submit certified test reports showing compliance with specified performance characteristics as follows:

a. U-Value Requirements:

(1) Perform test in accordance with the AAMA 1503 procedure and on the configuration specified therein.

(2) Thermal Transmittance ("U" Value) maximum 0.65 (6250) BTU/hr/sf/deg F at 15 mph exterior wind.

b. CRF Class Requirements:

(1) Perform a test in accordance with AAMA 1503.

3.4.5 Water Infiltration

Submit certified test reports showing that the system is designed to provide no uncontrolled water when tested in accordance with ASTM E1105 at a static pressure of 8 psf.

3.5 ADJUSTING AND CLEANING

3.5.1 Protection

Protect the installed product's finish surfaces from damage during construction. Protect the aluminum storefront system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other

harmful contaminants.

3.5.2 Cleaning

Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions before acceptance remove excess mastic, mastic smears, and other foreign materials. Remove construction debris from the project site and legally dispose of this debris.

3.6 WARRANTY

Submit three signed copies of the manufacturer's product warranty for the entrance system as follows:

a. Warranty Period: Fiveyears from Date of Substantial Completion of the project, provided that the Limited Warranty begins no later than six months from the date of shipment by the manufacturer. In addition, support welded door corner construction with a limited lifetime warranty for the life of the door under normal use.

Ensure that the Warranty's language is identical to the "As Approved" version of the sample warranty submitted to and returned from the Contracting Officer.

-- End of Section --

SECTION 08 71 00

DOOR HARDWARE
02/16, CHG 4: 02/22

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM E283	(2019) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM F883	(2013; R 2022) Standard Performance Specification for Padlocks

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.1	(2021) Butts and Hinges
ANSI/BHMA A156.2	(2022) Bored and Preassembled Locks and Latches
ANSI/BHMA A156.3	(2020) Exit Devices
ANSI/BHMA A156.4	(2013) Door Controls - Closers
ANSI/BHMA A156.5	(2020) Cylinder and Input Devices for Locks
ANSI/BHMA A156.6	(2021) Architectural Door Trim
ANSI/BHMA A156.7	(2016) Template Hinge Dimensions
ANSI/BHMA A156.8	(2021) Door Controls - Overhead Stops and Holders
ANSI/BHMA A156.13	(2022) Mortise Locks & Latches Series 1000
ANSI/BHMA A156.16	(2023) Auxiliary Hardware
ANSI/BHMA A156.18	(2020) Materials and Finishes
ANSI/BHMA A156.19	(2013) Power Assist & Low Energy Power Operated Doors
ANSI/BHMA A156.21	(2019) Thresholds
ANSI/BHMA A156.22	(2021) Gasketing
ANSI/BHMA A156.25	(2013) Electrified Locking Devices

ANSI/BHMA A156.26	(2012) Continuous Hinges
ANSI/BHMA A156.36	(2010) Auxiliary Locks

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2023; ERTA 7 2023; TIA 23-15) National Electrical Code
NFPA 72	(2022; ERTA 22-1) National Fire Alarm and Signaling Code
NFPA 80	(2022) Standard for Fire Doors and Other Opening Protectives
NFPA 101	(2021; TIA 21-1) Life Safety Code
NFPA 252	(2022) Standard Methods of Fire Tests of Door Assemblies

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR A250.8	(2023) Specifications for Standard Steel Doors and Frames

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FF-L-2740B	Federal Specification, Locks, Electromechanical.
FF-L-2890C	Federal Specification, Lock Extensions.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

UNDERWRITERS LABORATORIES (UL)

UL Bld Mat Dir	(updated continuously online) Building Materials Directory

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Manufacturer's Detail Drawings; G

Verification of Existing Conditions; G

Hardware Schedule; G

Keying System; G

SD-03 Product Data

Hardware Items; G

SD-08 Manufacturer's Instructions

Installation

SD-10 Operation and Maintenance Data

Hardware Schedule Items, Data Package 1; G

SD-11 Closeout Submittals

Key Bitting

1.3 SHOP DRAWINGS

Submit manufacturer's detail drawings indicating all hardware assembly components and interface with adjacent construction. Indicate power components and wiring coordination for electrified hardware. Base shop drawings on verified field measurements and include verification of existing conditions.

1.4 PRODUCT DATA

Indicate fire-ratings at applicable components. Provide documentation of ABA/ADA accessibility compliance of applicable components, as required by 36 CFR 1191 Appendix D - Technical.

1.5 HARDWARE SCHEDULE

Provide Hardware Item List and Hardware Schedule containing the following information, and additional information as needed to identify the complete make up of each hardware set and its application to each opening:

1.5.1 Hardware Item List:

a. Hardware Type

b. Item Number

c. Quantity

d. Size(s)

e. Reference Publication / Type Number

f. Manufacturer's Name / Catalog Number

g. Key Control Symbols

h. UL Mark (If fire rated and listed)

i. BHMA Finish(es)

j. Remarks

1.5.2 Hardware Schedule

a. Hardware Set Number

b. Opening Number(s)

c. Opening Description (single/double leaf, hand, size, door/frame material)

d. Fire Rating

e. Sound Rating

f. Hardware Items

g. Quantity

h. Size

i. BHMA Finish

j. Remarks

In addition, submit hardware schedule data package 1 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.6 KEY BITTING CHART REQUIREMENTS

Coordinate door cylinder and keying requirements with 177th Fighter Wing Atlantic City ANG Basd, POC information listed below in this specification. Configure cores and cut keys to Atlantic City ANG Basd lock shop specifications and master keying strategy. Configured cores and cut keys shall be delivered with key bitting chart(s) to the Atlantic City ANG Basd - lock shop for final installation. Final lockset core installation will be conducted by Atlantic City ANG Basd personnel. Keys (operating and control keys) to override locks for rooms in the secure area must be controlled by and coordinated with the 177 FW Advanced Programs Office. 177 FW CES controls keys for all other doors. Secure area locks are not authorized to be "master keyed".

1.6.1 Requirements

Submit key bitting charts to the Contracting Officer prior to completion of the work. Include:

a. Complete listing of all keys (e.g. AA1 and AA2).

b. Complete listing of all key cuts (AA1-123456, AA2-123458).

c. Tabulation showing which key fits which door.

d. Copy of floor plan showing doors and door numbers.

e. Listing of 20 percent more key cuts than are presently required in each master system.

1.7 QUALITY ASSURANCE

1.7.1 Hardware Manufacturers and Modifications

Provide, as far as feasible, locks, hinges, pivots, and closers of one lock, hinge, pivot, or closer manufacturer's make. Modify hardware as necessary to provide features indicated or specified.

Door hardware must be fully compatible with existing Security System Standards currently being utilized throughout the Base - Skillcraft Door Hardware (Cores and Cylinders) shall be fully compatible with the 177th Fighter Wing's existing door access system.

1.7.2 Key Shop Drawings Coordination Meeting

Prior to the submission of the key shop drawing, the Contracting Officer, Contractor, Door Hardware Subcontractor, using Activity and Base Locksmith must meet to discuss and coordinate key requirements for the facility.

1). Access to the new facilities shall be provided with an existing master key system provided by “Best Lock Corporation”.
2). Hardware including cores and keys shall be ordered by the contractor from BEST or an authorized BEST supplier. Contractor shall submit all invoicing detailing quantities of cores and keys ordered for the project. This invoicing should include all extra stock and any additional product needed to convert non BEST hardware that may come from other suppliers/manufacturers such as that supplied with storefront doors or cipher locks. Details on how the keying will be setup will be worked directly between BEST and the Base. Cores and keys will be sent from BEST directly to 177th FW and the keying requirement meetings/discussions must include a 177 FW APO representative for installation and key turnover to the building users. Cores and keys should be available prior to substantial completion to ensure a smooth transition to the users.
3). Quantities for orders shall be agreed to and approved by 9 CES/CENM prior to any orders being issued by the Contractor. The Contractor will actively work with his subcontractors/suppliers/and BEST directly to resolve any issues with quantities and payments. At no time will any permanent cores and keys be sent to or released to the Contractor. The Contractor will provide and install temporary construction cores and keys for all doors necessary to secure the new facility until the new ones can be installed. Contractor shall have available all control keys so that construction cores and other non-BEST cores can be removed and replaced.
4). All new facility construction will utilize BEST locksets with Coremax brand cores. At no time will generic no label cores or keying be used

1.8 DELIVERY, STORAGE, AND HANDLING

Deliver hardware in original individual containers, complete with necessary appurtenances including fasteners and instructions. Mark each individual container with item number as shown on hardware schedule. Deliver permanent keys and removable cores to the Contracting Officer, either directly or by certified mail. Deliver construction master keys with the locks.

PART 2 PRODUCTS

2.1 TEMPLATE HARDWARE

Hardware applied to metal doors must be manufactured using a template. Provide templates to door and frame manufacturers in accordance with ANSI/BHMA A156.7 for template hinges. Coordinate hardware items to prevent interference with other hardware.

2.2 HARDWARE FOR FIRE DOORS AND EXIT DOORS

Provide all hardware necessary to meet the requirements of NFPA 72 for door alarms, NFPA 80 for fire doors, NFPA 101 for exit doors, NFPA 252 for fire tests of door assemblies, ABA/ADA accessibility requirements, and all other requirements indicated, even if such hardware is not specifically mentioned in paragraph HARDWARE SCHEDULE. Provide Underwriters Laboratories, Inc. labels for such hardware in accordance with UL Bld Mat Dir or equivalent labels in accordance with another testing laboratory approved in writing by the Contracting Officer.

2.3 HARDWARE ITEMS

Clearly and permanently mark with the manufacturer's name or trademark, hinges, pivots, locks, latches, exit devices, bolts and closers where the identifying mark is visible after the item is installed. For closers with covers, the name or trademark may be beneath the cover. Coordinate electrified door hardware components with corresponding components specified in Division 28 ELECTRONIC SECURITY SYSTEMS (ESS).

2.3.1 Hinges

Provide in accordance with ANSI/BHMA A156.1. Provide hinges that are 4-1/2 by 4-1/2 inch unless otherwise indicated. Construct loose pin hinges for exterior doors and reverse-bevel interior doors so that pins will be nonremovable when door is closed. Use BHMA type 5111 heavy weight antifriction bearing hinges on exterior doors and doors exposed to the hangar bays. Use BHMA type 8111 heavy weight antifriction bearing hinges on interior doors that form part of the building circulation systems, secure storage and primary shop doors. Use BHMA type 8112 on primary office suite doors, conference, briefing and all other doors not included above that are equipped with closers. Use BHMA type 8131 on all other doors. Other antifriction bearing hinges may be provided in lieu of ball-bearing hinges.

2.3.1.1 Maximum Security Pin (MSP)

ANSI/BHMA A156.1 Provide Maximum Security pins and security studs at all hinges identified as "with MSP" in the hardware schedule.

Non-Removeable Pin (NRP)

ANSI/BHMA A156.1 Provide at all hinges identified as "with NRP" in the hardware schedule

Continuous Hinges

Where continuous hinges are required, provide in accordance with

ANSI/BHMA A156.26.2.3.2 Continuous HingesWhere continuous hinges are required, provide in accordance with ANSI/BHMA A156.26.2.3.3 Locks and Latches

a. At exterior locations provide locksets of full stainless steel type 302 or 304 construction including fronts, strike, escutcheons, knobs, bolts and all interior working parts. Marine Grade I, fully non-ferrous.

b. In non-air-conditioned interior environments or humid interior environments, provide interior locksets on the same Marine Grade I, fully non-ferrous as exterior locksets.

2.3.3.1 Mortise Locks and Latches

Provide in accordance with ANSI/BHMA A156.13, Series 1000, Operational Grade 1, Security Grade 2. Provide mortise locks with escutcheons not less than 7 by 2-1/4 inch with a bushing at least 1/4 inch long. Cut escutcheons to fit cylinders and provide trim items with straight, beveled, or smoothly rounded sides, corners, and edges. Provide levers of mortise locks with screwless shanks and no exposed screws.

2.3.3.2 Bored Locks and LatchesProvide in accordance with ANSI/BHMA A156.2, Series 4000, Grade 1. Provide factory installed lead lining in locks for lead -shielded doors.2.3.3.3 High Security Combination Lockset Assemblies

Provide complete, functional lockset assembly, complatible with referenced electronic access control system. Provide all strikes, plates, mounting assemblies, and hardware necessary for a compliant installation under the referenced standards. Assembly shall be comprised of the following:

2.3.3.4 Pedestrian Deadbolt Device

Provide rim lockset assembly complying with FF-L-2890C, capable of integrating with high security combination lock complying with FF-L-2740B. Lockset shall allow single-motion egress from secured side of door as defined by NFPA 101, allow for access control system integration/override, as well as physical key override (with core and key compatible with 177th FW keying system).

2.3.3.5 High Security Combination Lock

Lock shall conform to FF-L-2740B, High Security locks shall be model electromechanical combination unit approved by the GSA for use on Class 5 and Class 6 security vault doors. The lock shall be internally self-powered such that rotation of the dial in either direction provides all the power necessary to operate the lock. The lock shall have three combination modes: Single: 1 million combinations; Dual: 500 billion combinations; Supervisor/Subordinate: 2 million combinations. A limited view Liquid Crystal Display (LCD) shall be provided. The lock shall be tamper-resistant with drill-resistant dial ring mounting plate and shall be fail secure against manipulation or attack. Vibration and shock shall meet MIL-STD-810. Case and bolt strength shall be 600 lbs minimum in two directions. Opening and unsuccessful attempts shall be recorded.

5-Button Mechanical Locksets

ANSI/BHMA A156.5, Function 40. Lockset provided shall be rated for outdoor use and be door system compatible. Lock shall be mechanical, 5-push button

type, with lever handle (both sides of door, unless noted otherwise) and keyed cylindrical core, compatible with 177th FW keying system. Lockset shall be installed in a manner that is permanent, sturdy, and that does not allow access to the latch release from the unsecure side.

2.3.3.6 Auxiliary Locks

Provide in accordance with ANSI/BHMA A156.36, Grade 1.

2.3.3.7 Combination Locks

Heavy-duty, mechanical combination lockset with five push buttons, standard sized knobs, 3/4 inch deadlocking latch, 2-3/4 inch backset. Locks to operate by pressing two or more of the buttons in unison or individually in the proper sequence. Inside knob operates the latch. Provide a keyed cylinder on the interior to permit setting the combination. Provide a keyed removable core cylinder on the exterior to permit bypassing the combination.

2.3.4 Exit Devices

Provide in accordance with ANSI/BHMA A156.3, Grade 1. Provide adjustable strikes for rim type and vertical rod devices. Provide open back strikes for pairs of doors with mortise and vertical rod devices. Provide touch bars in lieu of conventional crossbars and arms. Provide escutcheons not less than 7 by 2-1/4 inch.

2.3.4.1 Electric Exit Devices

Provide electric actuated exit devices where identified in the hardware schedule. Grade and finish shall be similar to mechanical devices provided throughout the building.

2.3.5 Cylinders and Cores

Provide cylinders and cores for new locks, that meet 177th Base standard including locks provided under other sections of this specification. Provide cylinders and cores with seven pin tumblers. Provide cylinders from the products of one manufacturer, and provide cores from the products of one manufacturer. Rim cylinders, and mortise cylinders, shall have small format interchangeable cores which are removable by special control keys. Stamp each interchangeable core with a key control symbol in a concealed place on the core.

2.3.6 Electrified Hardware

Comply with the requirements of NFPA 70 for wiring of electrified hardware.

2.3.6.1 Electrified Mortise Locks

Provide in accordance with ANSI/BHMA A156.25, Grade 1. Provide electrified mortise locks that remain secure during power failure. Provide facility interface devices that use dc power to energize solenoids. Provide solenoids, resisters, and signal switches in accordance with paragraph ELECTRIC STRIKES AND FRAME MOUNTED ACTUATORS.

2.3.6.1.1 Power Transfer Hinges

Provide power transfer hinges with each electrified lock that route power and monitoring signals from the lockset to the door frame. Coordinate power transfer hinges with door frames.

2.3.6.2 Power Assist and Low Energy Power Operated Doors

Provide in accordance with ANSI/BHMA A156.19, Grade 1.

2.3.7 Keying System

Provide interchangeable cores. Provide key cabinet as specified.

2.3.8 Lock Trim

Provide cast, forged, or heavy wrought construction and commercial plain design for lock trim.

2.3.8.1 Lever Handles

Provide lever handles . Provide in accordance with ANSI/BHMA A156.3 for mortise locks of lever handles for exit devices. Provide lever handle locks with a breakaway feature (such as a weakened spindle or a shear key) to prevent irreparable damage to the lock when force in excess of that specified in ANSI/BHMA A156.13 is applied to the lever handle. Provide lever handles return to within 1/2 inch of the door face.

2.3.9 Keys

Provide one file key, one duplicate key, and one working key for each key change and for each master and grand master keying system. Provide one additional working key for each lock of each keyed-alike group. Provide 3 great grand master keys, 3 construction master keys, and 3 control keys for removable cores. Provide a quantity of key blanks equal to 20 percent of the total number of file keys. Stamp each key with appropriate key control symbol and **"U.S. property - do not duplicate".** Do not place room number on keys.

2.3.10 Door Bolts

Provide in accordance with ANSI/BHMA A156.16. Provide dustproof strikes for bottom bolts, except at doors having metal thresholds. Provide automatic latching flush bolts in accordance with ANSI/BHMA A156.3, Type 25.

2.3.11 Closers

Provide in accordance with ANSI/BHMA A156.4, Series C02000, Grade 1, with PT 4C. Provide with brackets, arms, mounting devices, fasteners, full size covers, except at storefront mounting, pivots, and other features necessary for the particular application. Size closers in accordance with manufacturer's printed recommendations, or provide multi-size closers, Sizes 1 through 6, and list sizes in the Hardware Schedule. Provide manufacturer's 10 year warranty.

Use stainless steel inside bracketed or door mounted closers on exterior doors. Non-ferrous closers, such as aluminum or cast bronze, are permissible where door utilization is minimal. On interior doors use

closers of 302 or 304 stainless steel or non-ferrous materials. On surface-mounted closers use or apply rust inhibiting finish on all ferrous parts. Also apply this finish on concealed closers.

2.3.11.1 Identification Marking

Engrave each closer with manufacturer's name or trademark, date of manufacture, and manufacturer's size designation in locations that will be visible after installation.

2.3.12 Overhead Holders

Provide in accordance with ANSI/BHMA A156.8.

2.3.13 Door Protection Plates

Provide in accordance with ANSI/BHMA A156.6.

2.3.13.1 Sizes of Armor and Kick Plates

2 inch less than door width for single doors; 1 inch less than door width for pairs of doors. Provide 10 inch kick plates for flush doors and 1 inch less than height of bottom rail for panel doors. Provide a minimum 36 inch armor plates for flush doors .

2.3.14 Door Stops and Silencers

Provide in accordance with ANSI/BHMA A156.16. Silencers Type L03011. Provide three silencers for each single door, two for each pair.

2.3.15 Padlocks

Provide in accordance with ASTM F883. Mark "**Property of U.S. Govt."**

2.3.16 Thresholds

Provide in accordance with ANSI/BHMA A156.21. Use J35100, with vinyl or silicone rubber insert in face of stop, for exterior doors opening out, unless specified otherwise.

2.3.17 Weatherstripping Gasketing

Provide in accordance with ANSI/BHMA A156.22. Provide the type and function designation where specified in paragraph HARDWARE SCHEDULE. Provide a set to include head and jamb seals, sweep strips, and, for pairs of doors, astragals. Air leakage of weatherstripped doors not to exceed 1.25 cubic feet per minute of air per square foot of door area when tested in accordance with ASTM E283. Provide weatherstripping with one of the following:

2.3.17.1 Extruded Aluminum Retainers

Extruded aluminum retainers not less than 0.050 inch wall thickness with vinyl, neoprene, silicone rubber, or polyurethane inserts. Provide clear (natural) anodized aluminum.

2.3.17.2 Interlocking Type

Zinc or bronze not less than 0.018 inch thick.

2.3.17.3 Spring Tension Type

Spring bronze or stainless steel not less than 0.008 inch thick.

2.3.18 Soundproofing Gasketing

Provide in accordance with ANSI/BHMA A156.22. Provide adjustable doorstops at heads,jambs and automatic door bottoms in accordance with the hardware set, of extruded aluminum, clear (natural) anodized, surface applied, with vinyl fin seals between plunger and housing. Provide doorstops with solid neoprene tube, silicone rubber, or closed cell sponge gasket. Provide door bottoms with adjustable operating rod and silicone rubber or closed cell sponge neoprene gasket. Provide doorstops that are mitered at corners. Provide type and function designation where specified in paragraph HARDWARE SETS.

2.3.19 Rain Drips

Provide in accordance with ANSI/BHMA A156.22. Provide extruded aluminum rain drips, not less than 0.08 inch thick, clear anodized finish. Provide the manufacturer's full range of color choices to the Contracting Officer for color selection. Provide rain drips with a 4 inch overlap on each side of each exterior door that is not protected by an awning, roof, eave or other horizontal projection. Set drips in sealant and fasten with stainless steel screws.

2.3.19.1 Door Rain Drips

Approximately 1-1/2 inch high by 5/8 inch projection. Align bottom with bottom edge of door.

2.3.19.2 Overhead Rain Drips

Approximately 1-1/2 inch high by 2-1/2 inch projection. Align bottom with door frame rabbet.

2.3.20 Auxiliary Hardware (Other than locks)

Provide in accordance with ANSI/BHMA A156.16, Grade 1.

2.3.21 Special Tools

Provide special tools, such as spanner and socket wrenches and dogging keys, as required to service and adjust hardware items.

2.4 FASTENERS

Provide fasteners of type, quality, size, and quantity appropriate to the specific application. Fastener finish to match hardware. Provide stainless steel or nonferrous metal fasteners in locations exposed to weather. Verify metals in contact with one another are compatible and will avoid galvanic corrosion when exposed to weather.

2.5 FINISHES

Provide in accordance with ANSI/BHMA A156.18. Provide hardware in BHMA 630 finish (satin stainless steel), unless specified otherwise. Provide items not manufactured in stainless steel in BHMA 626 finish (satin

chromium plated) over brass or bronze, except aluminum paint finish for surface door closers, and except BHMA 652 finish (satin chromium plated) for steel hinges. Provide hinges for exterior doors in stainless steel with BHMA 630 finish or chromium plated brass or bronze with BHMA 626 finish. Furnish exit devices in BHMA 626 finish in lieu of BHMA 630 finish . Match exposed parts of concealed closers to lock and door trim. Match hardware finish for aluminum doors to the doors.

2.6 KEY CABINET AND CONTROL SYSTEM

Provide in accordance with ANSI/BHMA A156.5, Type required to yield a capacity (number of hooks) 50 percent greater than the number of key changes used for door locks.

2.7 KEY BOXES

Provide Knox Box Company, "KnoxVault #4400" high capacity key lock box with tamper alert. Box shall be single lock recessed mount with stainless steel hinged door and 9-1/2"H x 9-1/2"W flange. Provide unit with 5/8" thick steel door with interior silicone gasket seal and 1/4" plate steel housing. Lock shall have 1/8" dust cover with tamper seal. Box and lock shall be UL listed. Lock shall have double action rotating tumblers and hardened steel pins accessed by a biased cut key. Finish shall be aluminum. Provide (2) keys to Base Fire Department Standard.

At Building Main Entry: Mount box securely within fabricated wall panels mounted at 4'-0" AFF to the Bottom of the box as shown on the architetural elevations. Box installation shall be fully coordinated with the electrical and security drawings.

PART 3 EXECUTION

3.1 INSTALLATION

Provide hardware in accordance with manufacturers' printed installation instructions. Fasten hardware to wood surfaces with full-threaded wood screws or sheet metal screws. Provide machine screws set in expansion shields for fastening hardware to solid concrete and masonry surfaces. Provide toggle bolts where required for fastening to hollow core construction. Provide through bolts where necessary for satisfactory installation.

3.1.1 Weatherstripping Installation

Provide full contact, weathertight seals that allow operation of doors without binding the weatherstripping.

3.1.1.1 Stop Applied Weatherstripping

Fasten in place with color matched sheet metal screws not more than 9 inch on center after doors and frames have been finish painted.

3.1.2 Soundproofing Installation

Provide as specified for stop applied weatherstripping.

3.1.3 Threshold Installation

Extend thresholds the full width of the opening and notch end for jamb

stops. Set thresholds in a full bed of sealant and anchor to floor with cadmium-plated, countersunk, steel screws in expansion sleeves. For aluminum thresholds placed on top of concrete surfaces, coat the underside surfaces that are in contact with the concrete with fluid applied waterproofing as a separation measure prior to placement.

3.2 FIRE DOORS AND EXIT DOORS

Provide hardware in accordance with NFPA 72 for door alarms, NFPA 80 for fire doors, NFPA 101 for exit doors, and NFPA 252 for fire tests of door assemblies. .

3.3 HARDWARE LOCATIONS

Provide in accordance with SDI/DOOR A250.8, unless indicated or specified otherwise.

a. Kick and Armor Plates: Push side of single-acting doors. Both sides of double-acting doors.

3.4 KEY CABINET AND CONTROL SYSTEM

Locate where directed. Tag one set of file keys and one set of duplicate keys. Place other keys in appropriately marked envelopes, or tag each key. Provide complete instructions for setup and use of key control system. On tags and envelopes, indicate door and room numbers or master or grand master key.

3.5 FIELD QUALITY CONTROL

After installation, protect hardware from paint, stains, blemishes, and other damage until acceptance of work. Submit notice of testing 15 days before scheduled, so that testing can be witnessed by the Contracting Officer. Adjust hinges, locks, latches, bolts, holders, closers, and other items to operate properly. Demonstrate that permanent keys operate respective locks, and give keys to the Contracting Officer. Correct, repair, and finish, errors in cutting and fitting and damage to adjoining work.

3.6 HARDWARE SETS

Provide hardware for aluminum doors under this section. Deliver Hardware templates and hardware, except field applied hardware, to the aluminum door and frame manufacturer for use in fabricating doors and frames.

SET 1.0 (ENTRANCE DOOR - SINGLE EXTERIOR)
DOOR: 101A

3 HINGE (SIZE PER SPEC, NRP AS APPLICABLE)
1 EXIT DEVICE, FUNCTION 10
1 PERMANENT CORE MATCH FACILITY KEYING
1 KEYED REMOVABLE MULLION
1 SURFACE CLOSER
1 GASKETING/WEATHER STRIPPING
1 RAIN GUARD
1 SWEEP W/HOOD
1 THRESHOLD

OPERATION:
1. ENTRANCE EXTERIOR LEVER. INSIDE KEY LOCKS/UNLOCKS EXTERIOR LEVER. OUTSIDE KEY ONLY RETRACTS LATCH.
2. INSIDE EXIT DEVICE IS ALWAYS FREE FOR IMMEDIATE EGRESS
3. IF THUMBTURN OR DEADBOLT IS ADDED, SIGNAGE MUST BE POSTED THAT READS "THIS DOOR TO REMAIN UNLOCKED WHILE BUILDING IS OCCUPIED," AND BE APPROVED BY LOCAL AHJ.

SET 2.0 (ACCESS CONTROL DOOR - SINGLE INTERIOR)
DOOR: 101B

1 CONTINUOUS HINGE
1 STOREROOM-FAIL SECURE LOCK, FUNCTION 07, MORTISE LOCKSET, ELECTRIC LATCH RETRACTION, FIXED EXTERIOR LEVER HANDLE, INTERIOR EXIT DEVICE KEY OVERRIDE, FAIL SECURE, (WITH ESS INTEGRATION)
1 PERMANENT CORE MATCH FACILITY KEYING
1 ELECTRIC TRANSFER DEVICE
1 SURFACE CLOSER
1 CARD READER / KEYPAD
1 POWER SUPPLY VOLTAGE X AMPERAGE AS REQ'D
1 GASKETING SMOKE/SOUND

OPERATION:
1. CARD READER / KEYPAD GRANTS ACCESS UPON PRESENTATION OF A VALID CREDENTIAL TO SIGNAL ELECTRIC LATCH RETRACTION.
2. LATCHBOLT RETRACTED BY KEY OUTSIDE OR BY OPERATING INSIDE EXIT DEVICE ON RESTRICTED SIDE.
3. OUTSIDE LEVER IS ALWAYS INOPERATIVE.
4. REQUEST SWITCH INSIDE HANDLE TO SIGNAL AUTHORIZED EGRESS TO THE ACCESS CONTROL SYSTEM. BALANCED MAGNETIC SWITCH TO SIGNAL DOOR OPEN/CLOSED TO THE INTRUSION DETECTION SYSTEM.
5. INSIDE EXIT DEVICE IS ALWAYS FREE FOR IMMEDIATE EGRESS

SET 3.0 (COMBINATION LOCK DOOR - SINGLE EXTERIOR)
DOOR: 116A

1 CONTINUOUS HINGE
1 PUSH BUTTON COMBINATION LOCK W/KEY OVERRIDE, INTERIOR EXIT DEVICE
1 PERMANENT CORE MATCH FACILITY KEYING
1 SURFACE CLOSER

1 GASKETING/WEATHER STRIPPING
1 RAIN GUARD
1 SWEEP W/HOOD
1 THRESHOLD

OPERATION:
HEAVY-DUTY, MECHANICAL COMBINATION LOCKSET WITH FIVE PUSH BUTTONS, WITH LEVER. LOCK TO OPERATE BY PRESSING TWO OR MORE OF THE BUTTONS IN UNISON OR INDIVIDUALLY IN THE PROPER SEQUENCE. INSIDE LEVER OPERATES THE LATCH. PROVIDE A KEYED CYLINDER ON THE INTERIOR TO PERMIT SETTING THE COMBINATION. PROVIDE A KEYED PERMANENT CORE MATCH FACILITY KEYING ON THE EXTERIOR TO PERMIT BYPASSING THE COMBINATION. INSIDE LEVER IS ALWAYS FREE FOR IMMEDIATE EGRESS.

SET 4.0 (COMBINATION LOCK DOOR - DOUBLE EXTERIOR)
DOOR: 115A, 117A

2 CONTINUOUS HINGE
1 PUSH BUTTON COMBINATION LOCK W/KEY OVERRIDE, INTERIOR EXIT DEVICE(ACTIVE LEAF)
1 PERMANENT CORE MATCH FACILITY KEYING
1 EXIT DEVICE WITH NO EXTERIOR HARDWARE (INACTIVE LEAF)
1 KEYED REMOVABLE MULLION
1 ASTRAGAL
2 SURFACE CLOSER
1 GASKETING/WEATHER STRIPPING
1 RAIN GUARD
1 SWEEP W/HOOD
1 THRESHOLD

OPERATION:
(ACTIVE LEAF)
HEAVY-DUTY, MECHANICAL COMBINATION LOCKSET WITH FIVE PUSH BUTTONS, WITH LEVER. LOCK TO OPERATE BY PRESSING TWO OR MORE OF THE BUTTONS IN UNISON OR INDIVIDUALLY IN THE PROPER SEQUENCE. INSIDE EXIT DEVICE OPERATES THE LATCH. PROVIDE A KEYED CYLINDER ON THE INTERIOR TO PERMIT SETTING THE COMBINATION. PROVIDE A KEYED PERMANENT CORE MATCH FACILITY KEYING ON THE EXTERIOR TO PERMIT BYPASSING THE COMBINATION. INSIDE EXIT DEVICE IS ALWAYS FREE FOR IMMEDIATE EGRESS.

(INACTIVE LEAF)
LATCHBOLT RETRACTED BY INTERIOR EXIT DEVICE ONLY. NO EXTERIOR HARDWARE. INSIDE EXIT DEVICE IS ALWAYS FREE FOR IMMEDIATE EGRESS.

SET 5.0 (OFFICE DOOR - SINGLE INTERIOR)
DOOR: 103A

3 HINGE (SIZE PER SPEC, NRP AS APPLICABLE)
1 OFFICE, MORTISE LOCKSET, FUNCTION 04
1 PERMANENT CORE MATCH FACILITY KEYING
1 SURFACE CLOSER
1 WALL /FLOOR STOP
1 GASKETING SMOKE/SOUND
1 AUTOMATIC ACOUSTIC DOOR BOTTOM
1 THRESHOLD

NOTES:
1. THRESHOLD, DOOR BOTTOM, AND SEALS PROVIDED BY STC DOOR MANUFACTURER

OPERATION:
1. LATCHBOLT RETRACTED BY LEVER FROM EITHER SIDE UNLESS OUTSIDE IS MADE INOPERATIVE BY KEY OUTSIDE OR INSIDE PUSHBUTTON.
2. WHEN OUTSIDE IS LOCKED, THE LATCHBOLT IS RETRACTED BY KEY OUTSIDE OR BY LEVER INSIDE.
3. INSIDE LEVER IS ALWAYS FREE FOR IMMEDIATE EGRESS

SET 6.0 (STOREROOM DOOR - SINGLE INTERIOR)
DOOR: 107A, 109A

3 HINGE (SIZE PER SPEC, NRP AS APPLICABLE)
1 STOREROOM, MORTISE LOCKSET, FUNCTION 07, DEADLOCKING LATCH
1 PERMANENT CORE MATCH FACILITY KEYING
1 SURFACE CLOSER
1 WALL /FLOOR STOP
1 GASKETING SMOKE/SOUND

OPERATION:
1. LATCHBOLT RETRACTED BY KEY OUTSIDE OR BY OPERATING INSIDE LEVER.
2. OUTSIDE LEVER IS ALWAYS INOPERATIVE.
3. INSIDE LEVER IS ALWAYS FREE FOR IMMEDIATE EGRESS.

SET 7.0 (PUSH/PULL DOOR - SINGLE INTERIOR)
DOOR: 106A, 108A

3 HINGE (SIZE PER SPEC)
1 PULL PLATE
1 PUSH PLACE
1 SURFACE CLOSER
1 KICK PLATE
1 WALL /FLOOR STOP
1 GASKETING SMOKE/SOUND

OPERATION:
1. NO LATCHING IS REQUIRED. PUSH / PULL PLATE.

SET 8.0 (PASSAGE DOOR - SINGLE INTERIOR)
DOOR: 113A, 118A, 120A, 124A, 126A, 127A, 128A, 130A

3 HINGE (SIZE PER SPEC, NRP AS APPLICABLE)
1 PASSAGE, MORTISE LOCKSET
1 SURFACE CLOSER
1 KICK PLATE
1 WALL /FLOOR STOP
1 GASKETING SMOKE/SOUND
1 AUTOMATIC ACOUSTIC DOOR BOTTOM
1 THRESHOLD

NOTES:
1. THRESHOLD, DOOR BOTTOM, AND SEALS PROVIDED BY STC DOOR MANUFACTURER

OPERATION:
1. LATCHBOLT RETRACTED BY LEVER OUTSIDE OR BY OPERATING INSIDE LEVER.
2. INSIDE LEVER IS ALWAYS FREE FOR IMMEDIATE EGRESS.

SET 9.0 (PASSAGE DOOR - DOUBLE INTERIOR)
DOOR: 119A, 123A, 129A

6 HINGE (SIZE PER SPEC, NRP AS APPLICABLE)

1 PASSAGE, MORTISE LOCKSET (ACTIVE LEAF)
1 MORTISE STIKE (INACTIVE LEAF)
2 FLUSH BOLTS (INACTIVE LEAF)
2 SURFACE CLOSER
1 ASTRAGAL
2 KICK PLATE
2 WALL /FLOOR STOP
1 GASKETING SMOKE/SOUND
2 AUTOMATIC ACOUSTIC DOOR BOTTOM
1 THRESHOLD

NOTES:
1. THRESHOLD, DOOR BOTTOM, AND SEALS PROVIDED BY STC DOOR MANUFACTURER

OPERATION:
(ACTIVE LEAF)
1. LATCHBOLT RETRACTED BY LEVER OUTSIDE OR BY OPERATING INSIDE LEVER.
2. INSIDE LEVER IS ALWAYS FREE FOR IMMEDIATE EGRESS.

(INACTIVE LEAF)
1. FIXED IN PLACE BY TOP AND BOTTOM BOLTS

SET 10.0 (HIGH SECURITY PRIMARY DOOR - SINGLE INTERIOR)
DOOR: 112A

1 CONTINUOUS HINGE
1 ELECTRIC POWER TRANSFER
1 PEDESTRIAN DEADBOLT DEVICE (WITH STRIKE AND MOUNTING ASSEMBLIES) COMPLYING WITH FF-L-2740B.
1 TYPE IV EXIT DEVICE - INTEGRATED ACCESS CONTROL COMPLYING WITH FF-L-2890C WITH REQUEST TO EXIT SWITCH AND KEY OVERRIDE
1 SURFACE CLOSER
1 KICK PLATE
1 GASKETING SMOKE/SOUND
1 AUTOMATIC ACOUSTIC DOOR BOTTOM
1 THRESHOLD
1 CARD READER / KEYPAD
1 POWER SUPPLY VOLTAGE X AMPERAGE AS REQ'D
1 HIGH SECURITY SWITCH, LEVER 2, UL634 SURFACE MOUNTED

NOTES:
1. THRESHOLD, DOOR BOTTOM, AND SEALS PROVIDED BY STC DOOR MANUFACTURER

OPERATION:
1. PEDESTRIAN DEADBOLT DEVICE (X-10 COMBINATION LOCK) IS THE FIRST TIER OF SECURITY AND MUST BE UNLOCKED. IN ORDER FOR THE SECOND TIER (CARD READER) TO BECOME OPERATIONAL.
2. CARD READER GRANTS ACCESS UPON PRESENTATION OF A VALID CREDENTIAL. LOCK TO FAIL SECURE DURING POWER FAILURE.
3. EGRESS ALWAYS FREE FROM INSIDE BY INSIDE EXIT DEVICE.
4. REQUEST SWITCH INSIDE EXIT DEVICE TO SIGNAL AUTHORIZED EGRESS TO THE ACCESS CONTROL SYSTEM.
5. HIGH SECURITY SWITCH TO SIGNAL DOOR OPEN/CLOSED TO THE INTRUSION DETECTION SYSTEM.

SET 11.0 (HIGH SECURITY PRIMARY DOOR - SINGLE INTERIOR)
DOOR: 111A

1 CONTINUOUS HINGE

1 ELECTRIC POWER TRANSFER
1 PEDESTRIAN DEADBOLT DEVICE (WITH STRIKE AND MOUNTING ASSEMBLIES) COMPLYING WITH FF-L-2740B.
1 TYPE II EXIT DEVICE - INTEGRATED ACCESS CONTROL COMPLYING WITH FF-L-2890C WITH REQUEST TO EXIT SWITCH AND KEY OVERRIDE
1 SURFACE CLOSER
1 KICK PLATE
1 GASKETING SMOKE/SOUND
1 AUTOMATIC ACOUSTIC DOOR BOTTOM
1 THRESHOLD
1 CARD READER / KEYPAD
1 POWER SUPPLY VOLTAGE X AMPERAGE AS REQ'D
1 HIGH SECURITY SWITCH, LEVER 2, UL634 SURFACE MOUNTED

NOTES:
1. THRESHOLD, DOOR BOTTOM, AND SEALS PROVIDED BY STC DOOR MANUFACTURER

OPERATION:
1. PEDESTRIAN DEADBOLT DEVICE (X-10 COMBINATION LOCK) IS THE FIRST TIER OF SECURITY AND MUST BE UNLOCKED. IN ORDER FOR THE SECOND TIER (CARD READER) TO BECOME OPERATIONAL.
2. CARD READER GRANTS ACCESS UPON PRESENTATION OF A VALID CREDENTIAL. LOCK TO FAIL SECURE DURING POWER FAILURE.
3. EGRESS ALWAYS FREE FROM INSIDE BY INSIDE EXIT DEVICE.
4. REQUEST SWITCH INSIDE EXIT DEVICE TO SIGNAL AUTHORIZED EGRESS TO THE ACCESS CONTROL SYSTEM.
5. HIGH SECURITY SWITCH TO SIGNAL DOOR OPEN/CLOSED TO THE INTRUSION DETECTION SYSTEM.

SET 13.0 (HIGH SECURITY SECONDARY DOOR - SINGLE INTERIOR)
DOOR: 112B, 114A, 122A

1 CONTINUOUS HINGE
1 ELECTRIC POWER TRANSFER
1 TYPE VII EXIT DEVICE - INTEGRATED ACCESS CONTROL COMPLYING WITH FF-L-2890C WITH REQUEST TO EXIT SWITCH AND KEY OVERRIDE
1 SURFACE CLOSER
1 KICK PLATE
1 GASKETING SMOKE/SOUND
1 AUTOMATIC ACOUSTIC DOOR BOTTOM
1 THRESHOLD
1 CARD READER / KEYPAD
1 POWER SUPPLY VOLTAGE X AMPERAGE AS REQ'D
1 HIGH SECURITY SWITCH, LEVER 2, UL634 SURFACE MOUNTED

NOTES:
1. THRESHOLD, DOOR BOTTOM, AND SEALS PROVIDED BY STC DOOR MANUFACTURER

OPERATION:
1. PEDESTRIAN DEADBOLT DEVICE (X-10 COMBINATION LOCK) IS THE FIRST TIER OF SECURITY AND MUST BE UNLOCKED. IN ORDER FOR THE SECOND TIER (CARD READER) TO BECOME OPERATIONAL.
2. CARD READER GRANTS ACCESS UPON PRESENTATION OF A VALID CREDENTIAL. LOCK TO FAIL SECURE DURING POWER FAILURE.
3. EGRESS ALWAYS FREE FROM INSIDE BY INSIDE EXIT DEVICE.
4. REQUEST SWITCH INSIDE EXIT DEVICE TO SIGNAL AUTHORIZED EGRESS TO THE ACCESS CONTROL SYSTEM.
5. HIGH SECURITY SWITCH TO SIGNAL DOOR OPEN/CLOSED TO THE INTRUSION DETECTION SYSTEM.

SET 14.0 (HIGH SECURITY SECONDARY DOOR - SINGLE INTERIOR)
DOOR:121A

1 CONTINUOUS HINGE
1 ELECTRIC POWER TRANSFER
1 TYPE VIII EXIT DEVICE - INTEGRATED ACCESS CONTROL
COMPLYING WITH FF-L-2890C WITH REQUEST TO EXIT SWITCH AND KEY OVERRIDE
1 SURFACE CLOSER
1 KICK PLATE
1 GASKETING SMOKE/SOUND
1 AUTOMATIC ACOUSTIC DOOR BOTTOM
1 THRESHOLD
1 CARD READER / KEYPAD
1 POWER SUPPLY VOLTAGE X AMPERAGE AS REQ'D
1 HIGH SECURITY SWITCH, LEVER 2, UL634 SURFACE MOUNTED

NOTES:
1. THRESHOLD, DOOR BOTTOM, AND SEALS PROVIDED BY STC DOOR MANUFACTURER

OPERATION:
1. PEDESTRIAN DEADBOLT DEVICE (X-10 COMBINATION LOCK) IS THE FIRST TIER OF SECURITY AND MUST BE UNLOCKED. IN ORDER FOR THE SECOND TIER (CARD READER) TO BECOME OPERATIONAL.
2. CARD READER GRANTS ACCESS UPON PRESENTATION OF A VALID CREDENTIAL. LOCK TO FAIL SECURE DURING POWER FAILURE.
3. EGRESS ALWAYS FREE FROM INSIDE BY INSIDE EXIT DEVICE.
4. REQUEST SWITCH INSIDE EXIT DEVICE TO SIGNAL AUTHORIZED EGRESS TO THE ACCESS CONTROL SYSTEM.
5. HIGH SECURITY SWITCH TO SIGNAL DOOR OPEN/CLOSED TO THE INTRUSION DETECTION SYSTEM.

SET 15.0 (HIGH SECURITY EXIT ONLY DOOR - SINGLE EXTERIOR)
DOOR: 125A

1 CONTINUOUS HINGE
1 TYPE X EXIT DEVICE - COMPLYING WITH FF-L-2890C.
1 LOCAL AUDIBLE ALARM INTEGRATION WITH HIGH SECURITY SWITCH
1 SURFACE CLOSER
1 KICK PLATE
1 GASKETING/WEATHER STRIPPING
1 AUTOMATIC ACOUSTIC DOOR BOTTOM
1 RAIN GUARD
1 SWEEP W/HOOD
1 THRESHOLD
1 HIGH SECURITY SWITCH, LEVER 2, UL634 SURFACE MOUNTED

NOTES:
1. DOUBLE POLE DOUBLE THROUGH HIGH SECURITY SWITCH TO SIGNAL DOOR OPEN/CLOSED TO THE INTRUSION DETECTION SYSTEM AND SIGNAL LOCAL AUDIBLE ALARM.

SET 16.0 (HIGH SECURITY FIXED DOOR - DOUBLE EXTERIOR)
DOOR: 118B, 124B, 126B, 130B

2 CONTINUOUS HINGE
1 LOCAL AUDIBLE ALARM INTEGRATION WITH HIGH SECURITY SWITCH
1 ASTRAGAL
4 FLUSH BOLTS

2 KICK PLATE
1 GASKETING/WEATHER STRIPPING
2 AUTOMATIC ACOUSTIC DOOR BOTTOM
1 RAIN GUARD
2 SWEEP W/HOOD
1 THRESHOLD
2 HIGH SECURITY SWITCH, LEVER 2, UL634 SURFACE MOUNTED

NOTES:
1. NEW STC DOOR - FOR THE INSTALLATION OF CPT EQUIPMENT, DOOR LEAFS TO BE FIXED FROM THE INTERIOR SIDE AFTER INSTALLATION OF CPT.
2. DOUBLE POLE DOUBLE THROUGH HIGH SECURITY SWITCH TO SIGNAL DOOR OPEN/CLOSED TO THE INTRUSION DETECTION SYSTEM AND SIGNAL LOCAL AUDIBLE ALARM.

-- End of Section --

SECTION 08 81 00

GLAZING
05/19

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 800	(2016) Voluntary Specifications and Test Methods for Sealants

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1	(2015) Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

ASTM INTERNATIONAL (ASTM)

ASTM C509	(2006; R 2021) Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM C864	(2005; R 2015) Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C1021	(2008; R 2014) Standard Practice for Laboratories Engaged in Testing of Building Sealants
ASTM C1036	(2021) Standard Specification for Flat Glass
ASTM C1048	(2018) Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass
ASTM C1087	(2016) Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems
ASTM C1172	(2019) Standard Specification for Laminated Architectural Flat Glass
ASTM C1281	(2016) Standard Specification for Preformed Tape Sealants for Glazing

	Applications
ASTM C1376	(2015) Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass
ASTM D395	(2016; E 2017) Standard Test Methods for Rubber Property - Compression Set
ASTM D2287	(2019) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
ASTM E1300	(2016) Standard Practice for Determining Load Resistance of Glass in Buildings
ASTM E2190	(2010) Standard Specification for Insulating Glass Unit Performance and Evaluation

GLASS ASSOCIATION OF NORTH AMERICA (GANA)

GANA Glazing Manual	(2008) Glazing Manual
GANA Sealant Manual	(2008) Sealant Manual

INSULATING GLASS MANUFACTURERS ALLIANCE (IGMA)

IGMA TB-1200	(1983; R 2016) Guidelines for Insulating Glass Dimensional Tolerances
IGMA TB-3001	(2001) Guidelines for Sloped Glazing
IGMA TM-3000	(1990; R 2016) North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

NFRC 100	(2020) Procedure for Determining Fenestration Product U-Factors
NFRC 200	(2020) Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 4-010-01	(2018; with Change 2, 2022) DoD Minimum Antiterrorism Standards for Buildings

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

16 CFR 1201	Safety Standard for Architectural Glazing Materials

1.2 SUBMITTALS

Government approval is required for submittals with a "G"classification.

Submittals not having a "G" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING.Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Insulating Glass
Exterior Glazing - performance documentation for all glass types

Glazing Accessories

Sealants

SD-04 Samples

Insulating Glass

Glazing Compound

Glazing Tape

Sealing Tapes
Certificates stating that the glass meets the specified requirements. Labels or manufacturers marking affixed to the glass will be accepted in lieu of certificates.

Insulating Glass Units

SD-08 Manufacturer's Instructions

Setting and Sealing Materials

Glass Setting
Submit glass manufacturer's recommendations for setting and sealing materials and for installation of each type of glazing material specified

SD-11 Closeout Submittals

Warranty for Insulated Glass Units

Warranty for Polycarbonate Sheet

1.3 SYSTEM DESCRIPTION

Fabricate and install watertight and airtight glazing systems to withstand thermal movement and wind loading without glass breakage, gasket failure, deterioration of glazing accessories, or defects in the work. Glazed panels must comply with the safety standards, in accordance with ANSI Z97.1, and comply with indicated wind/snow loading in accordance with ASTM E1300.

1.4 QUALITY CONTROL

Submit two 8 by 10 inch samples of each of the following: tinted glass, patterned glass, heat-absorbing glass, and insulating glass units.

Submit three samples of each other material. Samples of plastic sheets must be minimum 5 by 7 inches.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver products to the site in unopened containers, labeled plainly with manufacturers' names and brands. Store glass and setting materials in safe, enclosed dry locations and do not unpack until needed for installation. Handle and install materials in a manner that will protect them from damage.

1.6 ENVIRONMENTAL REQUIREMENTS

Do not start glazing work until the outdoor temperature is above 40 degrees F and rising, unless procedures recommended by the glass manufacturer and approved by the Contracting Officer are made to warm the glass and rabbet surfaces. Provide ventilation to prevent condensation of moisture on glazing work during installation. Do not perform glazing work during damp or rainy weather.

1.7 WARRANTY

1.7.1 Warranty for Insulated Glass Units

Warranty insulating glass units against development of material obstruction to vision (such as dust, fogging, or film formation on the inner glass surfaces) caused by failure of the hermetic seal, other than through glass breakage, for a 10-year period following acceptance of the work. Provide new units for any units failing to comply with terms of this warranty within 45 working days after receipt of notice from the Government.

1.7.2 Warranty for Polycarbonate Sheet

For a 5-year period following acceptance of the work:

a. Warranty Type I, Class A (UV stabilized) sheets against breakage;

b. Warranty Type III (coated, mar-resistant) sheets against breakage and against coating delamination;

c. Warranty Type IV (coated sheet) against breakage and against yellowing;

d. Warranty extruded polycarbonate profile sheet against breakage.

For a 10-year period following acceptance of the work, warranty Type IV against yellowing and loss of light transmission.

PART 2 PRODUCTS

2.1 PRODUCT SUSTAINABILITY CRITERIA

2.2 GLASS

ASTM C1036, unless specified otherwise. In doors and sidelights, provide safety glazing material conforming to 16 CFR 1201.

2.2.1 Clear Glass

Type I, Class 1 (clear), Quality q4 (A) . Provide for glazing openings not indicated or specified otherwise. Use 1/4 inch for glazing .

2.2.2 Annealed Glass

Annealed glass must be Type I transparent flat type, Class 1 - clear, Quality q3 - glazing select, conforming to ASTM C1036.

2.2.3 Reflective Coating Vision Glass

ASTM C1376

2.2.4 Laminated Glass

ASTM C1172, Laminated glass fabricated from two nominal 1/8 inch pieces of Type I, Class 1, , Quality Q3, flat annealed ; clear glass conforming to ASTM C1036. Flat glass to be laminated together with a minimum of 0.030 inch inch thick, clear polyvinyl butyral laminate, conforming to requirements of 16 CFR 1201 and ASTM C1172. The total thickness of nominally 1/4 inches. Color to be clear . The total thickness of nominally inch.

2.2.5 Tempered Glass

ASTM C1048, Kind FT (fully tempered), Condition A (uncoated), Type I, Class 1 (transparent) , Quality q3, 1/4 inch thick, Color must be bronze. Provide at exterior glazing and wherever safety glazing material is indicated or specified.

2.3 INSULATING GLASS UNITS

Two panes of glass separated by a dehydrated airspace and hermetically sealed, conforming to ASTM E2190. Submit performance and compliance documentation for each type of insulating glass.

Insulated glass units must comply with UFC 4-010-01 3-11 (Standard 10 Glazing). Insulated glass units must have a Solar Heat Gain Coefficient (SHGC) maximum of 0.26, shading coefficient of 0.31 determined according to NFRC 200 and a U-factor maximum of 0.29 Btu per square foot by hr by degree F in accordance with NFRC 100.

Dimensional tolerances must be as specified in IGMA TB-1200. Spacer must be black, roll-formed, thermally broken aluminum , with bent or tightly welded or keyed and sealed joints to completely seal the spacer periphery and eliminate moisture and hydrocarbon vapor transmission into airspace through the corners. Primary seal must be compressed polyisobutylene and the secondary seal must be a specially formulated silicone.

The inner light must be ASTM C1172, clear annealed flat glass Type I, Class I, Quality q3 , laminated ASTM C1048, Grade B (fully tempered), Style I (uncoated), Type I, Class 2 (tinted heat absorbing), Quality q3, with anti-reflective low-emissivity coating on No. 3 surface (inside surface of interior pane), 1/4 thick.

2.4 SETTING AND SEALING MATERIALS

Provide as specified in the GANA Glazing Manual, IGMA TM-3000, IGMA TB-3001, and manufacturer's recommendations, unless specified otherwise herein. Do not use metal sash putty, nonskinning compounds, nonresilient preformed sealers, or impregnated preformed gaskets. Materials exposed to view and unpainted must be gray or neutral color. Sealant testing must be performed by a testing agency qualified according to ASTM C1021.

Submit glass manufacturer's recommendations for setting and sealing materials and for installation of each type of glazing material specified. Include cleaning instructions for plastic sheets.

2.4.1 Putty and Glazing Compound

Provide glazing compound as recommended by manufacturer for face-glazing metal sash. Putty must be linseed oil type. Do not use putty and glazing compounds with insulating glass or laminated glass.

2.4.2 Glazing Compound

Use for face glazing metal sash. Do not use with insulating glass units or laminated glass.

2.4.3 Sealants

Provide elastomeric sealants.

2.4.3.1 Elastomeric Sealant

ASTM C920, Type S, Grade NS, Class 12.5, Use G. Use for channel or stop glazing metal sash. Sealants must be chemically compatible with setting blocks, edge blocks, and sealing tapes . Color of sealant must be white.

2.4.4 Glazing Tapes

2.4.4.1 Back-Bedding Mastic Glazing Tapes

Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:

a. AAMA 804.3 tape, where indicated.

b. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

c. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.4.4.2 Expanded Cellular Glazing Tapes

Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

a. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.

b. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.4.5 Sealing Tapes

Preformed, semisolid, PVC-based material of proper size and compressibility for the particular condition, complying with ASTM D2287. Use only where glazing rabbet is designed for tape and tape is recommended by the glass or sealant manufacturer. Provide spacer shims for use with compressible tapes. Tapes must be chemically compatible with the product being set.

2.4.6 Setting Blocks and Edge Blocks

Closed-cell neoprene setting blocks must be dense extruded type conforming to ASTM C509 and ASTM D395, Method B, Shore A durometer between 70 and 90. Edge blocking must be Shore A durometer of 50 (plus or minus 5). Provide silicone setting blocks when blocks are in contact with silicone sealant. Profiles, lengths and locations must be as required and recommended in writing by glass manufacturer. Block color must be black.

2.4.7 Glazing Gaskets

Glazing gaskets must be extruded with continuous integral locking projection designed to engage into metal glass holding members to provide a watertight seal during dynamic loading, building movements and thermal movements. Glazing gaskets for a single glazed opening must be continuous one-piece units with factory-fabricated injection-molded corners free of flashing and burrs. Glazing gaskets must be in lengths or units recommended by manufacturer to ensure against pull-back at corners. Provide glazing gasket profiles as recommended by the manufacturer for the intended application.

2.4.7.1 Fixed Glazing Gaskets

Fixed glazing gaskets must be closed-cell (sponge) smooth extruded compression gaskets of cured elastomeric virgin neoprene compounds conforming to ASTM C509, Type 2, Option 1.

2.4.7.2 Wedge Glazing Gaskets

Wedge glazing gaskets must be high-quality extrusions of cured elastomeric virgin neoprene compounds, ozone resistant, conforming to ASTM C864, Option 1, Shore A durometer between 65 and 75.

2.4.7.3 Aluminum Framing Glazing Gaskets

Glazing gaskets for aluminum framing must be permanent, elastic, non-shrinking, non-migrating, watertight and weathertight.

2.4.8 Accessories

Provide as required for a complete installation, including glazing points, clips, shims, angles, beads, and spacer strips. Provide noncorroding metal accessories. Provide primer-sealers and cleaners as recommended by the glass and sealant manufacturers. Use ASTM C1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to surface.

PART 3 EXECUTION

Any materials that show visual evidence of biological growth due to the presence of moisture must not be installed on the building project.

3.1 PREPARATION

Preparation, unless otherwise specified or approved, must conform to applicable recommendations in the GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, IGMA TM-3000, and manufacturer's recommendations. Determine the sizes to provide the required edge clearances by measuring the actual opening to receive the glass. Grind smooth in the shop glass edges that will be exposed in finish work. Leave labels in place until the installation is approved, except remove applied labels on heat-absorbing glass and on insulating glass units as soon as glass is installed. Securely fix movable items or keep in a closed and locked position until glazing compound has thoroughly set.

3.2 GLASS SETTING

Shop glaze or field glaze items to be glazed using glass of the quality and thickness specified or indicated. Glazing, unless otherwise specified or approved, must conform to applicable recommendations in the GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, IGMA TM-3000, and manufacturer's recommendations. Aluminum windows, wood doors, and wood windows may be glazed in conformance with one of the glazing methods described in the standards under which they are produced, except that face puttying with no bedding will not be permitted. Handle and install glazing materials in accordance with manufacturer's instructions. Use beads or stops which are furnished with items to be glazed to secure the glass in place. Verify products are properly installed, connected, and adjusted.

3.2.1 Sheet Glass

Cut and set with the visible lines or waves horizontal.

3.2.2 Insulating Glass Units

Do not grind, nip, or cut edges or corners of units after the units have left the factory. Springing, forcing, or twisting of units during setting will not be permitted. Handle units so as not to strike frames or other objects. Installation must conform to applicable recommendations of IGMA TB-3001 and IGMA TM-3000.

3.2.3 Installation of Laminated Glass

Sashes which are to receive laminated glass must be weeped to the outside to allow water drainage into the channel.

3.3 CLEANING

Clean glass surfaces and remove labels, paint spots, putty, and other defacement as required to prevent staining. Glass must be clean at the time the work is accepted.

3.4 PROTECTION

Protect glass work immediately after installation. Identify glazed openings with suitable warning tapes, cloth or paper flags, attached with non-staining adhesives. Protect reflective glass with a protective material to eliminate any contamination of the reflective coating. Place protective material far enough away from the coated glass to allow air to circulate to reduce heat buildup and moisture accumulation on the glass. Upon removal, separate protective materials for reuse or recycling. Remove and replace glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities with new units.

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SECTION 08 91 00

METAL WALL LOUVERS
08/20

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC. (AMCA)

AMCA 500-L	(2015) Laboratory Methods of Testing Louvers for Rating
AMCA 511	(2010; R 2016) Certified Ratings Program for Air Control Devices

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 2605	(2020) Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels

ASTM INTERNATIONAL (ASTM)

ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B221	(2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING.Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Wall Louvers

SD-03 Product Data

Metal Wall Louvers

SD-04 Samples

Wall Louver Samples; G

1.3 DELIVERY, STORAGE, AND PROTECTION

Deliver materials to the site in an undamaged condition. Carefully store materials off the ground to provide proper ventilation, drainage, and protection against dampness. Louvers must be free from nicks, scratches, and blemishes. Replace defective or damaged materials with new.

1.4 DETAIL DRAWINGS

Show all information necessary for fabrication and installation of wall louvers. Indicate materials, sizes, thicknesses, fastenings, and profiles.

1.5 COLOR SAMPLES

Colors of finishes for wall louver samples and must closely approximate colors indicated. Color shall be as indicated in Section 09 06 00 SCHEDULES FOR FINISHES.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Aluminum Sheet

ASTM B209, alloy 3003 or 5005 with temper as required for forming.

2.1.2 Extruded Aluminum

ASTM B221, alloy 6063-T5 or -T52.

2.2 METAL WALL LOUVERS

Weather resistant drainable type, with bird screens and made to withstand a wind load of not less than 30 pounds per square foot. Wall louvers must bear the AMCA certified ratings program seal for air performance and water penetration in accordance with AMCA 500-L and AMCA 511. The rating must show a water penetration of 0.10 or less ounce per square foot of free area at a free velocity of 1200 feet per minute. Blades shall be set at an appropriate angle and be not more than 6 inches o.c.

2.2.1 Extruded Aluminum Louvers

Fabricated of extruded 6063-T5 or -T52 aluminum with a wall thickness of not less than 0.081 inch.

2.2.2 Mullions and Mullion Covers

Same material and finish as louvers. Provide mullions for all louvers more than 5 feet in width at not more than 5 feet on centers. Provide mullion covers on both faces of joints between louvers.

2.2.3 Screens and Frames

For aluminum louvers, provide 3/4 inch square mesh, 0.51 inch expanded, flattened aluminum bird screening. Mount screens in removable, rewirable frames of same material and finish as the louvers.

2.2.4 2.2.4 Blank Panels

Provide galvanized sheet metal blank-off panels attached to back side of louvers at locations where no mechanical ducts are attached to louvers. Paint outside of panel black and inside white with paint specified in Section 09 90 00 PAINTS AND COATINGS.

2.3 FASTENERS AND ACCESSORIES

Provide stainless steel screws and fasteners for aluminum louvers and zinc-coated or stainless steel screws and fasteners for steel louvers. Provide other accessories as required for complete and proper installation.

2.4 FINISHES

2.4.1 Aluminum

Exposed aluminum surfaces must be factory finished with an organic coating. Color must be as indicated. in Section 09 06 00 SCHEDULES FOR FINISHES Louvers for each building must have the same finish.

2.4.1.1 Organic Coating

Clean and prime exposed aluminum surfaces. Provide a superior performance finish in accordance with AAMA 2605 with total dry film thickness of not less than 1.2 mil, color as indicated in Section 09 06 00 SCHEDULES FOR FINISHES..

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Wall Louvers

Install using jamb fasteners as appropriate for the wall construction and in accordance with manufacturer's recommendations.

3.1.2 Screens and Frames

Attach frames to louvers with screws or bolts.

3.2 PROTECTION FROM CONTACT OF DISSIMILAR MATERIALS

3.2.1 Aluminum

Where aluminum contacts metal other than zinc, paint the dissimilar metal with a primer and two coats of aluminum paint.

3.2.2 Metal

Paint metal in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.

-- End of Section --

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SECTION 09 06 00

SCHEDULES FOR FINISHES
08/22

PART 1 GENERAL

1.1 SUMMARY

This section covers only the color of exterior and interior materials and products that are exposed to view in the finished construction. The word "color", as used herein, includes surface color and pattern. Requirements for quality, product specifications, and method of installation are covered in other appropriate sections of the specifications. Specific locations where the various materials are required are shown on the drawings if not identified in this specification. Items not designated for color in this section may be specified in other sections. When color is not designated for items, propose a color for approval.

PART 2 PRODUCTS

2.1 COLOR SCHEDULE

The color information provided in the following paragraphs lists the colors, patterns and textures for exterior and interior finishes, including both factory applied and field applied colors. In the case of difference between the drawings and specifications, colors identified in this specification govern.

2.2 EXTERIOR FINISHES

2.2.1 Exterior Walls

Exterior wall colors apply to exterior wall surfaces including recesses at entrances and projecting vestibules. When applicable, paint conduit to closely match the adjacent surface color. Provide wall colors to match the colors listed below.

2.2.1.1 Mortar

Mortar to be selected by Architect or Base CE to coordinate with CMUV1 and CMUV2.

2.2.1.2 Concrete Masonry Units

CMUV1: York Building Products, Integrally Colored, Rock/Split-Faced, Fieldstone; Basis of Design
CMUV2: York Building Products, Integrally Colord, Smooth Face, Graphite; Basis of Design

2.2.1.3 Metal Wall Panels, Hardware, and Associated Trim

FWP1: Metl Span, Regal Gray; Basis of Design
FWP2: Metl Span, Dark Bronze; Basis of Design

2.2.1.4 Glass and Glazing

PPG Solarban z50 (2) Optiblue + Clear Glass Insulating Glass Unit; Basis of Design

2.2.1.5 Paint

PT5: Sherwin Williams, SW7048 Urbane Bronze, Semi-Gloss; Basis of Design

2.2.2 Exterior Trim

Provide exterior trim to match the colors listed below.

2.2.2.1 Steel Doors and Door Frames

EXTERIOR SIDE: PT5: Sherwin Williams, SW7048 Urbane Bronze, Semi-Gloss; Basis of Design
INTERIOR SIDE: PT4, PT5, OR PT6 as indicated in the Door Schedule in the Drawings.

2.2.2.2 Aluminum Doors and Door Frames

Dark Bronze Anodized

2.2.2.3 Aluminum Windows (mullion, muntin, sash, trim, and sill)

Dark Bronze Anodized

2.2.2.4 Fascia

Dark Bronze

2.2.2.5 Soffits and Ceilings

Dark Bronze

2.2.2.6 Overhangs

Dark Bronze

2.2.2.7 Downspouts and Gutters

Dark Bronze

2.2.2.8 Scuppers

Dark Bronze

2.2.2.9 Louvers

Match adjacent material in color.

2.2.2.10 Flashings

Match adjacent material in color.

2.2.2.11 Coping

Dark Bronze

2.2.2.12 Caulking and Sealants

Match adjacent material in color.

2.2.2.13 Signage

Full color emblem of Unit Insignia digitally printed on white translucent background, artwork provided by the Government (OLI #7)

Exterior plaque signs to match base standard colors.

2.2.2.14 Control Joints

Match adjacent material in color.

2.2.2.15 Expansion Joint and/or Covers

Match adjacent material in color.

2.2.3 Exterior Roof

Apply roof color to exterior roof surfaces including sheet metal flashings and copings, snow guards, mechanical units, mechanical penthouses, roof trim, pipes, conduits, electrical appurtenances, and similar items. Provide roof color to match the colors listed below.

2.2.3.1 Metal

SSMR1: Dark Bronze

2.2.3.2 Penetrations

Match roof in color.

2.3 INTERIOR FINISHES

2.3.1 Interior Floor Finishes

Provide flooring materials to match the colors listed below.

2.3.1.1 Carpet Tile

CPT1: Staticworx, Shadow FX, Treez Collection, Color Ash, 24" x 24"; Basis of Design

2.3.1.2 Vinyl Composition Tile

VCT1: Armstrong Flooring, Standard Excelon Imperial Texture, 51927 Field Gray, 12" x 12"; Basis of Design

2.3.1.3 Static-Control Resilient Flooring Static-Dissipative Vinyl Tile

SDT1: Staticworx ESD Solid Vinyl Tile, Classics Collection, Adirondack Ridge, 24" X 24"; Basis of Design, SDT1 is to be factory installed on the raised access flooring. The same product,

color and batch is to be installed on the adjacent concrete slab per the Drawings.

2.3.1.4 Porcelain Tile

PRC1: Daltile, Chord, Forte Grey CH25 Matte, 12" x 24"; Basis of Design

2.3.1.5 Grout

Mapei, Kerapoxy CQ, 104 Timberwolf; Basis of Design

2.3.1.6 Flooring Transition

TS1: Schluter Reno-U, Stainless Steel; Basis of Design
TS2: Roppe #22 Rubber Reducer,129 Dolphin; Basis of Design
TS3: Tarkett, CTA-XX-C, 40 Black; Basis of Design

2.3.1.7 Entrance Mat

EF1: Milliken, Obex Tile, Cutx, Fizz, Grey FZC27173, 19.7" x 19.7"; Basis of Design

2.3.1.8 Concrete

CONC1: Liquid Applied Penetrating Treatment
CONC2: United Static Control Products, ElectraGuard High Velocity Thin Set ESD Epoxy Floor Paint, Light Gray, Unsealed, Matte Finish; Basis of Design

2.3.1.9 Industrial Floor Coating

ERF1: Epoxy Resinous Flooring, Stonhard, Stonekote ESD 3 Coat System, Black Matte; Basis of Design

2.3.2 Interior Base Finishes

Provide base materials to match the colors listed below.

2.3.2.1 Resilient Base and Moldings

RB1: Roppe, Pinnacle Series with Cove, 4"H, 100 Black; Basis of Design

2.3.2.2 Porcelain Tile

PRCB1: Daltile, Chord, Canon Grey CH22 Matte, 3" x 24" Bullnose; Basis of Design

2.3.2.3 Grout

Mapei, Ultracolor Plus FA, 104 Timberwolf; Basis of Design

2.3.3 Interior Wall Finishes

Apply interior wall color to the entire wall surface, including reveals, vertical furred spaces and columns, grilles, diffusers, electrical and access panels, and piping and conduit adjacent to wall surfaces unless otherwise specified. Paint items not specified in other paragraphs to

match adjacent wall surface. Provide wall materials to match the colors listed below.

2.3.3.1 Paint

PT1: Sherwin Williams, SW 7015 Repose Gray, Eggshell; Basis of Design
PT1E: Sherwin Williams, SW 7015 Repose Gray, Epoxy; Basis of Design
PT6: Sherwin Williams, SW 6990 Caviar, Flat; Basis of Design

2.3.3.2 Porcelain Tile

PRC2: Daltile, Chord, Canon Grey CH22 Matte, 12" x 24"; Basis of Design

2.3.3.3 Grout

Mapei, Ultracolor Plus FA, 104 Timberwolf; Basis of Design

2.3.3.4 Exposed Structural Columns

Match wall paint color and sheen in the room.

2.3.4 Interior Ceiling Finishes

Apply ceiling colors to ceiling surfaces including soffits, furred down areas, grilles, diffusers, registers, and access panels. In addition, apply ceiling color to joists, underside of roof deck, and conduit and piping where joists and deck are exposed and required to be painted. Provide ceiling materials to match the colors listed below.

2.3.4.1 Acoustical Tile and Grid

ACP1: Armstrong Commercial Ceilings, Cortega 770, 15/16" White Grid, Square Lay-in, White, 24" x 24"; Basis of Design
ACP2: Armstrong Commercial Ceilings, Cortega, 15/16" Black Grid, Square Lay-in, 769 Tech Black, 24" x 24"; Basis of Design
Note: all devices, grilles, diffusers, registers and access panels must match the ceiling for which it is installed.

2.3.4.2 Paint (Ceilings)

PT3: Sherwin Williams, SW 7007 Ceiling Bright White, Flat; Basis of Design
PT6: Sherwin Williams, SW 6990 Caviar, Flat; Basis of Design

2.3.4.3 Structural Framing

PT3: Sherwin Williams, SW 7007 Ceiling Bright White, Flat; Basis of Design

2.3.5 Interior Trim

Provide interior trim to match the colors listed below.

2.3.5.1 Steel Doors

PT4: Sherwin Williams, SW 6990 Caviar, Eggshell; Basis of Design

PT6: Sherwin Williams, SW 6990 Caviar, Flat; Basis of Design

2.3.5.2 Steel Door Frames

PT4: Sherwin Williams, SW 6990 Caviar, Eggshell; Basis of Design

2.3.5.3 Aluminum Doors and Door Frames

Dark Bronze Anodized

2.3.5.4 Aluminum Windows (mullion, muntin, sash, trim, and stool)

Dark Bronze Anodized

2.3.5.5 Wood Doors

WD1: VT Industries, Select White Birch, Clear; Basis of Design

2.3.5.6 Ladders

PT5: Sherwin Williams, SW7048 Urbane Bronze, Semi-Gloss; Basis of Design

2.3.5.7 Exposed Ductwork

PT3: Sherwin Williams, SW 7007 Ceiling Bright White, Flat; Basis of Design
PT6: Sherwin Williams, SW 6990 Caviar, Flat; Basis of Design

2.3.6 Interior Window Treatment

Provide window treatments to match the colors listed below.

2.3.6.1 Window Shades

RS1: Mecho Shade Systems, Mecho/5 Standard Manual Roller System with Shadecloth EcoVeil 1350 Screens, 1369 Silver Birch, Basis of Design with Quaker Bronze Fascia and End Caps.

2.3.7 Interior Miscellaneous

Provide miscellaneous items to match the colors listed below.

2.3.7.1 Toilet Partitions and Urinal Screens

Scranton Hiney Hiders, Charcoal Grey, Orange Peel Texture; Basis of Design

2.3.7.2 Plastic Laminate

PLAM1: Formica, Black Riftwood, Natural Grain; Basis of Design

2.3.7.3 Solid Surfacing Material

SSM1: Corian, Silver Birch, Matte Finish; Basis of Design

2.3.7.4 Window Sills Solid Surface

SSM1: Corian, Silver Birch, Matte Finish; Basis of Design

2.3.7.5 Corner Guards

CG1: Stainless Steel, Type 304, 1-1/2 inch wings, 4 feet high

2.3.7.6 Protective Wall Covering/Panel

FRP1: Marlite, FRP Class A, P100 White; Basis of Design

2.3.7.7 Signage Message Color

SG1: 290 Sign Systems, Slide Modular System, 732 Oyster; Basis of Design

2.3.7.8 Signage Background Color

SG2: 290 Sign Systems, Slide Modular System, 704 Black; Basis of Design

2.3.7.9 Signage End Caps

SG3: 290 Sign Systems, Slide Modular System; 103 Black; Basis of Design

2.3.7.10 Wall Switch Handles and Standard Receptacle Bodies

White with PT1
Black with PT6

2.3.7.11 Electrical Device Cover Plates

White with PT1
Black with PT6

2.3.7.12 Electrical Panels

Manufacturer's Standard Gray

2.3.7.13 Sprinkler Head Covers

White with ACP1
Matte Black with ACP2

2.3.7.14 Concrete Trench Cover

Painted 3/8" steel checker plate covering interior floor trenches to be painted PT6 in all rooms except for 123 UPS to be painted PT1.

PART 3 EXECUTION

Not Used

-- End of Section --

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SECTION 09 22 00

SUPPORTS FOR GYPSUM BOARD
02/10, CHG 2: 08/18

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM C645	(2014; E 2015) Nonstructural Steel Framing Members
ASTM C754	(2020) Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Metal Support Systems; G

Submit for the erection of metal framing, furring, and ceiling suspension systems. Indicate materials, sizes, thicknesses, and fastenings.

SD-03 Product Data

Metal Support Systems

Submit manufacturer's maximum clear span data for determination of stud gauge, unless noted on the drawings.

SD-07 Certificates

Certificates Of Compliance; G

SD-11 Closeout Submittals

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the job site and store in ventilated dry locations permitting easy access for inspection and handling. If materials are stored outdoors, stack materials off the ground, supported on a level platform, and fully protected from the weather. Handle materials carefully to prevent damage. Remove damaged items and provide new items.

PART 2 PRODUCTS

2.1 MATERIALS

Provide steel materials for metal support systems with galvanized coating ASTM A653/A653M, G-60.

2.1.1 Recycled Content For Steel Framing Or Furring

Provide products with recycled content and provide certificates of compliance in accordance with Section 01 33 29 SUSTAINABILITY REPORTING.

2.1.2 Materials for Attachment of Gypsum Wallboard

2.1.2.1 Suspended and Furred Ceiling Systems

ASTM C645.

2.1.2.2 Non-load Bearing Wall Framing and Furring

ASTM C645, but not thinner than 0.0329 inch thickness , unless noted otherwise or determined by manufacturer's recommendations based on unbraced height and number of layers of gypsum board for 16 inches o.c. spacing and allowable deflection of L/240. ASTM certified third party testing statement for equivalent thicknesses.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Systems for Attachment of Gypsum Wallboard

3.1.1.1 Suspended and Furred Ceiling Systems

ASTM C754, except provide framing members 16 inches o.c. unless indicated otherwise.

3.1.1.2 Non-load Bearing Wall Framing and Furring

ASTM C754, except as indicated otherwise.

3.2 ERECTION TOLERANCES

Provide framing members which will be covered by finish materials such as wallboard, plaster, or ceramic tile set in a mortar setting bed, within the following limits:

a. Layout of walls and partitions: 1/4 inch from intended position;

b. Plates and runners: 1/4 inch in 8 feet from a straight line;

c. Studs: 1/4 inch in 8 feet out of plumb, not cumulative; and

d. Face of framing members: 1/4 inch in 8 feet from a true plane.

Provide framing members which will be covered by ceramic tile set in dry-set mortar within the following limits:

a. Layout of walls and partitions: 1/4 inch from intended position;

b. Plates and runners: 1/8 inch in 8 feet from a straight line;

c. Studs: 1/8 inch in 8 feet out of plumb, not cumulative; and

d. Face of framing members: 1/8 inch in 8 feet from a true plane.

-- End of Section --

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SECTION 09 29 00

GYPSUM BOARD
08/16, CHG 4: 02/20

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108.11	(1992; Reaffirmed 2005) Specifications for Interior Installation of Cementitious Backer Units

ASTM INTERNATIONAL (ASTM)

ASTM C475/C475M	(2017; R 2022) Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board
ASTM C514	(2004; R 2020) Standard Specification for Nails for the Application of Gypsum Board
ASTM C840	(2020) Standard Specification for Application and Finishing of Gypsum Board
ASTM C954	(2022) Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
ASTM C1002	(2022) Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
ASTM C1047	(2019) Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base
ASTM C1177/C1177M	(2017) Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
ASTM C1396/C1396M	(2017) Standard Specification for Gypsum Board
ASTM C1766	(2015; R2019) Standard Specification for Factory-Laminated Gypsum Panel Products
ASTM D226/D226M	(2017) Standard Specification for Asphalt-Saturated Organic Felt Used in

	Roofing and Waterproofing
ASTM D412	(2016; R 2021) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D624	(2000; R 2020) Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
ASTM D1149	(2007; R 2012) Standard Test Method for Rubber Deterioration - Surface Ozone Cracking in a Chamber
ASTM D3273	(2021) Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
ASTM E90	(2009; R2016) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
ASTM E336	(2023) Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

GREEN SEAL (GS)

GS-36	(2013) Adhesives for Commercial Use

GYPSUM ASSOCIATION (GA)

GA 214	(2010) Recommended Levels of Gypsum Board Finish
GA 216	(2016) Application and Finishing of Gypsum Panel Products
GA 253	(2012) Application of Gypsum Sheathing

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2022) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings
UL Fire Resistance	(2014) Fire Resistance Directory

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Cementitious Backer Units

Water-Resistant Gypsum Backing Board
Glass Mat Covered or Reinforced Gypsum Sheathing
Glass Mat Covered or Reinforced Gypsum Sheathing Sealant

Accessories

Submit for each type of gypsum board

Gypsum Board

Recycled Content for Gypsum Board; S

Recycled Content for Paper Facing and Gypsum Cores; S

VOC Content of Joint Compound; S

ASTM E90 Factory Test Report; G

ASTM E336 Field Test Report; G

SD-07 Certificates

Asbestos Free Materials; G

Certify that gypsum board types, gypsum backing board types, and joint treating materials do not contain asbestos.

Indoor Air Quality for Gypsum Board; G

Indoor Air Quality for Non-aerosol Adhesives; SIndoor Air Quality for Aerosol Adhesives; S

SD-11 Closeout Submittals

Recycled Content for Gypsum Board; S

Indoor Air Quality for Gypsum Board; S

VOC Content of Joint Compound; S

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality Certifications

Submit required indoor air quality certifications in one submittal package.

1.3.1.1 Ceiling and Wall Systems

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party program that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein. Gypsum wall board and panels must meet the emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type).

1.3.1.2 Adhesives and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party program that products meet the requirements of this Section. Sealants and non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) must meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) must meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of GS-36. Provide current product certification documentation from certification body. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

Deliver materials in the original packages, containers, or bundles with each bearing the brand name, applicable standard designation, and name of manufacturer, or supplier.

1.4.2 Storage

Keep materials dry by storing inside a sheltered building. Where necessary to store gypsum board outside, store off the ground, properly supported on a level platform, and protected from direct exposure to rain, snow, sunlight, and other extreme weather conditions. Provide adequate

ventilation to prevent condensation. Store per manufacturer's recommendations for allowable temperature and humidity range. Do not store panels near materials that may emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives. Do not use materials that have visible moisture or biological growth.

1.4.3 Handling

Neatly stack gypsum board flat to prevent sagging or damage to the edges, ends, and surfaces.

1.5 QUALIFICATIONS

Furnish type of gypsum board work specialized by the installer with a minimum of 3 years of documented successful experience.

1.6 ENVIRONMENTAL REQUIREMENTS

Do not expose the gypsum board to excessive sunlight prior to gypsum board application. Maintain a continuous uniform temperature of not less than 50 degrees F and not more than 80 degrees F for at least one week prior to the application of gypsum board work, while the gypsum board application is being done, and for at least one week after the gypsum board is set. Shield air supply and distribution devices to prevent any uneven flow of air across the plastered surfaces. Provide ventilation to exhaust moist air to the outside during gypsum board application, set, and until gypsum board jointing is dry. In glazed areas, keep windows open top and bottom or side to side 3 to 4 inches. Reduce openings in cold weather to prevent freezing of joint compound when applied. For enclosed areas lacking natural ventilation, provide temporary mechanical means for ventilation. In unglazed areas subjected to hot, dry winds or temperature differentials from day to night of 20 degrees F or more, screen openings with cheesecloth or similar materials. Avoid rapid drying. During periods of low indoor humidity, provide minimum air circulation following gypsum boarding and until gypsum board jointing complete and is dry.

1.7 FIRE RESISTIVE CONSTRUCTION

Comply with specified fire-rated assemblies for design numbers indicated per UL Fire Resistance or FM APP GUIDE.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to specifications, standards and requirements specified. Provide gypsum board types, gypsum backing board types and joint treating materials manufactured from asbestos free materials only.

2.1.1 Gypsum Board

ASTM C1396/C1396M. Gypsum board must contain a minimum of 5 percent post-consumer recycled content, or a minimum of 20 percent post-industrial recycled content. Provide data identifying percentage of recycled content for gypsum board. Paper facings must contain a minimum of 100 percent recycled paper content. Gypsum cores must contain a minimum of 95 percent post-industrial recycled gypsum content. Provide data identifying percentage of recycled content for paper facing and gypsum cores. Provide gypsum wall board and panels meeting the emissions requirements of

CDPH SECTION 01350 (limit requirements for office spaces regardless of space type). Provide certification or validation of indoor air quality for gypsum board.

2.1.1.1 Regular

48 inch wide, 5/8 inch thick, tapered edges. Provide tapered edge gypsum board as indicated.

2.1.1.2 Foil-Backed

48 inch wide, 1/2 & 5/8 inch thick edges with paper face for interior/exterior. Finish as scheduled.

2.1.1.3 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, tapered edges.

2.1.1.4 Mold Resistant / Anti-Microbial Gypsum

ASTM D3273. 48 inch wide, 5/8 inch thick, tapered edges.

2.1.2 Gypsum Backing Board

ASTM C1396/C1396M, gypsum backing board must be used as a base in a multilayer system.

2.1.2.1 Regular

48 inch wide, 5/8 inch thick, square edges.

2.1.2.2 Foil-Backed

2.1.2.3 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, square edges.

2.1.3 Regular Water-Resistant Gypsum Backing Board

ASTM C1396/C1396M

2.1.3.1 Regular

48 inch wide, 5/8 inch thick, tapered edges.

2.1.3.2 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, tapered edges.

2.1.4 Glass Mat Covered or Reinforced Gypsum Sheathing

Exceeds physical properties of ASTM C1396/C1396M and ASTM C1177/C1177M. Provide 1/2 inch, gypsum sheathing where indicated in drawings. Provide gypsum board of with a noncombustible water-resistant core, with glass mat surfaces embedded to the gypsum core or reinforcing embedded throughout the gypsum core. Warrant gypsum sheathing board for at least twelve months against delamination due to direct weather exposure. Provide continuous, asphalt impregnated, building felt to cover exterior face of sheathing. Seal all joints, seams, and penetrations with compatible sealant.

2.1.4.1 Glass Mat Covered or Reinforced Gypsum Sheathing Sealant

Provide sealant compatible with glass mat covered or reinforced gypsum sheathing, rubber washers for masonry veneer anchors, and other associated cavity wall components such as anchors and through wall flashing. Provide sealants for glass mat covered or reinforced gypsum sheathing board edge seams and veneer anchor penetrations recommended by the glass mat covered or reinforced gypsum sheathing manufacturer and have the following performance requirements:

a. ASTM D412: Tensile Strength, 80 psi
b. ASTM D412: Ultimate Tensile Strength (maximum elongation), 170 psi
c. ASTM D624: Tear Strength, dieB, 27 ppi
d. ASTM D1149: Joint Movement Capability after 14 Days cure, plus or minus 50 percent.

2.1.5 Factory-Laminated Gypsum Board

ASTM C1766, Type X, 48 inch wide 5/8 inch thick, sound dampening gypsum panel products composed of two or more factory-laminated gypsum panel laminated into a composite panel.

2.1.5.1 ASTM E90 Factory Test Report

Submit Factory Test Report for proposed STC Rated wall assembly. Test reports must be prepared by an independent acoustical laboratory qualified under the National Voluntary Laboratory Accreditation Program (NVLAP) by the National Institute for Science and Technology (NIST). Test reports must indicate that the sound transmission classification (STC) of the proposed wall and ceiling assembly, based on tests at 16 third-octave band frequencies from 125 to 4,000 hertz, is no less than STC 50 for STC 45 assemblies and no less than STC 55 for STC 50 assemblies when tested in accordance with ASTM E90.

2.1.6 Cementitious Backer Units

In accordance with the Tile Council of America (TCA) Handbook. Refer to Section 09 30 10 Ceramic, Quarry, and Glass Tiling.

2.1.7 Joint Treatment Materials

ASTM C475/C475M. Product must be low emitting VOC types with VOC limits not exceeding 50 g/L. Provide data identifying VOC content of joint compound. Use all purpose joint and texturing compound containing inert fillers and natural binders, including lime compound. Pre-mixed compounds must be free of antifreeze, vinyl adhesives, preservatives, biocides and other slow releasing compounds.

2.1.7.1 Embedding Compound

Specifically formulated and manufactured for use in embedding tape at gypsum board joints and compatible with tape, substrate and fasteners.

2.1.7.2 Finishing or Topping Compound

Specifically formulated and manufactured for use as a finishing compound.

2.1.7.3 All-Purpose Compound

Specifically formulated and manufactured to serve as both a taping and a finishing compound and compatible with tape, substrate and fasteners.

2.1.7.4 Setting or Hardening Type Compound

Specifically formulated and manufactured for use with fiber glass mesh tape.

2.1.7.5 Joint Tape

Use cross-laminated, tapered edge, reinforced paper, or fiber glass mesh tape recommended by the manufacturer.

2.1.8 Fasteners

2.1.8.1 Nails

ASTM C514.

2.1.8.2 Screws

ASTM C1002, Type "G", Type "S" or Type "W" steel drill screws for fastening gypsum board to gypsum board, and steel framing members less than 0.033 inch thick. ASTM C954 steel drill screws for fastening gypsum board to steel framing members 0.033 to 0.112 inch thick. Provide cementitious backer unit screws with a polymer coating.

2.1.8.3 Staples

No. 16 USS gage flattened galvanized wire staples with 7/16 inch wide crown outside measurement and divergent point for base ply of two-ply gypsum board application. Use as follows:

Length of Legs	Thickness of Gypsum Board
1-1/8 inches	1/2 inch
1-1/4 inches	5/8 inch

2.1.9 Adhesives

Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of GS-36. Provide certification or validation of indoor air quality for non-aerosol adhesives applied on the interior of the building (inside of the weatherproofing system). Provide certification or validation of indoor air quality for aerosol adhesives used on the interior of the building (inside of the weatherproofing system).

2.1.9.1 Adhesive for Fastening Gypsum Board to Metal Framing

Type recommended by gypsum board manufacturer.

2.1.9.2 Adhesive for Laminating

Adhesive attachment is not permitted for multi-layer gypsum boards. For laminating gypsum studs to face panels, provide adhesive recommended by gypsum board manufacturer.

2.1.10 Gypsum Studs

Provide one inch minimum thickness and 6 inch minimum width. Studs may be of one inch thick gypsum board or multilayers fastened to required thickness. Conform to ASTM C1396/C1396M for material and GA 216 for installation.

2.1.11 Accessories

ASTM C1047. Fabricate from corrosion protected steel or plastic designed for intended use. Accessories manufactured with paper flanges are not acceptable. Flanges must be free of dirt, grease, and other materials that may adversely affect bond of joint treatment. Provide prefinished or job decorated materials.

2.1.12 Asphalt Impregnated Building Felt

Provide a 15 lb asphalt moisture barrier over glass mat covered or reinforced gypsum sheathing. Conforming to ASTM D226/D226M Type 1 (No. 15) for asphalt impregnated building felt.

2.1.13 Water

Provide clean, fresh, and potable water.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Framing and Furring

Verify that framing and furring are securely attached and of sizes and spacing to provide a suitable substrate to receive gypsum board and cementitious backer units. Verify that all blocking, headers and supports are in place to support plumbing fixtures and to receive soap dishes, grab bars, towel racks, and similar items. Do not proceed with work until framing and furring are acceptable for application of gypsum board and cementitious backer units.

3.1.2 Gypsum Board and Framing

Verify that surfaces of gypsum board and framing to be bonded with an adhesive are free of dust, dirt, grease, and any other foreign matter. Do not proceed with work until surfaces are acceptable for application of gypsum board with adhesive.

3.1.3 Masonry and Concrete Walls

Verify that surfaces of masonry and concrete walls to receive gypsum board

applied with adhesive are dry, free of dust, oil, form release agents, protrusions and voids, and any other foreign matter. Do not proceed with work until surfaces are acceptable for application of gypsum board with adhesive.

3.1.4 Building Construction Materials

Do not install building construction materials that show visual evidence of biological growth.

3.2 APPLICATION OF GYPSUM BOARD

Apply gypsum board to framing and furring members in accordance with ASTM C840 or GA 216 and the requirements specified. Apply gypsum board with separate panels in moderate contact; do not force in place. Stagger end joints of adjoining panels. Neatly fit abutting end and edge joints. Use gypsum board of maximum practical length; select panel sizes to minimize waste. Cut out gypsum board to make neat, close, and tight joints around openings. In vertical application of gypsum board, provide panels in lengths required to reach full height of vertical surfaces in one continuous piece. Lay out panels to minimize waste; reuse cutoffs whenever feasible. Surfaces of gypsum board and substrate members may not be bonded together with an adhesive, except where prohibited by fire rating(s). Treat edges of cutouts for plumbing pipes, screwheads, and joints with water-resistant compound as recommended by the gypsum board manufacturer. Provide type of gypsum board for use in each system specified herein as indicated.

3.2.1 Semi-Solid Gypsum Board Partitions

Provide in accordance with ASTM C840, System IV or GA 216 .

3.2.2 Solid Gypsum Board Partitions

Provide in accordance with ASTM C840, System V or GA 216.

3.2.3 Adhesive Application to Interior Masonry or Concrete Walls

Apply in accordance with ASTM C840, System VI or GA 216.

3.2.4 Application of Gypsum Board to Steel Framing and Furring

Apply in accordance with ASTM C840, System VIII or GA 216.

3.2.5 Gypsum Board for Wall Tile or Tile Base Applied with Adhesive

In dry areas (areas other than tubs, shower enclosures, saunas, steam rooms, gang shower rooms), apply glass mat water-resistant gypsum tile backing board or water-resistant gypsum backing board in accordance with ASTM C840, System X or GA 216.

3.2.6 Exterior Application

Apply exterior gypsum board (such as at soffits) in accordance with ASTM C840, System XI or GA 216.

3.2.7 Glass Mat Covered or Fiber Reinforced Gypsum Sheathing

Apply glass mat covered or fiber reinforced gypsum sheathing in accordance

to gypsum association publications GA 253. Follow gypsum sheathing manufacturer's requirements of design details for joints and fasteners and be properly installed to protect the substrate from moisture intrusion. Do not leave exposed surfaces of the glass mat covered or fiber reinforced gypsum sheathing beyond the manufacturer's recommendation without a weather barrier cladding. Provide continuous asphalt impregnated building felt over sheathing surface in shingle fashion with edges and ends lapped a minimum of 6 inch. Properly flash the openings. Seal all joints, seams, and penetrations with a compatible silicone sealant.

3.2.8 Floating Interior Angles

Minimize framing by floating corners with single studs and drywall clips. Locate the attachment fasteners adjacent to ceiling and wall intersections in accordance with ASTM C840, System XII.

3.2.9 Control Joints

Install expansion and contraction joints in ceilings and walls in accordance with ASTM C840, System XIII or GA 216. Fill control joints between studs in fire-rated construction with firesafing insulation to match the fire-rating of construction.

3.2.10 Application of Factory-Laminated Gypsum Board

Apply in accordance with manufacturer instructions for testing sound assembly. Face of laminated surface must not be on finished side of assembly.

3.3 APPLICATION OF CEMENTITIOUS BACKER UNITS

3.3.1 Application

In wet areas (tubs, shower enclosures, saunas, steam rooms, gang shower rooms), apply cementitious backer units in accordance with ANSI A108.11. Place a 15 lb asphalt impregnated, continuous felt paper membrane behind cementitious backer units, between backer units and studs or base layer of gypsum board. Place membrane with a minimum 6 inch overlap of sheets laid shingle style.

3.3.2 Joint Treatment

ANSI A108.11.

3.4 FINISHING OF GYPSUM BOARD

Tape and finish gypsum board in accordance with ASTM C840, GA 214 and GA 216. Finish plenum areas above ceilings to Level 1 in accordance with GA 214. Finish water resistant gypsum backing board, ASTM C1396/C1396M, to receive ceramic tile to Level 2 in accordance with GA 214. Finish walls and ceilings to receive a heavy-grade wall covering or heave textured finish before painting to Level 3 in accordance with GA 214. Finish walls and ceilings without critical lighting to receive flat paints, light textures, or wall coverings to Level 4 in accordance with GA 214. Unless otherwise specified, finish all gypsum board walls, partitions and ceilings to Level 5 in accordance with GA 214. Provide joint, fastener depression, and corner treatment. Tool joints as smoothly as possible to minimize sanding and dust. Do not use self-adhering fiber glass mesh tape with conventional drying type joint compounds; use setting

or hardening type compounds only. Provide treatment for water-resistant gypsum board as recommended by the gypsum board manufacturer. Protect workers, building occupants, and HVAC systems from gypsum dust.

3.4.1 Uniform Surface

Wherever gypsum board is to receive eggshell, semigloss or gloss paint finish, or where severe, up or down lighting conditions occur, finish gypsum wall surface in accordance to GA 214 Level 5. In accordance with GA 214 Level 5, apply a thin skim coat of joint compound to the entire gypsum board surface, after the two-coat joint and fastener treatment is complete and dry.

3.5 SEALING

Seal openings around pipes, fixtures, and other items projecting through gypsum board and cementitious backer units as specified in Section 07 92 00 JOINT SEALANTS. Apply material with exposed surface flush with gypsum board or cementitious backer units.

3.5.1 Sealing for Glass Mat or Reinforced Gypsum Board Sheathing

Apply silicone sealant in a 3/8 inch bead to all joints and trowel flat. Apply enough of the same sealant to all fasteners penetrating through the glass mat gypsum board surface to completely cover the penetration when troweled flat. Do not place construction and materials behind sheathing until a visual inspection of sealed joints during daylight hours has been completed by Contracting Officer.

3.6 FIRE-RESISTANT ASSEMBLIES

Wherever fire-rated construction is indicated, provide materials and application methods, including types and spacing of fasteners, wall and ceiling framing in accordance with the specifications contained in UL Fire Resistance for the Design Number(s) indicated. Joints of fire-rated gypsum board enclosures must be closed and sealed in accordance with UL test requirements or GA requirements. Seal penetrations through rated partitions and ceilings tight in accordance with tested systems.

3.7 SOUND RATED ASSEMBLIES

When sound rated assemblies are required, provide materials and application methods, including panels, insulation, types and spacing of fasteners, wall and ceiling framing in accordance with the contract document and the description of the assembly in the ASTM E90 Factory Test Report. Seal partitions continuously with acoustical foam or sealant (both sides) and finished to match wall wherever it abuts another element such as the floor, ceiling, wall, column, mullion, or another system or assembly.

3.8 PATCHING

Patch surface defects in gypsum board to a smooth, uniform appearance, ready to receive finishes.

3.9 SOUND RATED ASSEMBLY FIELD TESTING

Provide third party testing of sound rated assemblies tested in accordance with ASTM E336. Provide the ASTM E336 Field Test Report verifying that

the installed assemblies perform no less than five ASTC rating points below the ASTM E90 Factory Test Report. Examine, modify adjust, and retest any installation not meeting the STC Rating until compliance is obtained.

-- End of Section --

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SECTION 09 30 10

CERAMIC, QUARRY, AND GLASS TILING
08/20

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108/A118/A136.1	(2019) American National Standard Specifications for theInstallation of Ceramic Tile
ANSI A137.1	(2019) American National Standards Specifications for Ceramic Tile

ASTM INTERNATIONAL (ASTM)

ASTM C33/C33M	(2023) Standard Specification for Concrete Aggregates
ASTM C144	(2018) Standard Specification for Aggregate for Masonry Mortar
ASTM C150/C150M	(2022) Standard Specification for Portland Cement
ASTM C206	(2014; R 2022) Standard Specification for Finishing Hydrated Lime
ASTM C207	(2018) Standard Specification for Hydrated Lime for Masonry Purposes
ASTM C373	(2018; R 2023)Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products
ASTM C648	(2020) Standard Test Method for Breaking Strength of Ceramic Tile
ASTM C1027	(2009; R 2017) Standard Test Method for Determining Visible Abrasion Resistance of Glazed Ceramic Tile

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor

Sources using Environmental Chambers

GREEN SEAL (GS)

GS-36 (2013) Adhesives for Commercial Use

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168 (2017) Adhesive and Sealant Applications

TILE COUNCIL OF NORTH AMERICA (TCNA)

TCNA Hdbk (2017) Handbook for Ceramic, Glass, and Stone Tile Installation

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

36 CFR 1191 Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

UNDERWRITERS LABORATORIES (UL)

UL 2818 (2022) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G, AE

SD-03 Product Data

Porcelain Tile; G, AE

Recycled Content for Porcelain Tile; S

Transition Strips; G, AE

Metal Strips; G, AE

Setting-Bed; G, AE

Mortar, Grout, and Adhesive; G, AE

Crack Isolation Membrane; G

SD-04 Samples

Tile; G

Accessories; G

Transition Strips; G

Metal Strips; G

Grout; G

SD-07 Certificates

Indoor Air Quality for Adhesives; S

Indoor Air Quality for Sealants; S

Water Absorption Rates

SD-08 Manufacturer's Instructions

Manufacturer's Approved Cleaning Instructions

SD-10 Operation and Maintenance Data
Porcelain Tile, Data Package 1; G

Transition Strips, Data Package 1; G

Metal Strips, Data Package 1; G

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality Certifications

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party programs that products meet the requirements of this Section. Provide current product certification documentation from certification body.When product does not have certification, provide validation that product meets the indoor air quality product requirements cited in this Section.

1.3.2 Water Absorption Rates Certification

Provide certification for each tile type indicating compliance with the following water absorption (wa) rates per ANSI A137.1 criteria as tested per ASTM C373 requirements.

a. Porcelain Tile (Impervious): Provide water absorption (wa) of 0.5 percent or less.

1.4 QUALITY ASSURANCE

Provide installers having a minimum of two years of experience with a company specializing in performing the type of work described. Each type

and color of tile to be provided from a single source. Each type and color of mortar, adhesive, and grout to be provided from the same source.

1.5 DELIVERY, STORAGE, AND HANDLING

Ship tiles in sealed packages and clearly marked with the grade, type of tile, producer identification, and country of origin. Deliver materials to the project site in manufacturer's original unopened containers with seals unbroken and labels and hallmarks intact. Protect materials from weather, and store them under cover in accordance with manufacturer's printed instructions. Store and handle tiles per manufacturer's instructions

1.6 ENVIRONMENTAL REQUIREMENTS

Do not perform ceramic tile work unless the substrate and ambient temperature is at least 50 degrees F and rising. Maintain temperature above 50 degrees F while the work is being performed and for at least 7 days after completion of the work. When temporary heaters are used, ventilate the area to the outside to avoid carbon dioxide damage to new tilework.

1.7 WARRANTY

Provide manufacturer's warranty to repair or replace defective tiling materials and workmanship, including tile, mortar and grout products and installation as a system, for a period of one year from date of final acceptance of the work.

1.8 EXTRA MATERIALS

Supply an extra 2 percent of each type tile used in clean and marked cartons.

PART 2 PRODUCTS

2.1 TILE

Provide tiles that comply with ANSI A137.1 and are standard grade tiles. Provide a minimum breaking strength of 125 lbs. for wall tile and 250 lbs. for floor tile in accordance with ASTM C648. Provide floor tiles with a minimum wet dynamic coefficient of friction (DCOF) value of 0.42 when tested in accordance with ANSI A137.1 requirements. Provide glazed floor tile with a Class IV-Commercial classification as rated by the manufacturer when tested in accordance with ASTM C1027 for visible abrasion resistance as related to foot traffic. For materials like tile, accessories, and transition strips submit samples of sufficient size to show color range, pattern, type and joints.

Submit manufacturers' descriptive product data for each type of porcelain tiling indicated. Include manufacturers' literature, finishes, profiles and thicknesses of materials.

Submit manufacturers' operations and maintenance data for each type of porcelain tiling indicated in accordance with Section 01 78 23 OPERATIONS AND MAINTENANCE DATA.

2.1.1 Porcelain Tile

Provide glazed color body (body of tile is stained to match the glaze color), porcelain tile and bullnose base and trim pieces. Provide tile with a V3 aesthetic classification. Blend tiles in factory and in a packages to have same color range and continuous blend for installation. Provide nominal tile size(s) of 12 by 24 inch and 5/16 inch thick.

Provide porcelain tiling materials that contain a minimum of 10 percent recycled content. Provide data identifying percentage of recycled content for porcelain tile.

2.2 SETTING-BED

Submit manufacturer's catalog data. Compose the setting-bed of the following materials:

2.2.1 Aggregate for Concrete Fill

Conform to ASTM C33/C33M for aggregate fill. Do not exceed one-half the thickness of concrete fill for maximum size of coarse aggregate.

2.2.2 Portland Cement

Conform to ASTM C150/C150M for cement, Type I, white for wall mortar and gray for other uses.

2.2.3 Sand

Conform to ASTM C144 for sand.

2.2.4 Hydrated Lime

Conform to ASTM C206 for hydrated lime, Type S or ASTM C207, Type S.

2.3 WATER

Provide potable water.

2.4 MORTAR, GROUT, AND ADHESIVE

Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide aerosol adhesives used on the interior of the building meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of GS-36. For products located on the interior of the building (inside of the weatherproofing system, provide certification or validation of indoor air quality for adhesives. Provide bond coat, mortar, and grout supplied from the same manufacturer.

2.4.1 Latex-Portland Cement Mortar

TCNA Hdbk.

2.4.2 Epoxy Resin Grout

TCNA Hdbk. Water cleanable epoxy conforming to ANSI A108/A118/A136.1; provide manufacturer proportioned and packaged kit having hardener, resin and colored filler and horizontal and vertical grade products as applicable. Provide antimicrobial additive designed for prevention of mold and mildew.

2.4.3 Sealants

Comply with applicable regulations regarding toxic and hazardous materials and as specified. Provide sealant that does not change the color or alter the appearance of the grout. Refer to Section 07 92 00 JOINT SEALANTS.

Provide sealants used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. For products located on the interior of the building (inside of the weatherproofing system), provide certification or validation of indoor air quality for sealants.

2.5 SUBSTRATES

Refer to Section 09 29 00 GYPSUM BOARD for cementitious backer units and glass-mat water-resistant backing board.

2.6 MISCELLANEOUS TRIMS

2.6.1 Transition Strips

Provide clear anodized aluminum transitions between tile and carpet or resilient flooring. Provide types as recommended by flooring manufacturer for both edges and transitions of flooring materials specified Provide transition strips that comply with 36 CFR 1191 requirements.

2.6.2 Metal Strips

Provide L-shape trim, height to match tile and setting thickness, designed specifically for flooring, and wall applications. Provide extruded clear anodized aluminum edging at tile surfaces with exposed outside corners. Provide profiles appropriate for finished floor and wall materials as indicated.

2.7 CRACK ISOLATION MEMBRANE

2.7.1 General

Manufacturer's standard product that complies with ANSI A108/A118/A136.1 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

2.7.2 Polyethylene Crack Isolation (Uncoupling) Membrane

Polyethlene membrane with grid structure and anchoring fleece laminated to the underside of 1/8 inch nominal thickness.

2.8 COLOR, TEXTURE, AND PATTERN

Provide color, pattern and texture as specified in Section 09 06 00

SCHEDULES FOR FINISHES.Colors listed are not intended to limit the selection of equal colors from other manufacturers.

PART 3 EXECUTION

3.1 PREPARATORY WORK AND WORKMANSHIP

Inspect surface to receive tile in conformance to the requirements of TCNA Hdbk for surface conditions for the type setting bed specified and for workmanship. Provide variations of tiled surfaces that fall within maximum values shown below:

TYPE	WALLS	FLOORS
Dry-Set Mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.
Organic Adhesives	1/8 inch in 8 ft.	1/16 inch in 3 ft.
Latex-Portland Cement Mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.
Epoxy	1/8 inch in 8 ft.	1/8 inch in 10 ft.

3.2 GENERAL INSTALLATION REQUIREMENTS

Do not start tile work until roughing in for mechanical and electrical work has been completed and tested, and built-in items requiring membrane waterproofing have been installed and tested. Close space, in which tile is being set, to traffic and other work. Keep closed until tile is firmly set. Do not start floor tile installation in spaces requiring wall tile until after wall tile has been installed. Apply tile in colors and patterns indicated in the area shown on the drawings. Install tile with the respective surfaces in true even planes to the elevations and grades shown. Provide special shapes as required for sills, jambs, recesses, offsets, external corners, and other conditions to provide a complete and neatly finished installation. Solidly back tile bases and coves with mortar. Do not walk or work on newly tiled floors without using kneeling boards or equivalent protection of the tiled surface. Keep traffic off horizontal portland cement mortar installations for at least 72 hours. Keep all traffic off epoxy installed floors for at least 40 hours after grouting, and heavy traffic off for at least 7 days, unless otherwise specifically authorized by manufacturer. Dimension and draw detail drawings at a minimum scale of 1/4 inch = 1 foot. Include drawings of pattern at inside corners, outside corners, termination points and location of all equipment items such as thermostats, switch plates, mirrors and toilet accessories mounted on surface. Submit drawings showing ceramic tile pattern elevations and floor plans. Submit manufacturer's preprinted installation instructions.

Do not install building construction materials that show visual evidence of biological growth.

3.3 INSTALLATION OF SUBSTRATES

3.3.1 Cementitious Backer Units

Install as specified in Section 09 29 00 GYPSUM BOARD.

3.4 INSTALLATION OF WALL TILE

Install wall tile in accordance with the TCNA Hdbk, method W244C-25 or W245-25 and with grout joints as recommended by the manufacturer for the type of tile.

3.4.1 Latex-Portland Cement Mortar

Use latex-portland cement when installing porcelain ceramic tile. Mortar to meet ANSI A118.4HTE

3.4.2 Ceramic Tile Grout

Provide a polymer-modified grout that is color-consistent, nonshrinking and efflorescence-free. Prepare and install ceramic tile grout in accordance with TCNA Hdbk method ANSI A108.10.

3.5 INSTALLATION OF FLOOR TILE

Install floor tile in accordance with TCNA Hdbk method F128-25 and with grout joints as recommended by the manufacturer for the type of tile.

3.5.1 Latex-Portland Cement

Use latex-portland cement mortar to install tile directly over properly cured, plane, clean concrete slabs in accordance with TCNA Hdbk method F128-25 and W244C-25. Use latex-portland cement when installing porcelain ceramic tile.

3.5.2 Ceramic Tile Grout

Prepare and install ceramic tile grout in accordance with TCNA Hdbk method ANSI A108.10.

3.5.3 Waterproof and Crack Isolation Membranes

Install as indicated in accordance with manufacturer's written instructions.

3.6 INSTALLATION OF MISCELLANEOUS TRIMS

3.6.1 Metal Trims

Install trim where indicated. Embed anchoring leg in setting mortar in accordance with manufacturer's instructions. During grouting of tile joints, immediately wipe grout from finish surface.

3.7 EXPANSION JOINTS

Form and seal joints as specified in Section 07 92 00 JOINT SEALANTS.

3.7.1 Walls

Provide expansion joints at control joints in backing material. Wherever backing material changes, install an expansion joint to separate the different materials.

3.7.2 Floors

Provide expansion joints over construction joints, control joints, and expansion joints in concrete slabs in accordance with TCNA Hdbk method

EJ171 type to suit conditions. Provide expansion joints where tile abuts restraining surfaces such as perimeter walls, curbs and columns and at intervals of 20 to 25 feet each way in large interior floor areas Extend expansion joints through setting-beds and fill.

3.8 CLEANING AND PROTECTING

Upon completion, thoroughly clean tile surfaces in accordance with manufacturer's approved cleaning instructions. Do not use acid for cleaning glazed tile. Clean floor tile with resinous grout or with factory mixed grout in accordance with printed instructions of the grout manufacturer. After the grout has set, provide a protective coat of a noncorrosive soap or other approved method of protection for tile wall surfaces. Cover tiled floor areas with building paper before foot traffic is permitted over the finished tile floors. Provide board walkways on tiled floors that are to be continuously used as passageways by workmen. Replace damaged or defective tiles.

-- End of Section --

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SECTION 09 51 00

ACOUSTICAL CEILINGS
08/20

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A489	(2018; E 2018) Standard Specification for Carbon Steel Eyebolts
ASTM A641/A641M	(2019) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM A653/A653M	(2023) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A1008/A1008M	(2023) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
ASTM B633	(2023) Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
ASTM C423	(2023) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
ASTM C635/C635M	(2022) Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings
ASTM C636/C636M	(2013) Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
ASTM C834	(2017; R 2023) Standard Specification for Latex Sealants
ASTM E413	(2022) Classification for Rating Sound Insulation
ASTM E795	(2023) Standard Practices for Mounting Test Specimens During Sound Absorption Tests

ASTM E1111/E1111M	(2014; R 2022) Standard Test Method for Measuring the Interzone Attenuation of Open Office Components
ASTM E1264	(2023) Standard Classification for Acoustical Ceiling Products
ASTM E1414/E1414M	(2021a) Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
ASTM E1477	(1998; R 2022a) Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval.. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Drawings; G

SD-03 Product Data

Recycled Content for Type III Ceiling Tiles; SRecycled Content for Suspension Systems; S

Acoustical Performance; G

Acoustical Ceiling Tiles; G

SD-04 Samples

Acoustical Units;

SD-07 Certificates

Indoor Air Quality for Type III Ceiling Tiles; SIndoor Air Quality for Sealants; S

1.3 DELIVERY, STORAGE. AND HANDLING

Deliver materials to the site in the manufacturer's original unopened containers with brand name and type clearly marked. Carefully handle and store materials in dry, watertight enclosures. Immediately before installation, store acoustical units for not less than 24 hours at the same temperature and relative humidity as the space where they will be installed in order to assure proper temperature and moisture acclimation.

1.4 ENVIRONMENTAL REQUIREMENTS

Maintain a uniform temperature of not less than 60 degrees F nor more than 85 degrees F and a relative humidity of not more than 70 percent for 24 hours before, during, and 24 hours after installation of acoustical units.

1.5 SCHEDULING

Complete and dry interior finish work such as plastering, concrete and terrazzo work before ceiling installation. Complete mechanical, electrical, and other work above the ceiling line; install and start operating heating, ventilating, and air conditioning systems in order to maintain temperature and humidity requirements.

1.6 WARRANTY

Provide manufacturer's warranty to repair or replace defective materials and workmanship including but not limited to, sagging and warping of panels and rusting and of grid systems, for a period of one year from date of final acceptance of the work.

1.7 EXTRA MATERIALS

Furnish spare tiles, from the same lot as those installed, of each color at the rate of 5 tiles for each 1000 tiles installed.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide sound controlling units mounted on a ceiling suspension system for acoustical treatment. Provide the unit size, texture, finish, and color as specified. Coordinate the entire ceiling system with other details, like the location of access panels and ceiling penetrations, for instance, shown on the drawings. Submit drawings showing the the location, extent and details of acoustical treatment including suspension system, method of anchoring and fastening, and reflected ceiling plan.

2.1.1 Acoustical Performance

2.1.1.1 Ceiling Sound Transmission

Provide ceiling systems with the specified Ceiling Attenuation Class (CAC) ratings as determined in accordance with ASTM E1414/E1414M and ASTM E413. Provide sound attenuators over light fixtures, air terminals and other ceiling penetrations, provide acoustical blanket insulation on top of the ceiling or adjacent to partitions to provide lightweight acoustical plenum barriers above partitions as required to achieve the specified CAC ratings. Provide test ceiling continuous at the partition and assembled in the suspension system in the same manner that the ceiling will be

installed on the project.

2.1.1.2 Ceiling Sound Absorption

Determine the Noise Reduction Coefficient (NRC) in accordance with ASTM C423. Determine Articulation Class (AC) in accordance with ASTM E1111/E1111M.

2.1.2 Light Reflectance

Determine light reflectance factor in accordance with ASTM E1477 test method.

2.2 ACOUSTICAL UNITS

Submit samples of each type of acoustical unit and each type of suspension grid tee section showing texture, finish, and color. Conform acoustical units to ASTM E1264, Class A, and the following requirements:

2.2.1 Units for Exposed-Grid System ACP1 and ACP2

2.2.1.1 Type

III (non-asbestos mineral fiber with painted finish). Provide Type III Acoustical Ceiling Tiles containing a minimum of 30 percent recycled content. Provide data identifying percentage of recycled content for Type III ceiling tiles. Provide certification of indoor air quality for Type III Ceiling Tiles.

2.2.1.2 Flame Spread

Class A, 25 or less

2.2.1.3 Pattern

C D

2.2.1.4 Minimum NRC

0.55 when tested on mounting Type E-400 of ASTM E795.

2.2.1.5 Minimum Light Reflectance Coefficient

LR-1, 0.75 or greater

2.2.1.6 Nominal Size

24 by 24 inch

2.2.1.7 Edge Detail

Square

2.2.1.8 Finish

Factory-applied standard finish.
ACP1: Color white
ACP2: Color black

2.2.1.9 Minimum CAC

35

2.3 SUSPENSION SYSTEM

Provide exposed-gridstandard width flange suspension system conforming to ASTM C635/C635M for intermediate-duty systems. Provide surfaces exposed to view of aluminum or steel with a factory-applied white and black baked-enamel finish to coordinate with the color of the ceiling tile. Provide wall molding having a flange of not less than 15/16 inch. Provide mitered corners. Provide a suspension system with a maximum deflection of 1/360 of the span length capable of supporting the finished ceiling, light fixtures, air diffusers, and accessories, as shown.

Provide Suspension System containing a minimum of 15 percent recycled content. Provide data identifying percentage of recycled content for suspension systems.

2.4 HANGERS

Provide hangers and attachment capable of supporting a minimum 300 pound ultimate vertical load without failure of supporting material or attachment.

2.4.1 Wires

Conform wires to ASTM A641/A641M, Class 1, 0.08 inch (12 gauge) in diameter.

2.4.2 Straps

Provide straps of 1 by 3/16 inch galvanized steel conforming to ASTM A653/A653M, with a light commercial zinc coating or ASTM A1008/A1008M with an electrodeposited zinc coating conforming to ASTM B633, Type RS.

2.4.3 Eyebolts

Provide eyebolts of weldless, forged-carbon-steel, with a straight-shank in accordance with ASTM A489. Provide minimum 1/4 inch, zinc coated eyebolts.

2.5 FINISHES

Use manufacturer's standard textures, patterns and finishes as specified for acoustical units and suspension system members. Treat ceiling suspension system components to inhibit corrosion.

2.6 ACOUSTICAL SEALANT

Conform acoustical sealant to ASTM C834, nonstaining. Provide sealants used on the interior of the building (defined as inside of the weatherproofing system) that meet either emissions requirements of CDPH SECTION 01350 (limit the requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. For products located on the interior of the building (inside of the weatherproofing system), provide certification of indoor air quality for Sealants.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

Examine surfaces to receive directly attached acoustical units for unevenness, irregularities, and dampness that would affect quality and execution of the work. Rid areas, where acoustical units will be cemented, of oils, form residue, or other materials that reduce bonding capabilities of the adhesive. Complete and dry interior finish work such as plastering, concrete, and terrazzo work before installation. Complete and approve mechanical, electrical, and other work above the ceiling line prior to the start of acoustical ceiling installation. Provide acoustical work complete with necessary fastenings, clips, and other accessories required for a complete installation. Do not expose mechanical fastenings in the finished work. Lay out hangers for each individual room or space. Provide hangers to support framing around beams, ducts, columns, grilles, and other penetrations through ceilings. Keep main runners and carrying channels clear of abutting walls and partitions. Provide at least two main runners for each ceiling span. Wherever required to bypass an object with the hanger wires, install a subsuspension system so that all hanger wires will be plumb.

3.1.1 Suspension System

Install suspension system in accordance with ASTM C636/C636M and as specified herein. Do not suspend hanger wires or other loads from underside of steel decking.

3.1.1.1 Plumb Hangers

Install hangers plumb and not pressing against insulation covering ducts and pipes. Where lighting fixtures are supported from the suspended ceiling system, provide hangers at a minimum of four hangers per fixture and located not more than 6 inch from each corner of each fixture.

3.1.1.2 Splayed Hangers

Splay (slope or slant) hangers around obstructions, offsetting the resulting horizontal force by bracing, countersplaying, or other acceptable means.

3.1.2 Wall Molding

Provide wall molding where ceilings abut vertical surfaces. Miter corners where wall moldings intersect or install corner caps. Secure wall molding not more than 3 inch from ends of each length and not more than 16 inch on centers between end fastenings. Provide wall molding springs at each acoustical unit in semi-exposed or concealed systems.

3.1.3 Acoustical Units

Install acoustical units in accordance with the approved installation instructions of the manufacturer. Ensure that edges of acoustical units are in close contact with metal supports, with each other, and in true alignment. Arrange acoustical units so that units less than one-half width are minimized. Hold units in exposed-grid system in place with

manufacturer's standard hold-down clips, if units weigh less than 1 psf or if required for fire resistance rating.

3.1.4 Acoustical Sealant

Seal all joints around pipes, ducts or electrical outlets penetrating the ceiling. Apply a continuous ribbon of acoustical sealant on vertical web of wall or edge moldings.

3.2 CLEANING

Following installation, clean dirty or discolored surfaces of acoustical units and leave them free from defects. Remove units that are damaged or improperly installed and provide new units as directed.

-- End of Section --

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SECTION 09 65 00

RESILIENT FLOORING
08/10, CHG 3: 08/18

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D4078	(2002; R 2015) Water Emulsion Floor Polish
ASTM E648	(2019a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
ASTM F710	(2022) Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
ASTM F1066	(2004; R 2014; E 2014) Standard Specification for Vinyl Composition Floor Tile
ASTM F1482	(2021) Standard Practice for Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring
ASTM F1861	(2021) Standard Specification for Resilient Wall Base
ASTM F1869	(2023) Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
ASTM F2170	(2019a) Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2022) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

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SD-02 Shop Drawings

Resilient Flooring and Accessories; G

SD-03 Product Data

Resilient Flooring and Accessories; G

Adhesives

Vinyl Composition Tile; G

Wall Base; G

SD-04 Samples

Resilient Flooring and Accessories; G

SD-06 Test Reports

Moisture, Alkalinity and Bond Tests; G

SD-07 Certificates

Indoor Air Quality for Vinyl Composition Tile; S

Indoor Air Quality for Wall Base; S

Indoor Air Quality for Adhesives; S

Recycled Content For Vinyl Composition Tile

SD-08 Manufacturer's Instructions

Surface Preparation; G

Installation; G

SD-10 Operation and Maintenance Data

Resilient Flooring and Accessories; G

1.3 CERTIFICATES

1.3.1 Indoor Air Quality

Submit required indoor air quality certifications and validations in one submittal package.

1.3.1.1 Floor Covering Materials

Provide Vinyl Composition Tile, and wall base and moulding products certified to meet indoor air quality requirements by FLOORSCORE, UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification by other third-party programs. Provide current product certification documentation from certification body.

1.3.1.2 Adhesives, Caulking and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party programs that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the building site in original unopened containers bearing the manufacturer's name, style name, pattern color name and number, production run, project identification, and handling instructions. Store materials in a clean, dry, secure, and well-ventilated area with ambient air temperature maintained above 68 degrees F and below 85 degrees F, stacked according to manufacturer's recommendations. Protect materials from the direct flow of heat from hot-air registers, radiators and other heating fixtures and appliances. Observe ventilation and safety procedures specified in the MSDS. Do not store flooring near materials that may offgas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives.

1.5 ENVIRONMENTAL REQUIREMENTS

Maintain areas to receive resilient flooring at a temperature above 68 degrees F and below 85 degrees F for 3 days before application, during application and 2 days after application, unless otherwise directed by the flooring manufacturer for the flooring being installed. Maintain a minimum temperature of 55 degrees F thereafter. Provide adequate ventilation to remove moisture from area and to comply with regulations limiting concentrations of hazardous vapors.

1.6 SCHEDULING

Schedule resilient flooring application after the completion of other work which would damage the finished surface of the flooring.

1.7 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a one year period.

1.8 EXTRA MATERIALS

Provide extra flooring material of each color and pattern at the rate of 5 tiles for each 1000 tiles installed. Provide extra wall base material composed of 20 linear feet of each type, color and pattern. Package all extra materials in original properly marked containers bearing the manufacturer's name, brand name, pattern color name and number, production run, and handling instructions. Provide extra materials from the same lot as those installed. Leave extra stock at the site in location assigned by Contracting Officer.

PART 2 PRODUCTS

2.1 VINYL COMPOSITION TILE VCT1

Conform to ASTM F1066 Class 2, (through pattern tile), Composition 1, asbestos-free, 12 inch square and 1/8 inch thick. Provide color and pattern uniformly distributed throughout the thickness of the tile.

Provide Vinyl Composition Tile containing a minimum of 10 percent recycled content. Provide data identifying percentage of recycled content for Vinyl Composition Tile.

Provide certification of indoor air quality for Vinyl Composition Tile.

2.2 WALL BASE

Conform to ASTM F1861, Type TS (vulcanized thermoset rubber)Style B (coved. Provide 4 inch high and a minimum 1/8 inch thick wall base. Provide job formed corners in matching height, shape, and color.

Provide certification of indoor air quality for Wall Base.

2.3 MOULDING

Provide tapered mouldings of rubber or clear anodized aluminum as indicated in the Drawings. Provide vertical lip on moulding of maximum 1/4 inch. Provide bevel change in level between 1/4 and 1/2 inch with a slope no greater than 1:2.

2.4 ADHESIVES

Provide adhesives for flooring, base and accessories as recommended by the manufacturer and comply with local indoor air quality standards. Submit manufacturer's descriptive data, documentation stating physical characteristics, and mildew and germicidal characteristics.

Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) that meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for adhesives.

2.5 SURFACE PREPARATION MATERIALS

Provide surface preparation materials, such as panel type underlayment, lining felt, and floor crack fillers as recommended by the flooring manufacturer for the subfloor conditions. Comply with ASTM F1482 for

panel type underlayment products.

2.6 POLISH/FINISH

Provide polish finish as recommended by the manufacturer and conform to ASTM D4078 for polish.

2.7 CAULKING AND SEALANTS

Provide caulking and sealants in accordance with Section 07 92 00 JOINT SEALANTS.

2.8 MANUFACTURER'S COLOR, PATTERN AND TEXTURE

Provide color, pattern and texture for resilient flooring and accessories in accordance with Section 09 06 00 SCHEDULES FOR FINISHES. Color listed is not intended to limit the selection of equal colors from other manufacturers. Provide floor patterns as specified on the drawings Sheet No. IN101. Provide flooring in any one continuous area or replacement of damaged flooring in continuous area from same production run with same shade and pattern. Submit scaled drawings indicating patterns (including location of patterns and colors) and dimensions. Submit manufacturer's descriptive data and three samples of each indicated color and type of flooring, base, mouldings, and accessories sized a minimum 2-1/2 by 4 inch. Submit Data Package 1 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

2.9 FIRE RESISTANCE TESTING REQUIREMENTS

Provide a minimum average critical radiant flux of 0.45 watts per square centimeter for flooring in corridors and exits when tested in accordance with ASTM E648.

PART 3 EXECUTION

3.1 EXAMINATION

Examine and verify that site conditions are in agreement with the design package. Report all conditions that will prevent a proper installation. Do not take any corrective action without written permission from the Government. Work will proceed only when conditions have been corrected and accepted by the installer. Submit manufacturer's printed installation instructions for all flooring materials and accessories, including preparation of substrate, seaming techniques, and recommended adhesives.

3.2 SURFACE PREPARATION

Provide a smooth, true, level plane for surface preparation of the flooring, except where indicated as sloped. Floor to be flat to within 3/16 inch in 10 feet. Prepare subfloor in accordance with flooring manufacturer's recommended instructions. Prepare the surfaces of lightweight concrete slabs (as defined by the flooring manufacturer). Comply with ASTM F710 for concrete subfloor preparation. Floor fills or toppings may be required as recommended by the flooring manufacturer. Install underlayments, when required by the flooring manufacturer, in accordance with manufacturer's recommended printed installation instructions. Comply with ASTM F1482 for panel type underlayments. Before any work under this section is begun, correct all defects such as rough or scaling concrete, chalk and dust, cracks, low spots, high spots,

and uneven surfaces. Repair all damaged portions of concrete slabs as recommended by the flooring manufacturer. Remove concrete curing and sealer compounds from the slabs, other than the type that does not adversely affect adhesion. Remove paint, varnish, oils, release agents, sealers, waxes, and adhesives, as required by the flooring product in accordance with manufacturer's printed installation instructions.

3.3 MOISTURE, ALKALINITY AND BOND TESTS

Determine the suitability of the concrete subfloor for receiving the resilient flooring with regard to moisture content and pH level by moisture and alkalinity tests. Conduct moisture testing in accordance with ASTM F1869 or ASTM F2170, unless otherwise recommended by the flooring manufacturer. Conduct alkalinity testing as recommended by the flooring manufacturer. Determine the compatibility of the resilient flooring adhesives to the concrete floors by a bond test in accordance with the flooring manufacturer's recommendations. Submit copy of test reports for moisture and alkalinity content of concrete slab, and bond test stating date of test, person conducting the test, and the area tested.

3.4 GENERAL INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

3.5 PLACING VINYL COMPOSITION TILES

Install tile flooring and accessories in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's directions. Keep tile lines and joints square, symmetrical, tight, and even. Keep each floor in true, level plane, except where slope is indicated. Vary edge width as necessary to maintain full-size tiles in the field, no edge tile to be less than one-half the field tile size, except where irregular shaped rooms make it impossible. Cut flooring to fit around all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Cut, fit, and scribe edge tile to walls and partitions after field flooring has been applied.

3.6 PLACING MOULDING

Provide moulding where flooring termination is higher than the adjacent finished flooring and at transitions between different flooring materials. When required, locate moulding under door centerline. Moulding is not required at doorways where thresholds are provided. Secure moulding with adhesive as recommended by the manufacturer. Prepare and apply adhesives in accordance with manufacturer's printed directions. Anchor aluminum moulding to floor surfaces as recommended by the manufacturer.

3.7 PLACING WALL BASE

Install wall base in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's printed directions. Tighten base joints and make even with adjacent resilient flooring. Fill voids along the top edge of base at masonry walls with caulk. Roll entire vertical surface of base with hand roller, and press toe of base with a straight piece of wood to ensure proper alignment. Avoid excess adhesive in corners.

3.8 CLEANING

Immediately upon completion of installation of flooring in a room or an area, dry and clean the flooring and adjacent surfaces to remove all surplus adhesive. Clean flooring as recommended in accordance with manufacturer's printed maintenance instructions and within the recommended time frame. As required by the manufacturer, apply the recommended number of coats and type of polish and finish in accordance with manufacturer's written instructions.

3.9 PROTECTION

From the time of installation until acceptance, protect flooring from damage as recommended by the flooring manufacturer. Remove and replace flooring which becomes damaged, loose, broken, or curled and wall base which is not tight to wall or securely adhered.

-- End of Section --

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SECTION 09 67 23.15

FUEL RESISTIVE RESINOUS FLOORING, 3-COAT SYSTEM
02/21

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C679	(2015) Tack-Free Time of Elastomeric Sealants
ASTM D412	(2016) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D638	(2014) Standard Test Method for Tensile Properties of Plastics
ASTM D1308	(2002; R 2013) Effect of Household Chemicals on Clear and Pigmented Organic Finishes
ASTM D2240	(2015; E 2017) Standard Test Method for Rubber Property - Durometer Hardness
ASTM D3925	(2002; R 2015) Sampling Liquid Paints and Related Pigmented Coatings
ASTM D4541	(2017) Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM D6237	(2019) Standard Guide for Painting Inspectors (Concrete and Masonry Substrates)
ASTM E11	(2020) Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves

INTERNATIONAL CONCRETE REPAIR INSTITUTE (ICRI)

ICRI 310.2R	(2013) Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair

MASTER PAINTERS INSTITUTE (MPI)

MPI 211	(2018) Floor Coating, Primer, Thin Film, for Aircraft Maintenance Facilities
MPI 212	(2018) Floor Coating, Thin Film, for

Aircraft Maintenance Facilities

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC QP 5	(2012) Standard Procedure for Evaluating the Qualifications of Coating and Lining Inspection Companies
SSPC-TU 2/NACE 6G197	(1997) Design, Installation, and Maintenance of Coating Systems for Concrete Used in Secondary Containment

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.134	Respiratory Protection
29 CFR 1910.1000	Air Contaminants
29 CFR 1926.59	Hazard Communication

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Joint Sealant; G AE

Thin Film Flooring System; G AE

White Aluminum Oxide Non-Skid Grit; G AE

SD-04 Samples

Hardboard Mounted Thin Film Flooring

Mockups

SD-05, Design Data

Environmental Control System

SD-06 Test Reports

Joint Sealant Test Report; G

Primer Coat; G

Urethane Topcoat; G

White Aluminum Oxide Non-Skid Grit; G

Patch Test Demonstration; G

Daily Inspection Report; G

Adhesion Testing; G

SD-07 Certificates

Coating Work Plan; G

Joint Sealant Certificates; G

Thin Film Flooring System Certificates; G

Qualifications of Certified Industrial Hygienist (CIH)

Qualifications of Certified Protective Coatings Specialist (PCS)

Qualifications of Coating Inspection Company

Qualifications of QC Specialist Coating Inspector

Qualifications of Coating Contractors; G

Warranty; G

SD-08 Manufacturer's Instructions

Joint Sealant Manufacturer's Instructions; G

Thin Film Flooring System Manufacturer's Instructions; G

Water-Based Alkaline Degreaser; G

SD-11 Closeout Submittals

Inspection Logbook; G

1.3 QUALITY CONTROL

1.3.1 Sampling

Submit Hardboard Mounted Thin Film Flooring samples not less than 12 inches square for each required color.

Provide panels showing nominal thickness of finished toppings, color, and texture of finished surfaces. Finished floor toppings and the approved samples are to match in color and texture.

1.3.2 Mockups

Build mockups to verify Broadcast Grit selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution. Apply full-thickness mockups on 96 inch square floor area selected by Contracting Officer. Simulate finished lighting conditions for the review of mockups.

1.4 QUALITY ASSURANCE

1.4.1 Qualifications of Certified Protective Coatings Specialist (PCS)

Submit name, address, telephone number, FAX number, and e-mail address of the independent third party PCS. Submit documentation that the specialist is certified by SSPC: The Society for Protective Coatings (SSPC) as a PCS, including certification number and date of certification/recertification. If the PCS is employed by the same coating inspection company to which the coating inspector is employed, this does not violate the independent third-party requirements. The PCS must remain certified during the entire project, and the Contracting Officer must be notified of any change in certification status within 10 days of the change. The PCS must not be the designated coating inspector.

1.4.2 Coating Work Plan

a. Include Coating Work Plan in Quality Control Plan.

b. Provide procedures for reviewing Contract Documents immediately after award to identify errors, omissions, and discrepancies so that any such issues can be resolved prior to project planning and development of detailed procedures.

c. Provide procedures for verification of key processes during Initial Phase to ensure that Contract requirements can be met. Key processes must include surface preparation, coating application and curing, inspection, and documentation, and any other process that might adversely impact orderly progression of work.

d. Provide procedures for all phases of coating operations, including planned work, rework, repair, inspection, and documentation. Address mobilization and setup, surface preparation, coating application, coating initial cure, tracking and correction of non-compliant work, and demobilization. Coordinate work processes with health and safety plans and confined space entry plans. For each process, provide procedures that include appropriate work instructions, material and equipment requirements, personnel qualifications, controls, and process verification procedures. Provide procedures for inspecting work to verify and document compliance with Contract requirements, including inspection forms and checklists, and acceptance and rejection criteria.

e. Provide procedures for correcting non-compliant work. Detailed procedures are required in advance to avoid delays in meeting overcoat windows as well as to avoid delays in production. Provide procedures for repairing defects in the coating film, such as runs, drips, sags, holidays, overspray, as well as how to correct coating thickness non-compliance, any other areas of repair or rework that might be adversely affected by delays in preparing and approving new procedures.

f. If a procedure is based on a proposed or approved request for deviation, the deviation must be referenced. Changes to procedures must be noted by submittal number and date approved, clearly delineating old requirements and new requirements, so that the records provide a continuous log of requirements and procedures.

1.4.3 Design Data

1.4.3.1 Environmental Control System

Submit design details of the proposed environmental control system to include ventilation, humidity control, and temperature regulation. Provide calculations for humidity control during separate surface preparation and coating application procedures, ventilation requirements during coating application, and maximum allowable coating application rates to coincide with ventilation. Include basis of design data on local conditions. Provide equipment layout sketches and procedures showing function of each piece of equipment and fail-safe measures. A Certified Industrial Hygienist must approve calculations, work procedures and personal protective equipment.

1.4.4 Test Reports

1.4.4.1 Joint Sealant Test Report

Submit test results that confirm sealant complies with the requirements of Table Ia. Samples must have been tested within the last three years.

1.4.4.2 Daily Inspection Report

Submit one copy of the daily inspection report to the Contracting Officer within 24 hours of the date recorded.

1.4.5 Certificates

1.4.5.1 Qualifications of Certified Industrial Hygienist (CIH)

Submit name, address, telephone number, FAX number, and e-mail address of the independent third party CIH. Submit documentation that hygienist is certified by the American Board of Industrial Hygiene in comprehensive practice, including certification number and date of certification/recertification. Provide evidence of experience with hazards involved in industrial coating application work.

1.4.5.2 Qualifications of Coating Inspection Company

Submit documentation that the coating inspection company performing all coating inspection functions is certified by SSPC to the requirements of SSPC QP 5 prior to Contract award. The coating inspection company submitted and approved must remain and not changed through completion of the Contract. The coating inspection company must remain so certified for the duration of the project. If a coating inspection company's certification expires, the firm will not be allowed to perform any inspection functions, and all surface preparation and coating application work must stop, until the certification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered. Notify the Contracting Officer of any change in coating inspection company certification status. Notify the Contracting Officer of all scheduled and unannounced on-site inspections from SSPC and furnish a copy of all inspection reports.

1.4.5.3 Qualifications of QC Specialist Coating Inspector

Submit documentation that each coating inspector is employed, and qualified to SSPC QP 5, Level II, by the selected coating inspection

company. Each inspector must remain employed by the coating inspection company while performing any coating inspection functions. In addition to the handwritten records, the inspector must employ an electronic reporting program with functionality as outlined in Table II. The Administrator must be the designated Government Representative for the project.

1.4.5.4 Qualifications of Coating Contractors

(*Am-0004) Minimum requirements for the installation Contractor are as follows: Completed three or more jobs within the past two years applying the specified materials to concrete surfaces in which the total area exceeds 200,000 square feet. Submit documentation listing location of work, point of contact at job site, total square footage of applied materials, listing of both materials and equipment used, and validation from coating manufacturer documenting quality of materials purchased per job for work totaling 200,000 square feet within the past two years. In addition to the above requirements, installation Contractor must be certified by the material manufacturer(s) to install the submitted coatings and sealant. Submit copy of certificates.(**Am-0004)

1.4.5.5 Joint Sealant Certificates

Submit literature documenting the past performance of the sealant's use in automotive or aircraft maintenance shops. Minimum requirements are two or more maintenance shops with joint work totaling 10,000 linear feet where the sealant has performed for two years with less than 1 percent combined sealant failures and defects. List location of shops, total linear feet of sealant applied per shop, shop point of contact, date sealant was applied, and the name of the installed sealant material.

1.4.5.6 Thin Film Flooring System Certificates

Provide manufacturer's certification of conformance to Contract requirements.

Submit literature documenting the past performance of the coating system's use in aircraft maintenance shops and over floors with high rates of Moisture Vapor Emission (MVE). Minimum requirements are two or more aircraft maintenance shops totaling 34,000 square feet where the coating system has performed for two years with less than 0.05 percent combined premature coating failures, material defects and surface discoloration; no more than 0.03 percent discoloration from aviation chemicals, tire plasticizers, and UV exposure. Provide a minimum of two additional case histories where successful installation occurred on floor slabs with no less than 3.5 pounds moisture per 24 hours, 1000 square feet. List location of shops, total coated area per shop, shop point of contact, date coating system was applied, successful installation to concrete with high MVE, and the names of the installed coating materials.

1.4.6 Product Data

1.4.6.1 Joint Sealant Manufacturer's Instructions

Submit manufacturer's printed instructions to include detailed application procedures, minimum and maximum application temperatures, and curing procedures. In accordance with 29 CFR 1926.59, include Safety Data Sheets (SDS) for the sealant to be used at the job site.

1.4.6.2 Thin Film Flooring System Manufacturer's Instructions

Submit manufacturer's printed instructions to include detailed mixing, minimum and maximum application temperatures, acceptable atmospheric and interior climatic conditions, application procedures, curing procedures, and procedures for maintenance cleaning of flooring system. Provide explicit instructions detailing surface preparation, recoat windows and remedial actions in case recoat windows are missed, and, if applicable, solvent-wiping between coats with acceptable types and grades of solvents. In accordance with 29 CFR 1926.59, include SDSs for the coatings to be used at the job site.

1.4.6.3 Water-Based Alkaline Degreaser

Submit manufacturer's printed instructions to include detailed mixing, rate of dilution, application procedures, and rinsing procedures. In accordance with 29 CFR 1926.59, include SDSs for the water-based alkaline degreaser to be used at this job site.

1.5 DELIVERY, STORAGE, AND HANDLING

Store coatings and sealant in spaces with temperatures from 40 degrees F to 75 degrees F. Inspect materials on site for damage prior to use. Return to manufacturer packaged materials in dented, rusty, or leaking containers. Conduct testing by manufacture of returned materials with an expired shelf life and if compliant, reissue a shelf life extension.

1.6 COATING HAZARDS

Ensure that employees are trained in all aspects of the safety plan. Follow the coating manufacturer's written safety precautions throughout mixing, application, and curing of coatings. Comply with respiratory protection requirements in 29 CFR 1910.134 and safe levels of airborne contaminants in 29 CFR 1910.1000.

1.7 JOB SITE REFERENCES

Make available to the Contracting Officer at least one copy each of ASTM D4541, ASTM D6237, SSPC-TU 2/NACE 6G197, and ICRI 310.2R, including replica standards ICRI 310.2R CSP 1 through CSP 9, at the job site.

1.8 PATCH TEST DEMONSTRATION

Prior to the submitted flooring system's approval, apply the complete coating system to a 10 foot by 10 foot square section of concrete as prepared in accordance with PART 3 EXECUTION. Within this area, perform three adhesion tests as described in the paragraph ADHESION TESTING. If adhesion testing produces cohesive failures within the concrete, no less than 40 mils concrete removed over 95 percent of each pull-off coupon, or adhesion more than 400 psi, patch test adhesion is acceptable. If concrete surface preparation was insufficient, apply an additional coating system patch to properly prepared concrete followed by the above adhesion testing. If adhesion results are unacceptable for both the topcoats and the primer, submit a new coating system manufactured by a different coating vendor. Apply a patch of the new coating system and subject patch to the above requirements for adhesion prior to approval. If customer is not satisfied with the non-skid grit application, adjustments to the specifications can be made. Grit coarser than No. 60 aluminum oxide is not recommended.

1.9 WARRANTY

Warranty materials and workmanship for a minimum period of one year following coating and sealant application. The following terms and conditions form a part of the warranty: If the applied coating system develops either blisters (chemical), checks, softening, or lifting within one year following application, rework each area at Contractor's expense. The following conditions are excluded from the warranty: A) concrete cracking, flooring system mirrors cracks in concrete; B) cosmetic imperfections due to scratching and gouging; and C) application to concrete with a rate of Moisture Vapor Emission (MVE) greater than 3.5 pounds moisture per 24 hours, 1000 square feet. If the coating system's adhesion is in question, perform one adhesion test per 100 square feet as described in the paragraph ADHESION TESTING. To satisfy the warranty, each adhesion test must produce cohesive failures, concrete removal over 95 percent of each pull-off coupon, or adhesion no less than 400 psi. Require two additional adhesion tests to confirm results for each area failing to meet adhesion requirements. Within the warranty period, remove to sound material and rework all areas unable to meet adhesion requirements. There must be zero percent sealant failures within one year. Within the warranty period, remove and rework all sealant material with chemically attacked surfaces or lifting from joint walls. Topcoat cracking over sealant is excluded from warranty.

PART 2 PRODUCTS

2.1 JOINT SEALANT

Formulate the joint sealant to exhibit the properties as listed in Table Ia.

2.2 THIN FILM FLOORING SYSTEM

A three-coat industrial flooring system consisting of primer and two urethane topcoats. Apply the coating system at a Dry Film Thickness (DFT) ranging from 13 to 20 mils and contain a broadcast of aluminum oxide non-skid grit.

2.2.1 Primer Coat

In addition to the requirements of the thin film flooring system, use MPI 211 primer coat.

2.2.2 Urethane Topcoat

In addition to the requirements of the thin film flooring system, use MPI 212 top coat. Color shall be as indicated in the Interior Finish Materials Legend on Sheet AE601.

2.3 WHITE ALUMINUM OXIDE NON-SKID GRIT

Size No. 60, dust free (washed and dry), minimum 99 percent pure, having the following sieve analysis when tested using a 2.2 pound sample (ASTM E11):

Sieve No. 40	100 percent passing
Sieve No. 50	15-30 percent retained
Sieve No. 60	70-85 percent retained
Sieve No. 70	0-15 percent retained

PART 3 EXECUTION

3.1 COATING SAMPLE COLLECTION

The Contracting Officer and QC Manager must witness all material sampling. Notify the Contracting Officer a minimum of three days in advance of sampling. Obtain liquid samples of each component of primer and topcoat by random selection from sealed containers and in accordance with ASTM D3925. Samples may be either individual cans of liquid material or 1.0 quart quantities of properly mixed, extracted, and sealed liquid material. Identify samples by designated name, specification number, batch number, project Contract number, sample date, intended use, and quantity involved. When the applied coating system has met the requirements defined in the paragraph ADHESION TESTING, return coating to the installation Contractor for proper disposal.

3.2 CRACK CHASING

Hairline cracks having no more than 1/8 inch width are typically not repaired. Chase concrete cracks identified for repair and open to a minimum depth of 1/2 inch below crack surface resulting in crack(s) with smooth vertical walls. Cracks greater than 3/4 inch width can be repaired using either epoxy mortar or epoxy concrete.

3.3 DEGREASING

On both coated and uncoated concrete, degrease entire floor by scrubbing using a solution of hot potable water, 120 degrees F to 170 degrees F, and a concentrated water-based alkaline degreaser. Perform two complete degreasing cycles on the entire floor surface. Allow solution to soak into surfaces prior to scrubbing and remove using hot potable water under a minimum of 4,000 psi. Rinsing is complete when the rinse water appears clear. If the industrial detergent is not biodegradable, collect all rinse water and dispose as hazardous waste. Squeegees and shop vacuums may be used to collect pooling rinse water. Fans may be used to aid drying of floor surfaces.

3.4 SURFACE PREPARATION

Shot blast entire floor to produce a level of coarseness equal to ICRI 310.2R CSP 3. Overlap each pass of shot blasting by 1/4 inches to 1/2 inches. Add new shot to shot blasting equipment prior to blasting. Prepare surfaces inaccessible to shot blasting, base of perimeter walls and under secured equipment, using diamond disk grinding or light scarification to produce a level of coarseness equal to ICRI 310.2R CSP 2 or ICRI 310.2R CSP 4, respectively. Resulting surfaces must appear clean and contain the appropriate level of surface coarseness. If the resulting level of cleanliness cannot be determined, place numerous drops of water on surfaces that appear contaminated. If the water drops soak into concrete, the surfaces are free of hydrocarbon contamination (oils,

grease, skydrol). If the water drops bead up and do not flatten out, surfaces require additional degreasing as detailed in the Article DEGREASING. Shot blasting coarse concrete or broom finished concrete can produce a level of coarseness equal to ICRI 310.2R CSP 5: employ a best-effort attempt to minimize over-shot-blasting of coarse concrete. If coarse concrete is encountered, shot blasting to a level of coarseness equal to ICRI 310.2R CSP 5 is acceptable: however, extremely coarse concrete can require resurfacing prior to the flooring system's installation. Sweep, vacuum, and run a high powered magnet over all surfaces to be coated, including joints.

3.4.1 Concrete Masonry Units (CMU) Surface Preparation

Remove 100 percent of coatings 6 inches up the base of CMU walls adjacent the flooring space, and prepare surface by power grinding to a resulting level of coarseness equal to ICRI 310.2R CSP 2. If oils/grease are present, degrease in accordance with the Article DEGREASING.

3.5 COVE STRIP INSTALLATION

Install a continuous cove strip at a nominal height of 6 inches up each CMU perimeter wall base. Install a solvent-resistant cove strip using a solvent-resistant adhesive.

3.6 JOINT TREATMENT

Use the "Conventional Sealed Joint" as detailed in Figure 1 of SSPC-TU 2/NACE 6G197 to seal joints. Employ measures to reduce contamination from equipment and foot traffic. Limit floor access to essential Contractor personnel. Confirm joint surfaces are sufficiently clean.

3.6.1 Install Backer Rod

Install a continuous length of round, closed-cell polyethylene backer rod into each joint using a backer rod tool. For 1/2 inch, 3/8 inch, and 1/4 inch wide joints, place backer rod to a depth of 3/8 inch (depth equals the distance from the concrete's surface to the highest point on the backer rod). For joints greater than or equal to 3/4 inch width, place backer to a depth of 5/8 inch below the concrete's surface. Fit backer rod tight between joint walls (30 percent compression). Remove and reinstall all backer rod that is installed using either the incorrect size (loose fit) or at the incorrect depth. Following backer rod installation, apply painter's tape to surfaces adjacent joints to protect from sealant.

3.6.2 Joint Sealant Application

Apply sealant directly into joints using a bulk-caulking gun. At room temperature, the resulting sealant application must exhibit a concave recess between 1/8 inch to 1/16 inch below the concrete's surface. Remove and reapply cured sealant remaining either flush or greater. Following sealant application, remove painter's tape and sealant drips on concrete surfaces. Cure sealant a minimum of 24 hours, prior to the application of coatings.

3.7 PRE-APPLICATION TESTING FOR CONTAMINATION

Spot check surfaces for oil/grease contamination using the water break test. At a rate of 5 tests per 1000 square feet, place one to two drops

of water onto surfaces and observe for beading. Test all other surfaces that show visible signs of potential contamination. Apply additional degreasing techniques to surfaces displaying water beading in accordance with the Article DEGREASING.

3.8 COATING APPLICATION

Vacuum flooring space one additional time prior to coating application.

3.8.1 Primer Application

Apply MPI 211 epoxy primer to flooring space at 7.0 mils to 15.0 mils Dry Film Thickness (DFT). If the prepared concrete resembles an ICRI 310.2R CSP 3 surface, apply the primer at a minimum of 7.0 mils DFT. If the prepared concrete resembles an ICRI 310.2R CSP 5 surface, apply the primer at a maximum of 15.0 mils DFT. The previously applied sealant may be lightly coated.

3.8.2 Non-Skid Grit Broadcast

Broadcast non-skid grit at a rate of 1.5 pounds per 100 square feet into the second urethane top coat and backroll. Map floor into 600 square foot sections where 9.0 pounds of non-skid grit is pre-weighed, placed into clean buckets and used in its entirety per marked 600 square foot section.

3.8.3 Application of Topcoats

Apply two coats of MPI 211 epoxy urethane topcoat to the epoxy primer and broadcast white aluminum oxide non-skid grit directly into the second urethane topcoat.

3.8.3.1 First Topcoat

Apply a full coat of the urethane topcoat at a spreading rate from 2.5 to 3.2 mils Dry Film Thickness (DFT). Stripe coat perimeter edges and around equipment footings. Monitor and record a minimum of one Wet Film Thickness (WFT) reading per 600 square feet of floor surface. Sealant is to be lightly coated.

3.8.3.2 Second Topcoat

Apply a second coat of the urethane topcoat at a spreading rate of 2.5 to 3.2 mils DFT. Stripe coat perimeter edges and around equipment footings. Monitor and record a minimum of one WFT reading per 600 square feet of floor surface prior to broadcasting non-skid grit. When the correct WFT has been applied per 600 square feet of area, immediately and evenly broadcast non-skid grit directly into the second topcoat of urethane and backroll in two directions. Test the adhesion of the thin film flooring system in accordance with the paragraph ADHESION TESTING.

3.8.3.3 Walkway Stripe and Grounding Rod Markings

Place the walkway stripe and grounding rod markings according to Government drawings, if applicable. When the second topcoat is within its recoat window, apply a walkway stripe of the red/orange urethane topcoat at 3.0 mils DFT, completely hiding the top coat, in one coat. If insufficient hiding occurs, apply one additional coat of the walkway stripe. Lightly broadcast non-skid grit into the wet walkway stripe. Use solvent-resistant tape to protect the floor coating against stripe coat

bleed. A thin clear coat of either epoxy or urethane may be required to prevent stripe coat bleed prior to the full application of the colored stripe coat. Apply grounding rod markings using similar procedures, urethane top coat, and colors and size according to Government drawings.

3.9 CURING

Cure installed materials to display performance equal to manufacturer's product literature. Remove and reapply improperly cured material.

3.10 FIELD QUALITY CONTROL

3.10.1 Coating Inspector

Consider the Coating Inspector as a QC Specialist, who works for the QC Manager, and qualified in accordance with Section QUALITY CONTROL. The Coating Inspector must be present during all field tests, surface preparation, flooring application, initial cure of the flooring system, and during all flooring repair work. The Coating Inspector must provide all tools/equipment necessary to perform field tests and inspection. The Coating Inspector is responsible for field tests and specified level of inspection.

3.10.2 Inspection

Document weather conditions, job site occurrences, and report conditions and occurrences potentially detrimental to the flooring system. The listed inspection requirements are in addition to the QC inspection and reporting requirements defined in Section QUALITY CONTROL. The Coating Inspector must prepare a project reference sheet outlining all requirements, tests, test methods, and evaluation criteria, and hold regular meetings with Contractor personnel, including shot blasting operators and applicators, to review requirements/evaluation criteria for upcoming work prior to execution. At the start of coating operations and every hour following until daily work is complete, record air temperature, substrate temperature, and relative humidity. Following the application of each coat, inspect surfaces for improperly cured material, blisters, inadequate or excessive coating thickness, and other defects. Document each inspection, test, non-compliant area, and location of each non-compliant area. List method of evaluation, evaluation criteria, areas requiring rework, and all other pertinent observations.

3.10.2.1 Daily Inspection Report

Submit to the Contracting Officer one copy of the daily inspection report completed each day when performing work under this Section. Use Appendix X1 "Inspection Checklist" of ASTM D6237 to monitor daily activity and to assist in preparing the daily inspection report. Note each non-compliant issue and each issue identified for rework in accordance with the QC documentation procedures of Section QUALITY CONTROL. Use of forms containing entry blocks for all required data is encouraged. The data must be legible and presented in a professional format. Submit report within 24 hours of the report date.

3.10.2.2 Inspection Logbook

Maintain a continuous record of all activity related to this Section on a daily basis. A computer / software package as outlined in Table II is preferred to record all information provided in the Daily Inspection

Reports, as well as other pertinent observations and information including photo documentation where appropriate. The designated Government Representative for the project is assigned the highest level Administrator privileges and only the Administrator must be able to modify reports. In areas where photography is not allowed, the computer must come with verification that the camera / photo capability has been removed.

Alternatively, a continuous record of all activity related to this Section must be maintained in an Inspection Logbook on a daily basis. The logbook must be hard or spiral bound with consecutively numbered pages, and must be used to record all information provided in the Daily Inspection Reports, as well as other pertinent observations and information. Submit the original Inspection Logbook to the Contracting Officer upon completion of the project and prior to final payment.

3.10.2.3 Inspection Equipment

Use equipment in good condition, operational within its design range, and calibrated as required by the specified standard for use with each device.

3.10.3 Adhesion Testing

Perform a minimum of three adhesion tests in accordance with ASTM D4541 to the thin film flooring system. Select three random flooring locations spaced a minimum of 20 feet between each location. Prior to attaching pull-off coupons, lightly sand flooring surface and attach pull-off coupons containing a grit-blasted anchor profile. Adhere directly to the center of each sanded surface a 3/4 inch diameter pull-off coupon. When pull-off coupon adhesive has sufficiently cured, score circumference of each pull-off coupon to concrete substrate. Test adhesion and evaluate results. If testing produces cohesive failures within the concrete, no less than 40 mils concrete removed over 95 percent of each pull-off coupon, or adhesion more than 400 psi coating system's adhesion is acceptable. If the above requirements are not satisfied, then perform one adhesion test per 100 square feet using the above procedures. Perform two additional tests per non-compliant area to confirm results. Remove to sound material and rework all areas unable to meet adhesion requirements. Repair each adhesion test using a combination of primer, sand-filled epoxy mortar (for deep cohesive failures, if applicable), and two urethane topcoats. Make repairs flush with adjacent coatings and display an equivalent appearance.

3.11 FINAL CLEANUP

Following completion of the work, remove debris, equipment, and materials from the site. Remove temporary connections to Government or Contractor furnished water and electrical services. Restore existing facilities in and around the work areas to their original condition.

TABLE I - MATERIALS REQUIREMENTS	
TABLE Ia	
Test	Minimum Requirement (maximum where indicated)
Sealant System (two-pack: self-leveling)	Polysulfide (Manganese Cure; MnO2) or Urethane
Percent Volume Solids	100 percent
Chemical Resistance to JP-8 plus 100 Fuel at 70 degrees F (ASTM D1308) (see note 1)	48 hours immersion: 2.0 percent (max) weight increase, 5.0 percent (max) volume increase, 2.0 percent (max) weight loss
Chemical Resistance to Motor Oils at 70 degrees F (ASTM D1308) (see note 1)	48 hours immersion: 2.0 percent (max) weight increase, 5.0 percent (max) volume increase, 2.0 percent (max) weight loss
Chemical Resistance to Skydrols at 70 degrees F (ASTM D1308) (see note 1)	48 hours immersion: 2.0 percent (max) weight increase, 5.0 percent (max) volume increase, 2.0 percent (max) weight loss
Hardness (ASTM D2240: Shore A)	20
Tensile Strength (ASTM D412) (or ASTM D638)	150 psi
Percent Elongation (ASTM D412) (or ASTM D638)	500 percent
Tack Free at 65 degrees F (ASTM C679)	12 hours maximum
Adhesion to Concrete	140 psi
Adhesion to Urethane Topcoats (paintable sealant)	140 psi
NOTES: (1) Immerse and test a minimum of three 2 inch by 1/2 inch by 1/2 inch section of cured sealant.	

TABLE II
Reporting Program Requirements QA/QC
Administrative Controls:
Administrators must be able to turn on and off unique access to specific jobs and Contracts.
Administrators must be able to remotely enable and disable access for users.
All enabled users must view the same active report in real time. There must be no opportunity for multiple versions of the same report to exist.
Administrators must be able to setup unique approval processes for each project and promote or remove unique people from this process at any time.
Administrators must be able to associate Contract specific documents and specification limits quickly and easily.
Administrators must be able to associate PDS, SDS, blueprints, scope of work and Contracts uniquely to each job.
Objectivity Controls:
Data Entry fields must be by multi-selectable choices, numeric keypads, pickers and skip logic to ensure repeatable data entry in a way that makes running analytics and metrics easy and objective.
The program / hardware package must be able to communicate with inspection devices that provide (batch) data export capability such as Elcometer and Defelsko gages.
The program / hardware package must automatically time, date and GPS stamp all reports without input or interference from the inspector.
Real Time Syncing:
Forms must be available for approved associates to view at all times.
Retrievable storage must be provided for all job related reports and documents for a minimum time of 5 years from completion of the job or project. Archiving of the documents after 5 years will be the responsibility of the Government.
Document Library:
All reports must be in searchable and annotatable PDF format.
The Administrator must be able to upload and annotate job specific reports in real time. Examples include but not limited to Safety Data Sheets, Product Data Sheets and Blueprints.

TABLE II
Annotations and modifications must be locked and associated with the document. Only the Administrator has rights to modify or delete annotations or allow modifications to the document library especially all related inspection reports.
Customization:
The program must be capable of being customized to specific jobs, Contracts or specifications.

-- End of Section --

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SECTION 09 68 00

CARPETING
11/17, CHG 2: 08/20

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC 16	(2004; E 2008; E 2010) Colorfastness to Light
AATCC 107	(2013) Colorfastness to Water
AATCC 134	(2016) Electrostatic Propensity of Carpets
AATCC 165	(2013) Colorfastness to Crocking: Textile Floor Coverings - Crockmeter Method
AATCC 174	(2016) Antimicrobial Activity Assessment of New Carpets

ASTM INTERNATIONAL (ASTM)

ASTM D1335	(2017; E 2018) Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings
ASTM D2859	(2016) Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials
ASTM D3278	(2021) Standard Test Methods for Flash Point of Liquids by Small Scale Closed-Cup Apparatus
ASTM D5793	(2018) Standard Test Method for Binding Sites Per Unit Length or Width of Pile Yarn Floor Coverings
ASTM D5848	(2020) Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Coverings
ASTM D6859	(2011) Standard Test Method for Pile Thickness of Finished Level Pile Yarn Floor Coverings
ASTM D7330	(2015) Standard Test Method for Assessment of Surface Appearance Change in Pile Floor Coverings Using Standard Reference Scales
ASTM E648	(2019a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems

Using a Radiant Heat Energy Source

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

CARPET AND RUG INSTITUTE (CRI)

CRI 104	(2015) Carpet Installation Standard for Commercial Carpet
CRI 105	(2015) Carpet Installation Standard for Residential Carpet
CRI GLP QM	(2017) Green Label Plus Quality Manual
CRI Test Method 103	(2015) Standard Test Method for the Evaluation of Texture Appearance Retention of Carpet Standards Program

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 2551	(2020) Textile Floor Coverings and Textile Floor Coverings in Tile Form-Determination of Dimensional Changes Due to the Effects of Varied Water and Heat Conditions and Distortion Out of Plane

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1113	(2016) Architectural Coatings
SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

16 CFR 1630	Standard for the Surface Flammability of Carpets and Rugs (FF 1-70)

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2022) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are or Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance

with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation Drawings; G

SD-03 Product Data

Carpet; G

Recycled Content for Carpeting; S

Moldings; G

Indoor Air Quality for Non-Aerosol Adhesives; S

Indoor Air Quality for Concrete Primer; S

SD-04 Samples

Carpet; G

Moldings; G

SD-06 Test Reports

Moisture and Alkalinity Tests; G

SD-07 Certificates

Indoor Air Quality for Carpet; S

SD-08 Manufacturer's Instructions

Surface Preparation

SD-10 Operation and Maintenance Data

Cleaning and Protection

SD-11 Closeout Submittals

Warranty

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality Certifications

1.3.1.1 Floor Covering Materials

Provide carpet certified to meet indoor air quality requirements by UL 2818 (GreenGuard) Gold, SCS Global Services Indoor Advantage Gold, CRI GLP QM or provide certification or validation by other third-party program that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor

air quality product requirements cited herein.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the site in the manufacturer's original wrappings and packages clearly labeled with the manufacturer's name, brand name, size, dye lot number, and related information. Remove materials from packaging and store them in a clean, dry, well ventilated area protected from damage, soiling, and moisture, and maintain at a temperature above 60 degrees F for 2 days prior to installation. Do not store carpet near materials that may off gas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives.

1.5 AMBIENT CONDITIONS

Maintain areas in which carpeting is to be installed at a temperature above 60 degrees F and below 90 degrees F for 2 days before installation, during installation, and for 2 days after installation. Provide temporary ventilation during work of this section. Maintain a minimum temperature of 55 degrees F thereafter for the duration of the contract.

1.6 WARRANTY

Provide manufacturer's standard performance guarantees or warranties including minimum ten year wear warranty, two year material and workmanship and ten year tuft bind and delamination.

PART 2 PRODUCTS

2.1 CARPET

Furnish first quality carpet that is free of visual blemishes, streaks, poorly dyed areas, fuzzing of pile yarn, spots or stains, and other physical and manufacturing defects. Provide carpet materials and treatments as reasonably nonallergenic and free of other recognized health hazards. Provide a static control construction on all grade carpets which gives adequate durability and performance. Submit manufacturer's catalog data and printed documentation stating physical characteristics, durability, resistance to fading, and flame resistance characteristics for each type of carpet material and installation accessory. Submit manufacturer's Product Data for 1) Carpet and 2) Moldings. Also, submit Samples of the following:

a. Carpet: Two "Production Quality" full size samples of each carpet proposed for use, showing quality, pattern, and color specified

2.1.1 Recycled Content

Carpeting must contain a minimum of 40 percent recycled content. Entrance carpeting must contain a minimum of 37 percent recycled content. Provide data identifying percentage of recycled content for carpeting.

2.1.2 Indoor Air Quality Requirements

Products must meet emissions requirements of CDPH SECTION 01350. Provide certification or validation of indoor air quality for carpet.

2.1.3 Physical Characteristics for Modular Tile(CPT1) and Entrance Carpet (EF1)

2.1.3.1 Carpet Construction

Tufted

2.1.3.2 Type

Modular tile 24 by 24 inch square with 0.15 percent growth/shrink rate in accordance with ISO 2551. Entrance 19.7 by 19.7 inch square. See Section 09 69 13 RIGID GRID ACCESS FLOORING for size required for a one to one alignment with raised access floor panels.

2.1.3.3 Pile Type

Multilevel loop (CPT1) and Cut pile (EF1)

2.1.3.4 Pile Fiber

Commercial 100 percent branded (federally registered trademark)nylon continuous filament.

2.1.3.5 Gauge or Pitch

Minimum 1/12 inch (CPT1) and 5/32 inch (EF1) in accordance with ASTM D5793

2.1.3.6 Stitches or Rows/Wires

Minimum 7 per square inch (CPT1) and 9.5 per square inch (EF1)

2.1.3.7 Surface Pile Weight

Minimum 15 ounces per square yard (CPT1) and 24 ounces per square yard (EF1). This does not include weight of backings. Determine weight in accordance with ASTM D5848.

2.1.3.8 Pile Thickness

Minimum 0.126 inch (CPT1) and 0.186 inch (EF1) in accordance with ASTM D6859

2.1.3.9 Pile Density

Minimum 4,286 ounces per yard cubed (CPT1) and 4,684 ounces per yard cubed (EF1).

2.1.3.10 Dye Method

Solution dyed (CPT1) and injection dyed (EF1)

2.1.3.11 Backing Materials

Provide primary backing materials like synthetic material. Provide secondary backing to suit project requirements of those customarily used and accepted by the trade for each type of carpet.

2.2 PERFORMANCE REQUIREMENTS

2.2.1 Texture Appearance Retention Rating (TARR)

Provide carpet with a greater than or equal to 3.0 (Heavy) TARR traffic level classification in accordance with ASTM D7330 or CRI Test Method 103.

2.2.2 Static Control

For Entrance Carpeting (EF1), provide static control to permanently regulate static buildup to less than 3.5 kV when tested at 20 percent relative humidity and 70 degrees F in accordance with AATCC 134.

For Modular Carpet Tile (CPT1), provide electrostatic propensity less than 0.4 kV per AATCC 134-1996. Provide electrical resistance per ANSI/ESD S7.1, RTT, RTG.

1.0 x 10 to the 6 power Ohms Minimum, 1.0 x 10 to the 9 power Ohms Maximum (ANSI/ESD S7.1-2013)

ANSI/ESD S20.20-2007:

ANSI/ESD S97.2 Voltage on a person < 100 volts when tested with approved conductive footwear system.

ANSI/ESD S97.1 System resistance < 3.5 x 10 to the 7 power Ohms

2.2.3 Flammability and Critical Radiant Flux Requirements

Comply with 16 CFR 1630 or ASTM D2859. Provide carpet in corridors and exits with a minimum average critical radiant flux of 0.45 watts per square centimeter when tested in accordance with ASTM E648.

2.2.4 Tuft Bind

Comply with ASTM D1335 for tuft bind force required to pull a tuft or loop free from carpet backing with a minimum 8 pound average force for modular carpet tile.

2.2.5 Colorfastness to Crocking

Comply dry and wet crocking with AATCC 165 and with a Class 4 minimum rating on the AATCC Color Transference Chart for all colors.

2.2.6 Colorfastness to Light

Comply colorfastness to light with AATCC 16, Test Option E "Water-Cooled Xenon-Arc Lamp, Continuous Light" and with a minimum 4 grey scale rating after 40 hours.

2.2.7 Colorfastness to Water

Comply colorfastness to water with AATCC 107 and with a minimum 4.0 gray scale rating and a minimum 4.0 transfer scale rating.

2.2.8 Delamination Strength

Provide delamination strength for tufted carpet with a secondary back of

minimum 2.5 lbs/inch.

2.2.9 Antimicrobial

Nontoxic antimicrobial treatment in accordance with AATCC 174 Part I (qualitative), guaranteed by the carpet manufacturer to last the life of the carpet.

2.3 ADHESIVES AND CONCRETE PRIMER

Comply with applicable regulations regarding toxic and hazardous materials. Provide water resistant, mildew resistant, nonflammable, and nonstaining adhesives and concrete primers for carpet installation as required by the carpet manufacturer. On concrete subfloors and on raised access flooring, provide releasable adhesive as recommended by the carpet manufacturer. Provide adhesives flashpoint of minimum 140 degrees F in accordance with ASTM D3278. Non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) must meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide validation of indoor air quality for non-aerosol adhesives. Concrete primer products used on the interior of the building (defined as inside of the weatherproofing system) must meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1113. Provide validation of indoor air quality for concrete primer.

2.4 MOLDINGS

Provide carpet moldings where floor covering material changes or carpet edge does not abut a vertical surface. Provide a heavy-duty rubber molding designed for the type of carpet being installed. Provide floor flange of a minimum 1 inches wide. Provide color as indicated in Section 09 06 00 SCHEDULES FOR FINISHES.

2.5 COLOR, TEXTURE, AND PATTERN

Provide color, texture, and pattern in accordance with Section 09 06 00 SCHEDULES FOR FINISHES.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Do not install carpet on surfaces that are unsuitable and will prevent a proper installation. Prepare subfloor in accordance with flooring manufacturer's recommended instructions. Repair holes, cracks, depressions, or rough areas using material recommended by the carpet or adhesive manufacturer. Free floor of any foreign materials and sweep clean. Before beginning work, test subfloor with glue and carpet to determine "open time" and bond. Submit copies of the manufacturer's printed Installation instructions for the carpet, including Surface Preparation, and recommended adhesives and tapes.

3.2 MOISTURE AND ALKALINITY TESTS

Test concrete slab for moisture content and excessive alkalinity in

accordance with CRI 104/CRI 105. Submit three copies of reports of Moisture and Alkalinity Tests including content of concrete slab stating date of test, person conducting the test, and the area tested.

3.3 PREPARATION OF CONCRETE SUBFLOOR

Do not commence installation of the carpeting until concrete substrate is at least 90 days old. Prepare the concrete surfaces in accordance with the carpet manufacturer's instructions. Match carpet, when required, and adhesives to prevent off-gassing to a type of curing compounds, leveling agents, and concrete sealer.

3.4 INSTALLATION

Perform all work by manufacturer's approved installers. Conduct installation in accordance with the manufacturer's printed instructions and CRI 104/CRI 105. Protect edges of carpet meeting hard surface flooring with molding and install in accordance with the molding manufacturer's printed instructions. Follow ventilation, personal protection, and other safety precautions recommended by the adhesive manufacturer. Continue ventilation during installation and for at least 72 hours following installation. Do not permit traffic or movement of furniture or equipment in carpeted area for 24 hours after installation. Complete other work which would damage the carpet prior to installation of carpet. Submit three copies of Installation Drawings for 1) Carpet and 2) Moldings indicating areas receiving carpet, carpet types, patterns, direction of pile, location of seams, and locations of edge molding.

Do not install building construction materials that show visual evidence of biological growth.

3.4.1 Modular Tile Installation

Install modular tiles with releasable adhesive approved for ESD installation (concrete substrates and raised access floor substrate) and snug joints. Use monolithic installation method (CPT1). Comply with manufacturer installation instructions for required drying time of releasable adhesive so it sets up properly. Provide accessibility to the subfloor where required. See Section 09 69 13 RIGID GRID ACCESS FLOORING. Refer to Electrical Drawings for grounding strips at ESD carpet tile.

3.4.2 Entrance Carpet Installation

Install tiles with releasable adhesive and snug joints. Use monolithic installation method. Prepare regular, unnoticeable, and treated seams with a seam adhesive. Install breadths parallel, with carpet pile in the same direction. Match patterns accurately. Neatly cut and fit, securely, cutouts at door jambs, columns, and ducts. Locate seams at doorways parallel to and centered directly under doors. Do not make seams perpendicular to doors or at pivot points.

3.5 CLEANING AND PROTECTION

Submit three copies of carpet manufacturer's maintenance instructions describing recommended type of cleaning equipment and material, spotting and cleaning methods, and cleaning cycles.

3.5.1 Cleaning

As specified in Section 01 78 00 CLOSEOUT SUBMITTALS. After installation of the carpet, remove debris, scraps, and other foreign matter. Remove soiled spots and adhesive from the face of the carpet with appropriate spot remover. Cut off and remove protruding face yarn. Vacuum carpet clean.

3.5.2 Protection

Protect the installed carpet from soiling and damage with heavy, reinforced, nonstaining kraft paper, plywood, or hardboard sheets. Lap and secure edges of kraft paper protection to provide a continuous cover. Restrict traffic for at least 48 hours. Remove protective covering when directed by the Contracting Officer.

3.6 REMNANTS

Manage waste as specified in the Waste Management Plan. Provide remnants remaining from the installation, consisting of scrap pieces more than 2 feet in dimension with more than 6 square feet total to the Government. Remove non-retained scraps from site and recycle appropriately.

3.7 MAINTENANCE

3.7.1 Extra Materials

Provide extra material from same dye lot consisting of uncut carpet tiles for future maintenance. Provide a minimum of three percent of total square yards of each carpet type, pattern, and color. Furnish three percent extra of total adhesive tabs.

-- End of Section --

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SECTION 09 69 13

RIGID GRID ACCESS FLOORING
11/15, CHG 1: 08/18

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A780/A780M	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM E648	(2019a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
ASTM F150	(2006; R 2013) Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring
ASTM F1700	(2020) Standard Specification for Solid Vinyl Floor Tile

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

CEILINGS AND INTERIOR SYSTEMS CONSTRUCTION ASSOCIATION (CISCA)

CISCA Access Floors	(2007) Recommended Test Procedures for Access Floors

GREEN SEAL (GS)

GS-36	(2013) Adhesives for Commercial Use

ICC EVALUATION SERVICE, INC. (ICC-ES)

ICC-ES AC300	(2014) Acceptance Criteria for Access Floors

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2021) International Building Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 75	(2020) Standard for the Protection of

	Information Technology Equipment
NFPA 99	(2021; TIA 20-1; TIA 21-2) Health Care Facilities Code
NFPA 253	(2011) Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detailed Installation Drawings; G

Fabrication Drawings; G

SD-03 Product Data

Access Flooring System; G

Recycled Content of Access Flooring System; S

Indoor Air Quality For Pedestal Adhesive; S

Indoor Air Quality For Adhesives; S

SD-04 Samples

Floor Panels

Floor Covering; G

Panel Support System

Accessories; G

Cut Outs; G

SD-05 Design Data

Seismic Calculations

SD-06 Test Reports

Factory Tests

Concentrated Load

Uniform Live Load

Rolling Load

Impact Load

Ultimate Load

Stringer Load

Pedestal Axial Load

Bonding Strength of Pedestal Adhesive

Electrical Resistance

Field Tests

SD-07 Certificates

Compliance with ICC-ES AC300

Compliance with ICC IBC

Certificate of Compliance

Qualification of Manufacturer

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals; G

SD-11 Closeout Submittals

Lifting Device

Warranty; G,

1.3 SPARE PARTS

Provide four spare panels with identical floor covering pedestals and stringers for each 1,000 square feet of access flooring and total of 10 linear feet of cut-out trim. Store extra stock in same manner and location as project materials.

1.4 QUALITY CONTROL

1.4.1 Qualification of Manufacturer

Access flooring manufacturer must have at least 5 years experience in manufacturing access flooring systems. Certify that the manufacturer of the access flooring system meets requirements specified under paragraph entitled QUALIFICATION OF MANUFACTURER.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery

Deliver materials to site in undamaged condition, in original containers or packages, complete with accessories and instructions. Label packages with manufacturer's name and brand designations. Package materials covered by specific references bearing specification number, type and class as applicable.

1.5.2 Storage

Store all materials in original protective packaging in a safe, dry, and clean location. Store panels at temperatures between 40 and 90 degrees F, and between 20 and 70 percent humidity. Replace defective or damaged materials.

1.5.3 Handling

Handle and protect materials in a manner to prevent damage during the entire construction period.

1.6 WARRANTY

Minimum manufacturer warranty must have no dollar limit, cover full system, and must have a minimum duration of 5 years. Include an agreement to repair or replace floor panels, pedestals or stringers that fail within the warranty period in the standard performance guarantee or warranty. Failures include, but are not limited to, sagging and warping of panels; rusting and manufacturers defects of panels or support system. For high pressure laminate provide manufacturer's standard performance guarantees or warranties that extend beyond a one-year period for finish materials. For static-dissipative vinyl tile provide manufacturer's standard performance guarantees or warranties that extend beyond one year, standard warranty must not be less than a five year wear warranty and ten year conductivity warranty. For carpet tile provide manufacturer's standard performance guarantees or warranties including a minimum two years for material and workmanship and ten years for wear, static control, tuft bind and delamination.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

a. Provide for self-alignment of floor panels, adjustable pedestals and readily removable floor panels covered as specified.

b. Lateral stability of floor support system must be independent of panels. Provide a finished assembly that is rigid and free of vibration, noises, and rocking panels. Provide bolted stringer system with equipotential plane grounding.

c. Submit certificate of compliance attesting that the installed access floor system meets specification requirements, including all special equipment loads and specific electrical and or cable requirements for the complete access flooring system including, but not limited to the following:

   (1) Compliance with ICC-ES AC300 and Compliance with ICC IBC Acceptance Criteria for Access Floors.

(2) Load-bearing capabilities of pedestals, floor panels, and pedestal adhesive resisting force.

(3) Supporting independent laboratory test reports. For panel, stringer and pedestal load test results include concentrated loads at center of panel, panel edge midpoint, ultimate loads and uniform loads.

(4) Floor electrical characteristics.

(5) Material requirements.

(6) An elevated floor system free of defects in materials, fabrication, finish, and installation, that will remain so for a period of not less than 1 years after completion.

d. Submit manufacturer's product data for access flooring system consisting of descriptive data, catalog cuts, and installation instructions. Include in the data information about any design and production techniques, total system including all accessories and finish coatings of under-floor components, procedures and policies used to conserve energy, reduce material, improve waste management or incorporate green building/recycled products into the manufacturer of their components or products. Include cleaning and maintenance instructions. Systems which contain zinc electroplated anti-corrosion coatings are prohibited.

2.1.1 Design Requirements

Conduct floor panel testing in accordance with CISCA Access Floors. When tested as specified, make all deflection and deformation measurements at the point of load application on the top surface of the panel. Floor panels must be capable of supporting the following loads:

a. Concentrated load of 1250 pounds on one square inch, at any point on panel, without a top-surface deflection more than 0.10 inch, and a permanent set not to exceed 0.01 inch in any of the specified tests. Testing must be in accordance with CISCA Access Floors, Section 1 Concentrated Loads with test panels being supported by understructure to be used with installed system instead of steel support blocks.

b. Uniform live load of 500 psf, without a top-surface deflection more than 0.06 inch, and a permanent set not to exceed 0.01 inch in any of the specified tests, when tested in accordance with CISCA Access Floors, Section 7 Uniform Load Test with test panels being supported by understructure to be used with installed system instead of steel support blocks.

c. A rolling load of 800 pounds applied through hard rubber surfaced wheel 6 inch diameter by 2 inch wide for 10,000 cycles over the same path. Permanent set at conclusion of test must not exceed 0.040 inch when tested in accordance with CISCA Access Floors, Section 3 Rolling Loads.

d. A rolling load of 1000 pounds applied through a 3 inch diameter by 1-13/16 inch wide caster for 10 cycles over the same path, without developing a local overall surface deformation greater than 0.04 inch. In accordance with CISCA Access Floors, Section 3 Rolling Loads, the permanent deformation limit under rolling load must be satisfied in

all of the specified tests.

e. An impact load of 150 pounds anywhere on the panel dropped from a height of 36 inches onto a 1 square inch area without failure of the system, according to CISCA Access Floors, Section 8 Drop Impact Load Test.

f. Ultimate Load. Panels must meet manufactures published Ultimate Load rating of 2500 pounds when tested in accordance with CISCA Access Floors, Section 2 Ultimate Loading.

g. Safety Factor. Panels must provide a minimum Safety Factor of 5 times the uniform load specified above in accordance with ICC-ES AC300.

h. Recycled Content. Provide Access Flooring System (panels, stringers and pedestals) containing a minimum of 20 percent recycled content. Provide data identifying percentage of recycled content of access flooring system.

2.1.2 Allowable Tolerances

2.1.2.1 Floor Panel Flatness

Plus or minus 0.035 inches on diagonal on top of panel or underneath edge.

2.1.2.2 Floor Panel Length

Plus or minus 0.015 inch.

2.1.2.3 Floor Panel Squareness

Plus or minus 0.02 inch in panel length.

2.1.3 Stringers

Provide stringers capable of supporting a pound 450 pound concentrated load at midspan without permanent deformation in excess of 0.010 inch, when tested in accordance with CISCA Access Floors, Section 4 Stringer Load Testing.

2.1.4 Pedestals

Pedestals must be capable of supporting a 5000 pound axial load without permanent deformation, when tested in accordance with CISCA Access Floors, Section 5 Pedestal Axial Load Test.

2.1.5 Bonding Strength of Pedestal Adhesive

Adhesive for anchoring pedestal bases must have a bonding strength capable of resisting an overturning moment of 1,000 lbf-in when a force is applied to the top of the pedestal in any direction, when tested in accordance with CISCA Access Floors, Section 6 Pedestal Overturning Moment Test. Pedestal adhesive must meet emissions requirement of CDPH SECTION 01350 (use the office or classroom requirements, regardless of space type). Provide validation of indoor air quality for pedestal adhesive.

2.1.6 Bond Strength of Factory Installed Covering

Bond strength of floor covering must be sufficient to permit handling of

the panels by use of the panel lifting device, and to withstand moving caster loads up to 800 pounds, without separation of the covering from the panel.

2.1.7 Seismic Calculations

2.2 FLOOR PANELS

2.2.1 Floor System Drawings And Planer Quality

a. Submit Fabrication Drawings for elevated floor systems consisting of fabrication and assembly details to be performed in the factory.

b. Indicate on Location Drawings exact location of pedestals, ventilation openings, cable cutouts, and the panel installation pattern.

c. Provide Detail Drawings showing details of the pedestals, pedestal-floor interlocks, floor panels, panel edging, floor openings, floor opening edging, floor registers, floor grilles, cable cutout treatment, perimeter base, expansion, and peripheral support facilities.

d. Design and workmanship of the floor, as installed, must be completely planar within plus or minus 0.060 inch in 10 feet, 0.100 inch for the entire floor, and 0.030 inch across panel joints.

e. Floor-panel joint-width tolerances must not exceed 0.017 inch as measured with a feeler gage at any point in any joint when the panels are installed and as long as the air leakage requirements specified in this section are met.

f. Submit three complete samples of floor panels.

2.2.2 Detailed Installation Drawings

Submit Detailed Installation Drawings that as a minimum indicate the following:

a. Location of panels

b. Layout of supports, panels, and cutout locations

c. Sizes and details of components

d. Details at floor perimeter and height above structural floor

e. Method of anchorage to structural subfloor

f. Lateral bracing

g. Typical cutout details

h. Description of factory coating

i. Floor finishes

j. Location of connection to building grounding electrode

2.2.3 Panel Construction

a. Base access floor system on a 24 by 24 inch square module providing minimum of 12 inch clearance between structural floor and underside of panel and stringer. Fabricate so accurate job cutting and fitting may be done using standard sizes for perimeters and around columns.

b. Do not expose metal on finished top surface of panels. Provide cutouts and cutout closures to accommodate utility systems and equipment intercabling. Reinforce cutouts to meet design load requirements. Provide extra support pedestals at each corner of cutout for cutout panels that do not meet specified design load requirements.

c. Panel design must provide for convenient panel removal for underfloor servicing and for openings for new equipment. Use panels of uniform dimensions within specified tolerances. Permanently mark panels to indicate load rating and model number.

d. Machine square floor panels to within plus or minus 0.015 inch with edge straightness plus or minus 0.0025 inch. If plastic edging is applied to the panel, the tolerances apply to the panel before the plastic edging is applied.

2.2.3.1 Cementitious-Filled Formed Steel (Composite Panels)

a. Provide composite panels of die-formed steel construction totally enclosing the panel, including the top surface. The void spaces between the top sheet and the formed steel bottom sheet must be completely filled with an incombustible cementitious or concrete material. Seal cut edges in accordance with manufacturer's recommendations. Gravity held panels with bolted stringer understructure: Fasten end of each stringer and mid-point of each 4 foot stringer positively to pedestal heads, using manufacturer's standard screws. Provide screws that are removable from top.

b. Grid supported panels must be further tested by supporting them at two opposite edges and applying a 500-pound load at the center of a panel selected; the panel must be similarly tested while supported at the other two edges. Weld failure at any point under this loading is not acceptable. This additional test must be applied to one panel per 500 square feet of floor in the system, but in no case less than two panels. When any weld fails, the number of panels designated by the Contracting Officer must be similarly tested; replace those panels that have a weld failure at no cost to the Government.

2.2.4 Floor Covering

Surface floor panels with factory applied static-dissipative vinyl tile in locations indicated in the Drawings. Static-dissipative vinyl tile is to be firmly bonded in place with waterproof adhesive. Access flooring manufacturer to provide static-dissipative vinyl tile to be installed on concrete slab from the same batch. Carpet tile is to be installed in the field in locations indicated in the Drawings. Provide finish flooring materials in corridors and exits with a critical radiant flux of not less than 0.45 watts per square centimeter (Class 1) when tested in accordance with ASTM E648 or NFPA 253. The electrical resistance must remain stable over the life expectancy of the floor covering. Any anti-static agent

used in the manufacturing process must be an integral part of the material, not surface applied. Bolt heads or similar attachments must not rise above the traffic surface. Submit threeseparate samples of each specified floor covering finish and color.

2.2.4.1 Static-Dissipative Vinyl Tile (SDT1)

Provide factory applied static-dissipative vinyl tile that is a homogeneous vinyl product and conforms to ASTM F1700, Class I monolithic, Type A smooth surface. Provide electrical resistance from surface to surface and surface to ground between 1,000,000 ohms (1.0×10^6) and 1,000,000,000 ohms (1.0×10^9) when tested in accordance with ASTM F150. Material must consist of one piece to cover the face of the panel. Provide edge detail that is integral to the finish material or is an applied trim piece that finishes the edges of the panel, is flush with floor finish, and is PVC. Adjacent concrete slab will have the same static-Dissipative Vinyl Tile and must be from the same die-lot.

2.2.4.2 Carpet Tile (CPT1)

Reference Section 09 68 00 CARPETING for carpet tile specification requirements including recyled content, volitale organic compound (VOC) limits, and additional flammability testing requirements for carpet tile. Carpet tile must be field installed and comply with the following:

a. Installation method on level surfaces must allow carpet tile to be easily removed and replaced in the field and must be installed in accordance with manufacturer's recommended installation instructions. Carpet tile will be field installed on the rigid grid access flooring and continue onto the adjacent concrete flooring. Refer to IN101 in the Drawings for installation instruction.

2.2.5 Adhesives

Provide adhesives as recommended by the manufacturer. Provide non-aerosol adhesive products that meet either emissions requirements of CDPH SECTION 01350 (use the requirements for either office or classroom, regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide aerosol adhesives that meet either emissions requirements of CDPH SECTION 01350 (use the requirements for office or classroom, regardless of space type) or VOC content requirements of GS-36. Provide validation of indoor air quality for adhesives. Provide conductive adhesive as recommended by the manufacturer of the static-control flooring.

2.2.6 Lifting Device

At turn over provide one floor panel lifting device standard with the floor manufacturer, for each individual floor area (room or corridor). Furnish a minimum of two devices.

2.3 PANEL SUPPORT SYSTEM

Design support system to allow for 360 degree clearance in laying out cable and cutouts for service to machines and so that panel and stringer together take up maximum of 2 inches. Submit one sample of suspension system proposed for use.

2.3.1 Pedestals

Provide pedestals made of steel or aluminum or a combination thereof. Ferrous materials must have a factory-applied corrosion-resistant finish. Provide pedestal base plates with a minimum of 16 square inches of bearing surface and a minimum of 1/8 inch thickness. Pedestal shafts must be threaded to permit height adjustment within a range of approximately 2 inches, to permit overall floor adjustment within plus or minus 0.10 inch of the required elevation, and to permit leveling of the finished floor surface within 0.062 inch in 10 feet in all directions. Provide locking devices to positively lock the final pedestal vertical adjustments in place. Pedestal caps must interlock with panels or stringers to preclude tilting or rocking of the panels.

2.3.2 Stringers

Provide stringers of rolled steel or extruded aluminum, to interlock with the pedestal heads to prevent lateral movement. Provide stringers that can be added or removed after floor is in place.

2.3.3 Gaskets

Provide continuous gasketing at contact surfaces between panel and stringers to deaden sound and seal off the underfloor cavity from above for air tightness, and to maintain panel alignment.

2.4 FACTORY TESTS

Factory test access flooring, using an independent laboratory, at the same position and maximum design elevation and in the same arrangement as shown on the drawings for installation so as to duplicate service conditions as much as possible.

2.4.1 Load Tests

Conduct floor panel, stringer, and pedestal testing in accordance with CISCA Access Floors to determine deformation and permanent set of panels and sytem due to concentrated, Uniform, rolling, impact and ultimate loading when panels are supported by actual understructure.

2.4.2 Bond Strength of Covering

Conduct test for bond strength of covering in accordance with CISCA Access Floors for rolling loads, except as specified. Panels must be tested with specified hard surface flooring and on the pedestals and stringers as specified for the installed floor. Brace the supports as necessary to prevent sideways movement during the test. Impose a test load of 1000 pounds on the test assembly through a 3 inches in diameter and 1 inch wide hard plastic caster. Roll the caster completely across the center of the panel. The panel must withstand 20 passes of the caster with no delamination or separation of the covering.

2.5 CUT OUTS

Provide cable cutouts finished with rigid polyvinylchloride or molded polypropylene edging to conform to the appearance level of the floor surface and to cover raw edges of the cutout panel. Extrusion must be of a configuration to permit its effective and convenient use when new cable openings are required. Provide at least 24 feet of additional extrusion

for future use. Submit three color samples for cut outs.

a. Provide non-metallic adapter for openings less than 4 inches wide. Secure adapter adhesively in cutout to preclude removal from panel. Provide at least two adapters per 1000 square feet for future use.

b. Openings larger than 4 inches wide must use rigid polyvinylchloride or molded polypropylene edging. Perform cutting of panels, including cutouts, outside of the building.

c. When size of cutout reduces the performance requirement of panel, provide intermediate stringers adjacent to cutouts.

2.6 EDGE CLOSURE

Provide 1/16 inch aluminum closure plate and extruded aluminum nosing at exposed edge of floor. Back up the closure plates with aluminum or steel framing braced diagonally, or anchor at bottom to continuous angle.

2.7 COLOR

Color must be in accordance with Section 09 06 00 SCHEDULES FOR FINISHES. Color listed is not intended to limit the selection of equal colors from other manufacturers.

PART 3 EXECUTION

3.1 INSTALLATION

Install access flooring at the location and elevation and in the arrangement shown on the approved detailed installation drawings. The floor system must be of the rigid grid stringer type, complete with all supplemental items, and be the standard product of a manufacturer specializing in access flooring systems.

Install the floor system in accordance with the manufacturer's instructions. Open ends of the floor, where the floor system does not abut wall or other construction, must have positive anchorage and rigid support. Maintain areas to receive access flooring between 60 and 90 degrees F, and between 20 and 70 percent humidity for 24 hours prior to and during installation.

3.1.1 Preparation for Installation

Clear out all debris in the area in which the floor system is to be installed. Thoroughly clean structural floor surfaces and remove all dust. Install floor coatings, required for dust or vapor control, prior to installation of pedestals, only if the pedestal adhesive will not damage the coating. If the coating and adhesive are not compatible, apply the coating after the pedestals have been installed and the adhesive has cured.

3.1.2 Pedestals

Pedestals must be accurately spaced, and set plumb and in true alignment. Set base plates in full and firm contact with the structural floor, and secured to the structural floor with adhesive or steel expansion anchors in accordance with manufacturer's instructions.

3.1.3 Stringers

Interlock stringers with the pedestal caps to preclude lateral movement, spaced uniformly in parallel lines at the indicated elevation.

3.1.4 Auxiliary Framing

Provide auxiliary framing or pedestals around columns and other permanent construction, at open ends of the floor, and beneath panels that are substantially cut to accommodate utility systems. Use special framing for additional lateral support as shown on the approved detailed installation drawings. Provide additional pedestals and stringers designed to specific heights and lengths to meet structural irregularities and design loads. Connect auxiliary framing to main framing.

3.1.5 Panels

Interlock panels with supports in a manner that will preclude lateral movement. Fasten perimeter panels, cutout panels, and panels adjoining columns to the supporting components to form a rigid boundary for the interior panels. Level floors within the specified tolerances. Cut edges of steel and wood-core panels must be finished as recommended by the panel manufacturer. Secure extruded vinyl edging in place at all cut edges of all panel cut-outs to prevent abrasion of cables. Where the space below the floor is a plenum, close cutouts for conduit and similar penetrations using self-extinguishing sponge rubber or air sealing grommets.

3.1.6 Repair of Zinc Coating

Repair zinc coating that has been damaged, and cut edges of zinc-coated components and accessories, by the application of a galvanizing repair paint conforming to ASTM A780/A780M. Areas to be repaired must be thoroughly cleaned prior to application of the paint.

3.2 FIELD TESTS

Submit certified copies of test reports from an approved testing laboratory, attesting that the proposed floor system components meet the performance requirements specified.

3.2.1 Acceptance Tests

Conduct acceptance tests after installation of floor system. Make at least one test for each 1000 square feet of floor area. Conduct tests in presence of Contracting Officer and representatives of manufacturer and installer. Submit certified copies of test reports from an approved testing laboratory, attesting that the proposed floor system components meet the performance requirements specified.

3.2.2 Grounding

Ground the access flooring system for safety hazard and static suppression. Provide positive contact between components for safe, continuous electrical grounding of entire floor system. Total system resistance from wearing surface of floor to building grounding electrode must be within range of 0.5 to 20,000 megohms .

3.2.2.1 Metal Grilles

Exposed metal is not allowed at wearing surface of access floor system, except at metal grilles and registers. When grilles and metal registers are provided, insulate as required to provide same grounding resistance as wearing surface.

3.2.2.2 Joint Resistance

Electrical joint resistance between individual stringer and pedestal junctions must be less than 0.1 milliohms. Electrical resistance between stringers and floor panels, as mounted in normal use, must be less than 3 ohms when tested in accordance with ASTM F150.

3.2.3 Electrical Resistance

Conduct testing of electrical resistance, in the completed installation, in the presence of the Contracting Officer in accordance with NFPA 99, modified by placing one electrode on the center of the panel surface and connecting the other electrode to the metal flooring support. Take measurements at five or more locations. Each measurement must be the average of five readings of 15 seconds duration at each location. During the tests, relative humidity must be 45 to 55 percent and temperature set at 69 to 75 degrees F. Select panels used in the testing at random and include two panels most distant from the ground connection. Measure electrical resistance with instruments that are accurate within 2 percent and that have been calibrated within 60 days prior to the performance of the resistance tests. The metal-to-metal resistance from panel to supporting pedestal must not exceed 10 ohms. The resistance between the wearing surface of the floor covering and the ground connection, as measured on the completed installation, must be in accordance with paragraph FLOOR COVERING.

3.3 CLEANING AND PROTECTION

3.3.1 Cleaning

Keep the space below the completed floor free of all debris. Before any traffic or other work on the completed raised floor is started, clean the completed floor in accordance with the floor covering manufacturer's instructions. Do not permit seepage of cleaner between individual panels.

3.3.2 Protection

Protect traffic areas of raised floor systems with a covering of building paper, fiberboard, or other suitable material to prevent damage to the surface. Cover cutouts with material of sufficient strength to support the loads to be encountered. Place plywood or similar material on the floor to serve as runways for installation of heavy equipment not in excess of design load capacity. Maintain protection until the raised floor system is accepted.

3.3.3 Surplus Material Removal

Clean surfaces of the work, and adjacent surfaces soiled as a result of the work. Remove all installation equipment, surplus materials, and rubbish from the work site.

3.4 FIRE SAFETY

Install an automatic detection system below the raised floor meeting the requirements of NFPA 75 paragraph 5-2.1 to sound an audible and visual alarm. Air space below the raised floor must be subdivided into areas not exceeding 10,000 square feet by tight, noncombustible bulkheads. Seal all penetrations for piping and cables to maintain bulkhead properties.

3.5 OPERATION AND MAINTENANCE MANUALS

Submit maintenance instructions for proper care of the floor panel surface. When conductive flooring is specified, also submit maintenance instructions to identify special cleaning and maintenance requirements to maintain "conductivity" properties of the panel finish.

-- End of Section --

SECTION 09 77 20

FIBERGLASS REINFORCED WALL PANELS
06/12

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D 256	(2010) Determining the Izod Pendulum Impact Resistance of Plastics
ASTM D 2583	(2007) Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
ASTM D 5319	(1997, R2008e1) Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels
ASTM D 570	(1998; R 2010e1) Standard Test Method for Water Absorption of Plastics
ASTM D 638	(2010) Standard Test Method for Tensile Properties of Plastics
ASTM D 790	(2010) Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM E 84	(2011a) Standard Test Method for Surface Burning Characteristics of Building Materials

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fiberglass Reinforced Wall Panels; G

Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.

SD-03 Product Data

Fiberglass Reinforced Wall Panels; G

Submit sufficient manufacturer's data to indicate compliance with these specifications, including:
a. Preparation instructions and recommendations.
b. Storage and handling requirements and recommendations.
c. Installation methods.

SD-04 Samples

Fiberglass Reinforced Wall Panels

Submit manufacturer's standard color pattern selection samples representing manufacturer's full range of available colors and patterns.

1.3 QUALITY ASSURANCE

Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with ASTM E 84 for Wall Class A.

1.4 DELIVERY, STORAGE AND HANDLING

a. Deliver materials factory packaged on strong pallets.

b. Store panels and trim lying flat, under cover and protected from the elements. Allow panels to acclimate to room temperature (70°) for 48 hours prior to installation.

1.5 PROJECT CONDITIONS

a. Environmental Limitations: Building are to be fully enclosed prior to installation with sufficient heat (70°) and ventilation consistent with good working conditions for finish work.

b. During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of adhesive manufacturer.

1. Provide ventilation to disperse fumes during application of adhesive as recommended by the adhesive manufacturer.

PART 2 PRODUCTS

2.1 PANELS

Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D 5319.

a. Coating: Multi-layer print, primer and finish coats or applied over-layer.

b. Dimensions:

1. Thickness: 0.090 inch nominal
2. Width: 4 feet nominal
3. Length: 8 feet nominal

c. Tolerance:

1. Length and Width: +/-1/8 inch
2. Square: Not to exceed 1/8 inch for 8 foot panels or 5/32 inch for 10 foot panels

2.1.1 Properties

a. Flexural Strength: 1.0×10^4 psi per ASTM D 790.

b. Flexural Modulus: 3.1 x 105 psi per ASTM D 790.

c. Tensile Strength: 7.0 x 103 psi per ASTM D 638.

d. Tensile Modulus: 1.6 x 105 psi per ASTM D 638.

e. Water Absorption: 0.72% per ASTM D 570.

f. Barcol Hardness (scratch resistance) of 35-55 as per ASTM D 2583.

g. Izod Impact Strength of 72 ft. lbs./in ASTM D 256.

2.1.2 Back Surface

Smooth. Imperfections which do not affect functional properties are not cause for rejection.

2.1.3 Front Finish

Pebble as Indicated in Section 09 06 00 SCHEDULE FOR FINISHES. Finish listed is not intended to limit the selection of equal finishes from other manufacturers.

2.1.4 Color

As Indicated in Section 09 06 00 SCHEDULE FOR FINISHES. Color listed is not intended to limit the selection of equal colors from other manufacturers.

2.2 MOLDINGS

Extruded PVC Trim Profiles for 0.090 inch thick panels, in color to match panels.

2.3 ACCESSORIES

2.3.1 Adhesive

Manufacturer's standard water-resistant, non-flammable adhesive.

2.3.2 Sealant

Clear Silicone Sealant.

PART 3 EXECUTION

3.1 PREPARATION

a. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.

1. Verify that stud spacing does not exceed 24 inches on-center.

b. Repair defects prior to installation.

1. Level wall surfaces to panel manufacturer's requirements. Remove protrusions and fill indentations.

3.2 INSTALLATION

a. Comply with manufacturer's recommended procedures and installation sequence.

b. Cut sheets to meet supports allowing 1/8 inch clearance for every 8 foot of panel.

1. Cut and drill with carbide tipped saw blades or drill bits, or cut with shears.

2. Pre-drill fastener holes 1/8 inch oversize with high speed drill bit.

a) Space at 8 inches maximum on center at perimeter, approximately 1 inch from panel edge.

b) Space at in field in rows 16 inches on center, with fasteners spaced at 12 inches maximum on center.

c. Apply panels to board substrate, above base, vertically oriented with seams plumb and pattern aligned with adjoining panels.

1. Install panels with manufacturer's recommended gap for panel field and corner joints.

a) Adhesive trowel and application method to conform to adhesive manufacturer's recommendations.

b) Drive fasteners for snug fit. Do not over-tighten.

d. Apply panel moldings to all panel edges using silicone sealant providing for required clearances.

1. All moldings must provide for a minimum 1/8 inch of panel expansion at joints and edges, to insure proper installation.

2. Apply sealant to all moldings, channels and joints between the system and different materials to assure watertight installation.

3.3 CLEANING

a. Remove excess sealant from panels and moldings. Wipe panel down

using a damp cloth and mild soap solution or cleaner.

b. Refer to manufacturer's specific cleaning recommendations Do not use abrasive cleaners.

-- End of Section --

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SECTION 09 90 00

PAINTS AND COATINGS
02/21

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

1.1.1 Painting Included

Where a space or surface is indicated to be painted, include the following unless indicated otherwise.

a. Surfaces behind portable objects and surface mounted articles readily detachable by removal of fasteners, such as screws and bolts.

b. New factory finished surfaces that require identification or color coding and factory finished surfaces that are damaged during performance of the work.

c. Existing coated surfaces that are damaged during performance of the work.

1.1.1.1 Exterior Painting

Includes new surfaces of the building and appurtenances. Also included are existing coated surfaces made bare by cleaning operations.

1.1.1.2 Interior Painting

Includes new surfaces of the building and appurtenances as indicated and existing coated surfaces made bare by cleaning operations. Where a space or surface is indicated to be painted, include the following items, unless indicated otherwise.

a. Exposed columns, girders, beams, joists, and metal deck; and

b. Other contiguous surfaces.

1.1.2 Painting Excluded

Do not paint the following unless indicated otherwise.

a. Surfaces concealed and made inaccessible by panelboards, fixed ductwork, machinery, and equipment fixed in place.

b. Surfaces in concealed spaces. Concealed spaces are defined as enclosed spaces above suspended ceilings, furred spaces, attic spaces, crawl spaces, elevator shafts and chases.

c. Steel to be embedded in concrete.

d. Copper, stainless steel, aluminum, anodized aluminum, brass, and lead except existing coated surfaces.

e. Hardware, fittings, and other factory finished items.

f. Fire-treated plywood or fire rating labels.

g. Do not paint surfaces in the following areas: as indicated on drawings.

1.1.3 Mechanical and Electrical Painting

Includes field coating of interior and exterior new surfaces.

a. Where a space or surface is indicated to be painted, include the following items unless indicated otherwise.

(1) Exposed piping, conduit, and ductwork;

(2) Supports, hangers, air grilles, and registers;

(3) Miscellaneous metalwork and insulation coverings.

b. Do not paint the following, unless indicated otherwise:

(1) New zinc-coated, aluminum, and copper surfaces under insulation

(2) New aluminum jacket on piping

(3) New interior ferrous piping under insulation.

1.1.3.1 Fire Extinguishing Sprinkler Systems

Clean, pretreat, prime, and paint new fire extinguishing sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories. Apply coatings to clean, dry surfaces, using clean brushes.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH 0100	(2017; Suppl 2020) Documentation of the Threshold Limit Values and Biological Exposure Indices

ASTM INTERNATIONAL (ASTM)

ASTM D235	(2002; R 2012) Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)
ASTM D523	(2014; R 2018) Standard Test Method for Specular Gloss
ASTM D4263	(1983; R 2018) Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
ASTM D4444	(2013; R 2018) Standard Test Method for Laboratory Standardization and Calibration of Hand-Held Moisture Meters

ASTM D6386	(2016a) Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
ASTM F1869	(2023) Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC)

Intelligence Bulletin 65	(2013) Occupational Exposure to Carbon Nanotubes and Nanofibers

MASTER PAINTERS INSTITUTE (MPI)

MPI 2	(2012) Aluminum Heat Resistant Enamel (up to 427 C and 800 F
MPI 4	(2016) Interior/Exterior Latex Block Filler
MPI 8	(2016) Alkyd, Exterior Flat (MPI Gloss Level I)
MPI 9	(2016) Alkyd, Exterior Gloss (MPI Gloss Level 6)
MPI 10	(2016) Latex, Exterior Flat (MPI Gloss Level 1)
MPI 11	(2016) Latex, Exterior Semi-Gloss, MPI Gloss Level 5
MPI 17	(2016) Primer, Bonding, Water Based
MPI 19	(2012) Primer, Zinc Rich, Inorganic
MPI 21	(2012) Heat Resistant Coating, (Up to 205°C/402°F), MPI Gloss Level 6
MPI 22	(2012) Aluminum Paint, High Heat (up to 590° C/1100° F)
MPI 23	(2015) Primer, Metal, Surface Tolerant
MPI 47	(2016) Alkyd, Interior, Semi-Gloss (MPI Gloss Level 5)
MPI 48	(2016) Alkyd, Interior, Gloss (MPI Gloss Level 6-7)
MPI 49	(2015) Alkyd, Interior, Flat (MPI Gloss Level 1)
MPI 50	(2015) Primer Sealer, Latex, Interior
MPI 51	(2016) Alkyd, Interior, (MPI Gloss Level 3)2

MPI 72	(2016) Polyurethane, Two-Component, Pigmented, Gloss (MPI Gloss Level 6-7)
MPI 76	(2016) Primer, Alkyd, Quick Dry, for Metal
MPI 77	(2015) Epoxy, Gloss
MPI 79	(2016) Primer, Alkyd, Anti-Corrosive for Metal
MPI 94	(2016) Alkyd, Exterior, Semi-Gloss (MPI Gloss Level 5)
MPI 95	(2015) Primer, Quick Dry, for Aluminum
MPI 101	(2016) Primer, Epoxy, Anti-Corrosive, for Metal
MPI 107	(2016) Primer, Rust-Inhibitive, Water Based
MPI 108	(2015) Epoxy, High Build, Low Gloss
MPI 116	(2012) Block Filler, Epoxy
MPI 119	(2016) Latex, Exterior, Gloss (MPI Gloss Level 6)
MPI 120	(2020) Epoxy, High Build, Self Priming, Low Gloss
MPI 134	(2015) Primer, Galvanized, Water Based
MPI 138	(2016) Latex, Interior, High Performance Architectural, (MPI Gloss Level 2)
MPI 139	(2016) Latex, Interior, High Performance Architectural, (MPI Gloss Level 3)
MPI 140	(2016) Latex, Interior, High Performance Architectural, (MPI Gloss Level 4)
MPI 141	(2016) Latex, Interior, High Performance Architectural, Semi-Gloss (MPI Gloss Level 5)
MPI 144	(2016) Latex, Interior, Institutional Low Odor/VOC, (MPI Gloss Level 2)
MPI 145	(2016) Latex, Interior, Institutional Low Odor/VOC, (MPI Gloss Level 3)
MPI 146	(2016) Latex, Interior, Institutional Low Odor/VOC, (MPI Gloss Level 4)
MPI 147	(May 2016) Latex, Interior, Institutional Low Odor/VOC, Semi-Gloss (MPI Gloss Level 5)

MPI 149	(2016) Primer Sealer, Interior, Institutional Low Odor/VOC
MPI 151	(2016) Light Industrial Coating, Interior, Water Based (MPI Gloss Level 3)
MPI 153	(2016) Light Industrial Coating, Interior, Water Based, Semi-Gloss (MPI Gloss Level 5)
MPI 154	(2016) Light Industrial Coating, Interior, Water Based, Gloss (MPI Gloss Level 6)
MPI 161	(2016) Light Industrial Coating, Exterior, Water Based (MPI Gloss Level 3)
MPI 163	(2016) Light Industrial Coating, Exterior, Water Based, Semi-Gloss (MPI Gloss Level 5)
MPI 164	(2016) Light Industrial Coating, Exterior, Water Based, Gloss (MPI Gloss Level 6)
MPI 177	(2020) Epoxy, Semi-Gloss (MPI Gloss Level 5)
MPI GPS-1-14	(2014) Green Performance Standard GPS-1-14
MPI GPS-2-14	(2014) Green Performance Standard GPS-2-14
MPI MRM	(2015) Maintenance Repainting Manual

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC 7/NACE No.4	(2007) Brush-Off Blast Cleaning
SSPC Glossary	(2011) SSPC Protective Coatings Glossary
SSPC PA 1	(2016) Shop, Field, and Maintenance Coating of Metals
SSPC SP 1	(2015) Solvent Cleaning
SSPC SP 2	(2018) Hand Tool Cleaning
SSPC SP 3	(2018) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning
SSPC SP 10/NACE No. 2	(2015) Near-White Blast Cleaning
SSPC-SP WJ-3/NACE WJ-3	(2012) Thorough Cleaning, Waterjet Cleaning of Metals
SSPC-SP WJ-4/NACE WJ-4	(2012) Light Cleaning, Waterjet Cleaning of Metals

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2024) Safety -- Safety and Health Requirements Manual

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-101	(2014; Rev C) Color Code for Pipelines and for Compressed Gas Cylinders

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD-313	(2018) Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.1000	Air Contaminants

1.3 DEFINITIONS

1.3.1 Qualification Testing

Qualification testing is the performance of all test requirements listed in the product specification. This testing is accomplished by MPI to qualify each product for the MPI Approved Product List, and may also be accomplished by Contractor's third-party testing lab if an alternative to Batch Quality Conformance Testing by MPI is desired.

1.3.2 Batch Quality Conformance Testing

Batch quality conformance testing determines that the product provided is the same as the product qualified to the appropriate product specification. This testing must be accomplished by an MPI testing lab.

1.3.3 Coating

SSPC Glossary; (1) A liquid, liquefiable, or mastic composition that is converted to a solid protective, decorative, or functional adherent film after application as a thin layer; (2) Generic term for paint, lacquer, enamel.

1.3.4 DFT or dft

Dry film thickness, the film thickness of the fully cured, dry paint or coating.

1.3.5 DSD

Degree of Surface Degradation, the MPI system of defining degree of surface degradation. Five levels are generically defined under the Assessment sections in the MPI MRM, MPI Maintenance Repainting Manual.

1.3.6 EXT

MPI short term designation for an exterior coating system.

1.3.7 INT

MPI short term designation for an interior coating system.

1.3.8 Loose Paint

Paint or coating that can be removed with a dull putty knife.

1.3.9 mil / mils

The English measurement for 0.001 in or one one-thousandth of an inch.

1.3.10 MPI Gloss Levels

MPI system of defining gloss. Seven gloss levels (G1 to G7) are generically defined under the Evaluation sections of the MPI Manuals. Traditionally, Flat refers to G1/G2, Eggshell refers to G3, Semigloss refers to G5, and Gloss refers to G6.

Gloss levels are defined by MPI as follows:

Gloss Level	Description	Units at 60 degree angle	Units at 80 degree angle
G1	Matte or Flat	0 to 5	10 max
G2	Velvet	0 to 10	10 to 35
G3	Eggshell	10 to 25	10 to 35
G4	Satin	20 to 35	35 min
G5	Semi-Gloss	35 to 70	
G6	Gloss	70 to 85	
G7	High Gloss		

Gloss is tested in accordance with ASTM D523. Historically, the Government has used Flat (G1 / G2), Eggshell (G3), Semi-Gloss (G5), and Gloss (G6).

1.3.11 MPI System Number

The MPI coating system number in each MPI Division found in either the MPI Architectural Painting Specification Manual or the Maintenance Repainting Manual and defined as an exterior (EXT/REX) or interior system (INT/RIN).

1.3.12 Paint

SSPC Glossary; (1) Any pigmented liquid, liquefiable, or mastic composition designed for application to a substrate in a thin layer that is converted to an opaque solid film after application. Used for protection, decoration, identification, or to serve some other functional purposes; (2) Application of a coating material.

1.3.13 REX

MPI short term designation for an exterior coating system used in repainting projects or over existing coating systems.

1.3.14 RIN

MPI short term designation for an interior coating system used in repainting projects or over existing coating systems.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:
Samples of specified materials may be taken and tested for compliance with specification requirements.

SD-02 Shop Drawings

Piping Identification

SD-03 Product Data

Coating; G

Product Data Sheets

Volatile Organic Compounds (Voc) Contents; S

SD-04 Samples

Color; G

SD-07 Certificates

Qualification Testing laboratory for coatings; G

Indoor Air Quality for Paints and Primers

SD-08 Manufacturer's Instructions

Mixing

Manufacturer's Safety Data Sheets

SD-10 Operation and Maintenance Data

Coatings, Data Package 1; G

1.5 QUALITY ASSURANCE

1.5.1 Regulatory Requirements

1.5.1.1 Environmental Protection

In addition to requirements specified elsewhere for environmental protection, provide coating materials that conform to the restrictions of

the local Air Pollution Control District and regional jurisdiction. Notify Contracting Officer of any paint specified herein which fails to conform.

1.5.1.2 Lead Content

Do not use coatings having a lead content over 0.06 percent by weight of nonvolatile content.

1.5.1.3 Chromate Content

Do not use coatings containing zinc-chromate or strontium-chromate.

1.5.1.4 Asbestos Content

Provide asbestos-free materials.

1.5.1.5 Mercury Content

Provide materials free of mercury or mercury compounds.

1.5.1.6 Silica

Provide abrasive blast media containing no free crystalline silica.

1.5.1.7 Human Carcinogens

Provide materials that do not contain ACGIH 0100 confirmed human carcinogens (A1) or suspected human carcinogens (A2).

1.5.1.8 Carbon Based Fibers / Tubes

Materials must not contain carbon based fibers such as carbon nanotubes or carbon nanofibers. Intelligence Bulletin 65 ranks toxicity of carbon nanotubes on a par with asbestos.

1.5.2 Approved Products List

The current MPI, "Approved Product List" which lists paint by brand, label, product name and product code as of the date of Contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use a subsequent MPI "Approved Product List", however, only one list may be used for the entire Contract and each coating system is to be from a single manufacturer. Provide all coats on a particular substrate from a single manufacturer. No variation from the MPI Approved Products List is acceptable.

1.5.3 Paints and Coatings Indoor Air Quality Certifications

Provide paint and coating products certified to meet indoor air quality requirements by MPI GPS-1-14, MPI GPS-2-14 or provide certification by other third-party programs. Provide current product certification documentation from certification body.

Provide certification of Indoor Air Quality for Paints and Primers. Submit required indoor air quality certifications in one submittal package.

1.5.4 Field Samples and Tests

The Contracting Officer may choose up to two coatings that have been delivered to the site to be tested at no cost to the Government. Take samples of each chosen product as specified in the paragraph SAMPLING PROCEDURE. Test each chosen product as specified in the paragraph TESTING PROCEDURE. Remove products from the job site which do not conform, and replace with new products that conform to the referenced specification. Test replacement products that failed initial testing as specified in the paragraph TESTING PROCEDURE at no cost to the Government.

1.5.4.1 Sampling Procedure

Select paint at random from the products that have been delivered to the job site for sample testing. The Contractor must provide one quart samples of the selected paint materials. Take samples in the presence of the Contracting Officer, and label, and identify each sample. Provide labels in accordance with the paragraph PACKAGING, LABELING, AND STORAGE.

1.5.4.2 Testing Procedure

Provide Batch Quality Conformance Testing for specified products, as defined by and performed by MPI. As an alternative to Batch Quality Conformance Testing, the Contractor may provide Qualification Testing for specified products above to the appropriate MPI product specification, using the third-party laboratory approved under the paragraph QUALIFICATION TESTING laboratory for coatings. Include the backup data and summary of the test results within the qualification testing lab report. Provide a summary listing of all the reference specification requirements and the result of each test. Clearly indicate in the summary whether the tested paint meets each test requirement. Note that Qualification Testing may take 4 to 6 weeks to perform, due to the extent of testing required.

Submit name, address, telephone number, FAX number, and e-mail address of the independent third party laboratory selected to perform testing of coating samples for compliance with specification requirements. Submit documentation that laboratory is regularly engaged in testing of paint samples for conformance with specifications, and that employees performing testing are qualified. If MPI is chosen to perform the Batch Quality Conformance testing, the above submittal information is not required, only a letter is required from the Contractor stating that MPI will perform the testing.

1.6 PACKAGING, LABELING, AND STORAGE

Provide paints in sealed containers that legibly show the Contract specification number, designation name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name and address of manufacturer. Furnish pigmented paints in containers not larger than 5 gallons. Store paints and thinners in accordance with the manufacturer's written directions, and as a minimum, stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors, and at temperatures between 40 to 95 degrees F.

1.7 SAFETY AND HEALTH

Comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis as specified in Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS and in Appendix A of EM 385-1-1. Include in the Activity Hazard Analysis the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.

1.7.1 Toxic Materials

To protect personnel from overexposure to toxic materials, conform to the most stringent guidance of:

a. The applicable manufacturer's Safety Data Sheets (SDS) or local regulation.

b. 29 CFR 1910.1000.

c. ACGIH 0100, threshold limit values.

Submit manufacturer's Safety Data Sheets for coatings, solvents, and other potentially hazardous materials, as defined in FED-STD-313.

1.8 ENVIRONMENTAL REQUIREMENTS

Comply, at minimum, with manufacturer recommendations for space ventilation during and after installation. Isolate area of application from rest of building when applying high-emission paints or coatings.

1.8.1 Coatings

Do not apply coating when air or substrate conditions are:

a. Less than 5 degrees F above dew point;

b. Below 50 degrees F or over 95 degrees F, unless specifically pre-approved by the Contracting Officer and the product manufacturer. Do not, under any circumstances, violate the manufacturer's application recommendations.

PART 2 PRODUCTS

2.1 PRODUCT SUSTAINABILITY CRITERIA

For products in this section, where applicable and to extent allowed by performance criteria, provide and document the following:

2.1.1 Reduce Volatile Organic Compounds (VOC) (Low-Emitting Materials)

Reduced VOC content is identified for some products in this section; provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING paragraph REDUCE VOLATILE ORGANIC COMPOUNDS (VOC) (LOW-EMITTING MATERIALS). Other products listed in this section may be available with reduced VOC content; identify those products that meet project requirements for reduced VOC content, and provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING paragraph REDUCE VOLATILE ORGANIC COM-POUNDS (VOC) (LOW-EMITTING MATERIALS).

2.2 MATERIALS

Conform to the coating specifications and standards referenced in PART 3. Submit Product Data Sheets for specified coatings and solvents. Provide preprinted cleaning and maintenance instructions for all coating systems. Submit Manufacturer's Instructions on Mixing: Detailed mixing instructions, minimum and maximum application temperature and humidity, pot life, and curing and drying times between coats.

Provide interior coatings in compliance with the minimum emissions requirements as specified in 01 33 29 SUSTAINABILITY REPORTING, Table 3-1 VOLATILE ORGANIC COMPOUNDS (VOC) (LOW-EMITTING MA-TERIALS) REQUIREMENTS and provide data for volatile organic compounds (voc) contents in accordance with 01 33 29 SUSTAINABILITY REPORTING paragraph REDUCE VOLATILE ORGANIC COMPOUNDS (VOC) (LOW-EMITTING MATERIALS). Provide certification of Indoor Air Quality for paints and primers.

2.3 COLOR SELECTION OF FINISH COATS

Provide colors of finish coats as indicated or specified. Allow Contracting Officer to select colors not indicated or specified. Manufacturers' names and color identification are used for the purpose of color identification only. Named products are acceptable for use only if they conform to specified requirements. Products of other manufacturers are acceptable if the colors are approximately the colors indicated and the product conforms to specified requirements.

Provide color, texture, and pattern of wall coating systems in accordance with Section 09 06 00 SCHEDULES FOR FINISHES. Submit manufacturer's samples of paint colors. Cross reference color samples to color scheme as indicated. Submit color stencil codes. Tint each coat progressively darker to enable confirmation of the number of coats.

PART 3 EXECUTION

3.1 PROTECTION OF AREAS AND SPACES NOT TO BE PAINTED

Prior to surface preparation and coating applications, remove, mask, or otherwise protect hardware, hardware accessories, machined surfaces, radiator covers, plates, lighting fixtures, public and private property, and other such items not to be coated that are in contact with surfaces to be coated. Following completion of painting, reinstall removed items by workmen skilled in the trades. Restore surfaces contaminated by coating materials, to original condition and repair damaged items.

3.2 PREPARATION OF METAL SURFACES

3.2.1 Existing and New Ferrous Surfaces

a. Ferrous Surfaces including Shop-coated Surfaces and Small Areas That Contain Rust, Mill Scale and Other Foreign Substances: Solvent clean or detergent wash in accordance with SSPC SP 1 to remove oil and grease. Where shop coat is missing or damaged, clean according to SSPC SP 2, SSPC SP 3, SSPC SP 6/NACE No.3, or SSPC SP 10/NACE No. 2. Brush-off blast remaining surface in accordance with SSPC 7/NACE No.4; Water jetting to SSPC-SP WJ-4/NACE WJ-4 may be used to remove loose coating and other loose materials. Use inhibitor as recommended by

coating manufacturer to prevent premature rusting. Protect shop-coated ferrous surfaces from corrosion by treating and touching up corroded areas immediately upon detection.

3.2.2 Galvanized Surfaces

a. New Galvanized Surfaces With Only Dirt and Zinc Oxidation Products: Clean with solvent, steam, or non-alkaline detergent solution in accordance with SSPC SP 1. Completely remove coating by brush-off abrasive blast if the galvanized metal has been passivated or stabilized. Do not "passivate" or "stabilize" new galvanized steel to be coated. If the absence of hexavalent stain inhibitors is not documented, test as described in ASTM D6386, Appendix X2, and remove by one of the methods described therein.

b. Galvanized with Slight Coating Deterioration or with Little or No Rusting: Water jetting to SSPC-SP WJ-3/NACE WJ-3 to remove loose coating from surfaces with less than 20 percent coating deterioration and no blistering, peeling, or cracking. Use inhibitor as recommended by the coating manufacturer to prevent rusting.

3.2.3 Non-Ferrous Metallic Surfaces

Aluminum and aluminum-alloy, lead, copper, and other nonferrous metal surfaces.

Surface Cleaning: Solvent clean in accordance with SSPC SP 1 and wash with mild non-alkaline detergent to remove dirt and water soluble contaminants.

3.2.4 Terne-Coated Metal Surfaces

Solvent clean surfaces with mineral spirits, ASTM D235. Wipe dry with clean, dry cloths.

3.3 PREPARATION OF CONCRETE AND CEMENTITIOUS SURFACE

3.3.1 Concrete and Masonry

a. Curing: Allow concrete, stucco and masonry surfaces to cure at least 30 days before painting, and concrete slab on grade to cure at least 90 days before painting.

b. Surface Cleaning: Remove the following deleterious substances.

(1) Dirt, Chalking, Grease, and Oil: Wash new surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, and 4 quarts of warm water. Then rinse thoroughly with fresh water. For large areas, water blasting may be used.

(2) Fungus and Mold: Wash new surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, one quart 5 percent sodium hypochlorite solution and 3 quarts of warm water. Rinse thoroughly with fresh water.

(3) Paint and Loose Particles: Remove by wire brushing.

(4) Efflorescence: Remove by scraping or wire brushing followed by washing with a 5 to 10 percent by weight aqueous solution of hydrochloric (muriatic) acid. Do not allow acid to remain on the surface for more than five minutes before rinsing with fresh water. Do not acid clean more than 4 square feet of surface, per workman, at one time.

c. Cosmetic Repair of Minor Defects: Repair or fill mortar joints and minor defects, including but not limited to spalls, in accordance with manufacturer's recommendations and prior to coating application.

d. Allowable Moisture Content: Latex coatings may be applied to damp surfaces, but not to surfaces with droplets of water. Do not apply epoxies to damp vertical surfaces as determined by ASTM D4263 or horizontal surfaces that exceed 3 lbs of moisture per 1000 square feet in 24 hours as determined by ASTM F1869. In all cases follow manufacturer's recommendations. Allow surfaces to cure a minimum of 30 days before painting.

3.3.2 Gypsum Board, Plaster, and Stucco

3.3.2.1 Surface Cleaning

Verify that plaster and stucco surfaces are free from loose matter and that gypsum board is dry. Remove loose dirt and dust by brushing with a soft brush, rubbing with a dry cloth, or vacuum-cleaning prior to application of the first coat material. A damp cloth or sponge may be used if paint is water-based.

3.3.2.2 Repair of Minor Defects

Prior to painting, repair joints, cracks, holes, surface irregularities, and other minor defects with patching plaster or spackling compound and sand smooth.

3.3.2.3 Allowable Moisture Content

Latex coatings may be applied to damp surfaces, but not surfaces with droplets of water. Do not apply epoxies to damp surfaces as determined by ASTM D4263. Verify that new plaster to be coated has a maximum moisture content of 8 percent, when measured in accordance with ASTM D4444, Method A, unless otherwise authorized. In addition to moisture content requirements, allow new plaster to age a minimum of 30 days before preparation for painting.

3.4 APPLICATION

3.4.1 Coating Application

a. Comply with applicable federal, state and local laws enacted to ensure compliance with Federal Clean Air Standards. Apply coating materials in accordance with SSPC PA 1. SSPC PA 1 methods are applicable to all substrates, except as modified herein.

b. At the time of application, paint must show no signs of deterioration. Maintain uniform suspension of pigments during application.

c. Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. Use trigger operated spray nozzles for water hoses. Use rollers for applying paints and enamels of a type designed for the coating to be applied and the surface to be coated. Wear protective clothing and respirators when applying oil-based paints or using spray equipment with any paints.

d. Only apply paints, except water-thinned types, to surfaces that are completely free of moisture as determined by sight or touch.

e. Thoroughly work coating materials into joints, crevices, and open spaces. Pay special attention to ensure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces.

f. Apply each coat of paint so that dry film is of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Completely hide all blemishes.

g. Touch up damaged coatings before applying subsequent coats. Broom clean and clear dust from interior areas before and during the application of coating material.

h. Apply paint to new fire extinguishing sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metal work, and accessories. Shield sprinkler heads with protective coverings while painting is in progress. Remove sprinkler heads which have been painted and replace with new sprinkler heads. Unfinished spaces include attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and space where walls or ceiling are not painted or not constructed of a prefinished material. Upon completion of painting, remove protective covering from sprinkler heads.

i. Piping in Unfinished Areas: Provide primed surfaces with one coat of red alkyd gloss enamel (MPI 9) applied to a minimum dry film thickness of 1.0 mil in attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and spaces where walls or ceiling are not painted or not constructed of a prefinished material.

j. Piping in Finished Areas: Provide primed surfaces with two coats of paint to match adjacent surfaces, except provide valves and operating accessories with one coat of red alkyd gloss enamel (MPI 9) applied to a minimum dry film thickness of 1.0 mil or two component gloss polyurethane (MPI 72) in exterior applications.

k. Provide labeling on the surfaces of all feed and cross mains to show the pipe function such as "Sprinkler System", "Fire Department Connection", "Standpipe". For pipe sizes 4-inch and larger provide white painted stenciled letters and arrows, a minimum of 2 in in height and visible from at least two sides when viewed from the floor. For pipe sizes less than 4-inch, provide white painted stenciled letters and arrows, a minimum of 0.75 in in height and visible from the floor.

l. All fire suppression system valves must be marked with permanent tags

indicating normally open or normally closed.

m. Drying Time: Allow time between coats, as recommended by the coating manufacturer, to permit thorough drying, but not to present topcoat adhesion problems. Provide each coat in specified condition to receive next coat.

n. Primers, and Intermediate Coats: Do not allow primers or intermediate coats to dry more than 30 days, or longer than recommended by manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if primers or intermediate coats are allowed to dry longer than recommended by manufacturers of subsequent coatings. Cover each preceding coat or surface completely by ensuring visually perceptible difference in shades of successive coats.

o. Finished Surfaces: Provide finished surfaces free from runs, drops, ridges, waves, laps, brush marks, and variations in colors.

p. Thermosetting Paints: Apply topcoats over thermosetting paints (epoxies and urethanes) within the overcoat window recommended by the manufacturer.

3.4.2 Mixing and Thinning of Paints

Reduce paints to proper consistency by adding fresh paint, except when thinning is mandatory to suit surface, temperature, weather conditions, application methods, or for the type of paint being used. Obtain written permission from the Contracting Officer to use thinners. Verify that the written permission includes quantities and types of thinners to use.

When thinning is allowed, thin paints immediately prior to application with not more than one pint of suitable thinner per gallon. The use of thinner does not relieve the Contractor from obtaining complete hiding, full film thickness, or required gloss. Thinning cannot cause the paint to exceed limits on volatile organic compounds. Do not mix paints of different manufacturers.

3.4.3 Two-Component Systems

Mix two-component systems in accordance with manufacturer's instructions. Follow recommendation by the manufacturer for any thinning of the first coat to ensure proper penetration and sealing for each type of substrate.

3.4.4 Coating Systems

a. Systems by Substrates: Apply coatings that conform to the respective specifications listed in the following Tables:

Table for Exterior Applications	
MPI Division	Substrate Application
MPI Division 3	Exterior Concrete Paint Table

Table for Exterior Applications	
MPI Division 4	Exterior Concrete Masonry Units Paint Table
MPI Division 5	Exterior Metal, Ferrous and Non-Ferrous Paint Table
MPI Division 6	Exterior Wood; Dressed Lumber, Paneling, Decking, Shingles Paint Table
MPI Division 9	Exterior Stucco Paint Table
MPI Division 10	Exterior Cloth Coverings and Bituminous Coated Surfaces Paint Table
Table for Interior Applications	
MPI Division	Substrate Application
MPI Division 3	Interior Concrete Paint Table
MPI Division 4	Interior Concrete Masonry Units Paint Table
MPI Division 5	Interior Metal, Ferrous and Non-Ferrous Paint Table
MPI Division 6	Interior Wood Paint Table
MPI Division 9	Interior Plaster, Gypsum Board, Textured Surfaces Paint Table

b. Minimum Dry Film Thickness (DFT): Apply paints, primers, varnishes, enamels, undercoats, and other coatings to a minimum dry film thickness of 1.5 mil each coat unless specified otherwise in the Tables. Coating thickness, where specified, refers to the minimum dry film thickness.

c. Coatings for Surfaces Not Specified Otherwise: Coat unspecified surfaces the same as surfaces having similar conditions of exposure.

d. Existing Surfaces Damaged During Performance of the Work, Including New Patches In Existing Surfaces: Coat surfaces with the following:

(1) One coat of primer.

(2) One coat of undercoat or intermediate coat.

(3) One topcoat to match adjacent surfaces.

e. Existing Coated Surfaces To Be Painted: Apply coatings conforming to the respective specifications listed in the Tables herein, except that pretreatments, sealers and fillers need not be provided on surfaces where existing coatings are soundly adhered and in good condition. Do not omit undercoats or primers.

3.5 COATING SYSTEMS FOR METAL

Apply coatings of Tables in MPI Division 5 for Exterior and Interior.

a. Apply specified ferrous metal primer to steel surfaces on the same day that surface is cleaned, to surfaces that meet all specified surface preparation requirements at time of application.

b. Inaccessible Surfaces: Prior to erection, use one coat of specified primer on metal surfaces that will be inaccessible after erection.

c. Shop-primed Surfaces: Touch up exposed substrates and damaged coatings to protect from rusting prior to applying field primer.

d. Surface Previously Coated with Epoxy or Urethane: Apply MPI 101, 1.5 mils DFT immediately prior to application of epoxy or urethane coatings.

e. Pipes and Tubing: The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat. Overcoat these items with the specified ferrous-metal primer prior to application of finish coats.

f. Exposed Nails, Screws, Fasteners, and Miscellaneous Ferrous Surfaces. On surfaces to be coated with water thinned coatings, spot prime exposed nails and other ferrous metal with latex primer MPI 107.

3.6 COATING SYSTEMS FOR CONCRETE AND CEMENTITIOUS SUBSTRATES

Apply coatings of Tables in MPI Division 3, 4 and 9 for Exterior and Interior.

3.7 PIPING IDENTIFICATION

Piping Identification, Including Surfaces In Concealed Spaces: Provide in accordance with MIL-STD-101. Place stenciling in clearly visible locations. On piping not covered by MIL-STD-101, stencil approved names or code letters, in letters a minimum of 1/2 inch high for piping and a minimum of 2 inches high elsewhere. Stencil arrow-shaped markings on piping to indicate direction of flow using black stencil paint.

3.8 INSPECTION AND ACCEPTANCE

In addition to meeting previously specified requirements, demonstrate mobility of moving components, including swinging and sliding doors, cabinets, and windows with operable sash, for inspection by the Contracting Officer. Perform this demonstration after appropriate curing and drying times of coatings have elapsed and prior to invoicing for final payment.

3.9 WASTE MANAGEMENT

As specified in the Waste Management Plan and as follows. Do not use kerosene or any such organic solvents to clean up water based paints. Properly dispose of paints or solvents in designated containers. Close and seal partially used containers of paint to maintain quality as necessary for reuse. Store in protected, well-ventilated, fire-safe area at moderate temperature. Place materials defined as hazardous or toxic waste in designated containers. Set aside extra paint for future color matches or reuse by the Government.

3.10 PAINT TABLES

All DFT's are minimum values. Acceptable products are listed in the MPI Green Approved Products List, available at http://www.specifygreen.com/APL/ProductIdxByMPInum.asp.

3.10.1 Exterior Paint Tables

3.10.1.1 MPI Division 5: Exterior Metal, Ferrous and Non-Ferrous Paint Table

A. Steel / Ferrous Surfaces

(1) New Steel that has been hand or power tool cleaned to SSPC SP 2 or SSPC SP 3

Alkyd					
New		Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.1Q-G5 (Semigloss		MPI 23	MPI 94	MPI 94	5.25 mils
MPI EXT 5.1Q-G6 (Gloss)		MPI 23	MPI 9	MPI 9	5.25 mils
Topcoat: Coating to match adjacent surfaces.					

(2) New Steel that has been blast-cleaned to SSPC SP 6/NACE No.3

Alkyd					
New		Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.1D-G5 (Semigloss)		MPI 79	MPI 94	MPI 94	5.25 mils
MPI EXT 5.1D-G6 (Gloss)		MPI 79	MPI 9	MPI 9	5.25 mils
Topcoat: Coating to match adjacent surfaces.					

(4) New steel blast cleaned to SSPC SP 10/NACE No. 2

Waterborne Light Industrial					
New		Primer	Intermediate	Topcoat	System DFT

MPI EXT 5.1R-G5 (Semigloss)		MPI 101	MPI 108	MPI 163	8.5 mils
MPI EXT 5.1R-G6 (Gloss)		MPI 101	MPI 108	MPI 164	8.5 mils
Topcoat: Coating to match adjacent surfaces.					

Pigmented Polyurethane					
New		Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.1J-G6 (Gloss)		MPI 101	MPI 108	MPI 72	8.5 mils
Topcoat: Coating to match adjacent surfaces.					

(5) Metal floors (non-shop-primed surfaces or non-slip deck surfaces) with non-skid additive (NSA), load at manufacturer's recommendations

Epoxy					
New		Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.1S-G5 (Semi Gloss)		MPI 120	MPI 177	MPI 177	5.25 mils
MPI EXT 5.1S-G6 (Gloss)		MPI 120	MPI 77	MPI 77	5.25 mils
Topcoat: Coating to match adjacent surfaces. Load Non-Skid Additive at manufacturer's recommendations.					

B. Exterior Galvanized Surfaces

(1) New Galvanized surfaces

Waterborne Primer / Latex				
New Galvanized Surfaces	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.3H-G1 (Flat)	MPI 134	MPI 10	MPI 10	4.5 mils

EXT 5.3H-G5 (Semigloss)	MPI 134	MPI 11	MPI 11	4.5 mils
MPI EXT 5.3H-G6 (Gloss)	MPI 134	MPI 119	MPI 119	4.5 mils
Topcoat: Coating to match adjacent surfaces.				

Waterborne Primer / Waterborne Light Industrial Coating				
New Galvanized Surfaces	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.3J-G5 (Semigloss)	MPI 134	MPI 163	MPI 163	4.5 mils
MPI EXT 5.3J-G6 (Gloss)	MPI 134	MPI 164	MPI 164	4.5 mils
Topcoat: Coating to match adjacent surfaces.				

Epoxy Primer / Waterborne Light Industrial Coating				
New Galvanized Surfaces	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.3K-G5 (Semigloss)	MPI 101	MPI 163	MPI 163	5 mils
MPI EXT 5.3K-G6 (Gloss)	MPI 101	MPI 164	MPI 164	5 mils
Topcoat: Coating to match adjacent surfaces.				

Pigmented Polyurethane				
New Galvanized Surfaces	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.3L-G6 (Gloss)	MPI 101	N/A	MPI 72	5 mils
Topcoat: Coating to match adjacent surfaces.				

C. Exterior Surfaces, Other Metals (Non-Ferrous)

(1) Aluminum, aluminum alloy and other miscellaneous non-ferrous metal items not otherwise specified except hot metal surfaces, roof surfaces, and new prefinished equipment

Alkyd				
New Galvanized Surfaces	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.4F-G1 (Flat	MPI 95	MPI 8	MPI 8	5 mils
MPI EXT 5.4F-G5 (Semigloss)	MPI 95	MPI 94	MPI 94	5 mils
MPI EXT 5.4F-G6 (Gloss)	MPI 95	MPI 9	MPI 9	5 mils
Topcoat: Coating to match adjacent surfaces.				

Waterborne Light Industrial Coating				
New Galvanized Surfaces	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.4F-G1 (Flat	MPI 95	MPI 161	MPI 161	5 mils
MPI EXT 5.4F-G5 (Semigloss)	MPI 95	MPI 163	MPI 163	5 mils
MPI EXT 5.4F-G6 (Gloss)	MPI 95	MPI 164	MPI 164	5 mils
Topcoat: Coating to match adjacent surfaces.				

(3) Surfaces adjacent to painted surfaces; Mechanical, Electrical, Fire extinguishing sprinkler systems including valves, conduit, hangers, supports,exposed copper piping, and miscellaneous metal items not otherwise specified except floors, hot metal surfaces, and new prefinished equipment

Alkyd				
New	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.1D-G1 (Flat)	MPI 79	MPI 8	MPI 8	5.25 mils
MPI EXT 5.1D-G5 (Semigloss)	MPI 79	MPI 94	MPI 94	5.25 mils

MPI EXT 5.1D-G6 (Gloss)	MPI 79	MPI 9	MPI 9	5.25 mils
Topcoat: Coating to match adjacent surfaces.				

Waterborne Light Industrial Coating				
New	Primer	Intermediate	Topcoat	System DFT
MPI EXT 5.1C-G3(Eggshell)	MPI 79	MPI 161	MPI 161	5 mils
MPI EXT 5.1C-G5(Semigloss)	MPI 79	MPI 163	MPI 163	5 mils
MPI EXT 5.1C-G6(Gloss)	MPI 79	MPI 164	MPI 164	5 mils
Primer as recommended by manufacturer. Topcoat: Coating to match adjacent surfaces.				

D. Exterior Hot Surfaces(1) Hot metal surfaces subject to temperatures up to 400 degrees F

Heat Resistant Enamel				
New	N/A	Intermediate	Topcoat	System DFT
MPI EXT 5.2A	MPI 21	N/A	N/A	Per Manufacturer
Surface preparation and number of coats per manufacturer's instructions.				

(2) Ferrous metal subject to high temperature, up to 750 degrees F

Inorganic Zinc Rich Coating				
New	N/A	Intermediate	Topcoat	System DFT
MPI EXT 5.2C	MPI 19	N/A	N/A	Per Manufacturer
Surface preparation and number of coats per manufacturer's instructions.				

Heat Resistant Aluminum Enamel				
New	N/A	Intermediate	Topcoat	System DFT

MPI EXT 5.2B	MPI 2	N/A	N/A	Per Manufacturer
Surface preparation and number of coats per manufacturer's instructions.				

(3) New surfaces made bare subject to temperatures up to 1100 degrees F

(1) New surfaces made bare cleaning to SSPC SP 10/NACE No. 2 subject to temperatures up to 1100 degrees F

Heat Resistant Coating					
New	Existing	N/A	Intermediate	Topcoat	System DFT
MPI EXT 5.2D	MPI REX 5.2D	MPI 22	N/A	N/A	Per Manufacturer
Surface preparation and number of coats per manufacturer's instructions.					

3.10.2 Interior Paint Tables

3.10.2.1 MPI Division 4: Interior Concrete Masonry Units Paint Table

A. New and uncoated Existing Concrete Masonry

High Performance Architectural Latex					
New, uncoated Existing	Filler	Primer	Intermediate	Topcoat	System DFT
MPI INT 4.2D-G2 (Flat)	MPI 4	N/A	MPI 139	MPI 138	11 mils
MPI INT 4.2D-G3 (Eggshell)	MPI 4	N/A	MPI 139	MPI 139	11 mils
MPI INT 4.2D-G4 (Satin)	MPI 4	N/A	MPI 140	MPI 140	11 mils
MPI INT 4.2D-G5 (Semigloss)	MPI 4	N/A	MPI 141	MPI 141	11 mils
Fill all holes in masonry surface					

Institutional Low Odor / Low VOC Latex					
New, uncoated Existing	Filler	Primer	Intermediate	Topcoat	System DFT
MPI INT 4.2E-G2 (Flat)	MPI 4	N/A	MPI 144	MPI 144	4 mils

MPI INT 4.2E-G3 (Eggshell)	MPI 4	N/A	MPI 145	MPI 145	4 mils
MPI INT 4.2E-G4 (Satin)	MPI 4	N/A	MPI 146	MPI 146	4 mils
MPI INT 4.2E-G5 (Semigloss)	MPI 4	N/A	MPI 147	MPI 147	4 mils
Fill all holes in masonry surface					

B. Existing, Previously Painted Concrete Masonry

High Performance Architectural Latex					
Existing, previously painted	Filler	Primer	Intermediate	Topcoat	System DFT
MPI RIN 4.2K-G2 (Flat)	N/A	MPI 138	MPI 138	MPI 138	4.5 mils
MPI RIN 4.2K-G3 (Eggshell)	N/A	MPI 139	MPI 139	MPI 139	4.5 mils
MPI RIN 4.2K-G4	N/A	MPI 140	MPI 140	MPI 140	4.5 mils
MPI RIN 4.2K-G5 (Semigloss)	N/A	MPI 141	MPI 141	MPI 141	4.5 mils

Institutional Low Odor / Low VOC Latex					
Existing, previously painted	Filler	Primer	Intermediate	Topcoat	System DFT
MPI RIN 4.2L-G2 (Flat)	N/A	MPI 144	MPI 144	MPI 144	4 mils
MPI RIN 4.2L-G3 (Eggshell)	N/A	MPI 145	MPI 145	MPI 145	4 mils
MPI RIN 4.2L-G4 (Satin)	N/A	MPI 146	MPI 146	MPI 146	4 mils
MPI RIN 4.2L-G5 (Semigloss)	N/A	MPI 147	MPI 147	MPI 147	4 mils

C. New and uncoated Existing Concrete masonry units in unless otherwise specified

Waterborne Light Industrial Coating					
New, uncoated Existing	Filler	Primer	Intermediate	Topcoat	System DFT
MPI INT 4.2K-G3(Eggshell)	MPI 4	N/A	MPI 151	MPI 151	11 mils
MPI INT 4.2K-G5(Semigloss)	MPI 4	N/A	MPI 153	MPI 153	11 mils
MPI INT 4.2K-G6(Gloss)	MPI 4	N/A	MPI 154	MPI 154	11 mils
Fill all holes in masonry surface					

Alkyd					
New, uncoated Existing	Filler	Primer	Intermediate	Topcoat	System DFT
MPI INT 4.2K-G3(Eggshell)	MPI 4	MPI 50	MPI 51	MPI 51	12 mils
MPI INT 4.2K-G5(Semigloss)	MPI 4	MPI 50	MPI 47	MPI 47	12 mils
MPI INT 4.2K-G6(Gloss)	MPI 4	MPI 50	MPI 48	MPI 48	12 mils
Fill all holes in masonry surface					

Epoxy					
New, uncoated Existing	Filler	Primer	Intermediate	Topcoat	System DFT
MPI INT 4.2G-G6 (Gloss)	MPI 116	N/A	MPI 77	MPI 77	10 mils
Fill all holes in masonry surface					

D. Existing, previously painted, concrete masonry units in unless otherwise specified

Waterborne Light Industrial Coating					
Existing, previously painted	Filler	Primer	Intermediate	Topcoat	System DFT

MPI RIN 4.2G-G3(Eggshell)	N/A	MPI 151	MPI 151	MPI 151	4.5 mils
MPI RIN 4.2G-G5(Semigloss)	N/A	MPI 153	MPI 153	MPI 153	4.5 mils
MPI RIN 4.2G-G6(Gloss)	N/A	MPI 154	MPI 154	MPI 154	4.5 mils

Alkyd					
Existing, previously painted	Filler	Primer	Intermediate	Topcoat	System DFT
MPI RIN 4.2C-G3 (Eggshell)	N/A	MPI 17	MPI 51	MPI 51	4.5 mils
MPI RIN 4.2C-G5 (Semigloss)	N/A	MPI 17	MPI 47	MPI 47	4.5 mils
MPI RIN 4.2C-G6 (Gloss)	N/A	MPI 17	MPI 48	MPI 48	4.5 mils

Epoxy					
Existing, previously painted	Filler	Primer	Intermediate	Topcoat	System DFT
MPI RIN 4.2D-G6 (Gloss)	N/A	MPI 77	MPI 77	MPI 77	5 mils

3.10.2.2 MPI Division 5: Interior Metal, Ferrous and Non-Ferrous Paint Table

A. Interior Steel / Ferrous Surfaces

(1) Metal, Mechanical, Electrical, Fire extinguishing sprinkler systems including valves, conduit, hangers, supports, Surfaces adjacent to painted surfaces (Match surrounding finish), exposed copper piping, and miscellaneous metal items not otherwise specified except floors, hot metal surfaces, and new prefinished equipment

Alkyd				
New	Primer	Intermediate	Topcoat	System DFT
MPI INT 5.1E-G2 (Flat)	MPI 76	MPI 49	MPI 49	5.25 mils
MPI INT 5.1E-G3 (Eggshell)	MPI 76	MPI 51	MPI 51	5.25 mils
MPI INT 5.1E-G5 (Semigloss)	MPI 76	MPI 47	MPI 47	5.25 mils

MPI INT 5.1E-G6 (Gloss)	MPI 76	MPI 48	MPI 48	5.25 mils
Topcoat: Coating to match adjacent surfaces.				

(2) Metal floors and metal trough covers(non-shop-primed surfaces or non-slip deck surfaces) with non-skid additive (NSA), load at manufacturer's recommendations

Epoxy				
New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT
MPI INT 5.1L-G6 (Gloss)	MPI 101	MPI 101	MPI 101	5.25 mils
Topcoat: Coating to match adjacent surfaces.				

(3) Metal in toilets, restrooms, not otherwise specified except floors, hot metal surfaces, and new prefinished equipment

Alkyd				
New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT
MPI INT 5.1E-G3 (Eggshell)	MPI 76	MPI 51	MPI 51	5.25 mils
MPI INT 5.1E-G5 (Semigloss)	MPI 76	MPI 47	MPI 47	5.25 mils
MPI INT 5.1E-G6 (Gloss)	MPI 76	MPI 48	MPI 48	5.25 mils
Topcoat: Coating to match adjacent surfaces.				

Alkyd; For Hand Tool Cleaning				
New, uncoated Existing	Primer	Intermediate	Topcoat	System DFT
MPI INT 5.1T-G3 (Eggshell)	MPI 23	MPI 51	MPI 51	5.25 mils
MPI INT 5.1T-G5 (Semigloss)	MPI 23	MPI 47	MPI 47	5.25 mils
MPI INT 5.1T-G6 (Gloss)	MPI 23	MPI 48	MPI 48	5.25 mils

Topcoat: Coating to match adjacent surfaces.

B. Hot Surfaces

(1) Hot metal surfaces subject to temperatures up to 400 degrees F

Heat Resistant Enamel				
New	N/A	Intermediate	Topcoat	System DFT
MPI INT 5.2A	MPI 21	N/A	N/A	Per Manufacturer
Surface preparation and number of coats per manufacturer's instructions.				

(2) Ferrous metal subject to high temperature, up to 750 degrees F

Heat Resistant Aluminum Enamel				
New	N/A	Intermediate	Topcoat	System DFT
MPI INT 5.2B (Aluminum Finish)	MPI 2	N/A	N/A	Per Manufacturer
Surface preparation and number of coats per manufacturer's instructions.				

(3) New and Existing Surfaces made bare subject to temperatures up to 1100 degrees F

(1) New surfaces made bare cleaning to SSPC SP 10/NACE No. 2 subject to temperatures up to 1100 degrees F:

Heat Resistant Coating					
New	Existing	N/A	Intermediate	Topcoat	System DFT
MPI INT 5.2D	MPI RIN 5.2D	MPI 22	N/A	N/A	Per Manufacturer
Surface preparation and number of coats per manufacturer's instructions.					

3.10.2.3 MPI Division 9: Interior Plaster, Gypsum Board, Textured Surfaces Paint Table

A. Interior New Wallboard not otherwise specified

High Performance Architectural Latex

New	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI INT 9.2B-G2 (Flat)	MPI RIN 9.2B-G2 (Flat)	MPI 50	MPI 138	MPI 138	4 mils
MPI INT 9.2B-G3 (Eggshell)	MPI RIN 9.2B-G3 (Eggshell)	MPI 50	MPI 139	MPI 139	4 mils
Topcoat: Coating to match adjacent surfaces.					

Institutional Low Odor / Low VOC Latex, New

Institutional Low Odor / Low VOC Latex				
New	Primer	Intermediate	Topcoat	System DFT
MPI INT 9.2M-G2 (Flat)	MPI 149	MPI 144	MPI 144	4 mils
MPI INT 9.2M-G3 (Eggshell)	MPI 149	MPI 145	MPI 145	4 mils
Topcoat: Coating to match adjacent surfaces.				

B. Interior New Wallboard in toilets, restrooms, not otherwise specified

Waterborne Light Industrial Coating, Pre-Catalyzed Epoxy					
New	Existing, previously painted	Primer	Intermediate	Topcoat	System DFT
MPI INT 9.2L-G5(Semigloss)	MPI RIN 9.2L-G5 (Semigloss)	MPI 50	MPI 153	MPI 153	4 mils
Topcoat: Coating to match adjacent surfaces.					

-- End of Section --

SECTION 10 14 00.20

INTERIOR SIGNAGE
08/20

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes
AA PK-1	(2015) Pink Sheets: Designations and Chemical Composition Limits for Aluminum Alloys in the Form of Castings & Ingot

AMERICAN WELDING SOCIETY (AWS)

AWS D1.2/D1.2M	(2014; Errata 1 2014; Errata 2 2020) Structural Welding Code - Aluminum

ASTM INTERNATIONAL (ASTM)

ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B221	(2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

INTERNATIONAL CODE COUNCIL (ICC)

ICC/ANSI A117.1	(2009) Accessible and Usable Buildings and Facilities

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2021; TIA 21-1) Life Safety Code

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section

01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G, AE

SD-03 Product Data

Room Identification And Directional Signage System; G, AEExit Door Tactile Sign; G, AE

SD-04 Samples

Interior Signage; G

Software; G

Room Identification And Directional Signage System; G

Exit Door Tactile Sign; G

SD-10 Operation and Maintenance Data

Approved Manufacturer's Instructions; G

Protection and Cleaning; G

1.3 EXTRA MATERIALS

Provide 10 paper inserts and laser print templates to support end-user printing copy one copy of the software for user produced signs and inserts after project completionand equipment necessary for removal of signage parts and pieces.

1.4 QUALITY ASSURANCE

1.4.1 Samples

Submit interior signage samples of each of the following sign types showing typical quality, workmanship and color: Room Identification and Directional Signage System. Approved samples may be installed in the work, provided each sample is identified and location recorded.

1.4.2 Detail Drawings

Submit detail drawings showing elevations of each type of sign, dimensions, details and methods of mounting or anchoring, mounting height, shape and thickness of materials, and details of construction. Include a schedule showing the location, each sign type, and message.

1.4.3 Sign Fabricator

Sign Fabricator to follow room number strategies created by designer. The room numbering system to be reviewed and approved by the Contracting Officer and command end users during the shop drawing phase, and prior to fabrication.

1.5 DELIVERY, STORAGE, AND HANDLING

Package materials to prevent damage and deterioration during shipment, handling, storage and installation. Deliver products to the jobsite in manufacturer's original packaging and store in a clean, dry area in accordance with manufacturer's instructions.

1.6 WARRANTY

Provide manufacturer's warranty to repair or replace defective interior signage materials and workmanship for a period of 2 years from date of final acceptance of the work.

PART 2 PRODUCTS

2.1 ROOM IDENTIFICATION AND DIRECTIONAL SIGNAGE SYSTEM

Provide signs, plaques, directories, and dimensional building letters that are standard products of manufacturers regularly engaged in the manufacture of such products that essentially duplicate signs that have been in satisfactory use at least 2 years prior to bid opening. Obtain signage from a single manufacturer with edges and corners of finished letter forms and graphics true and clean.

2.1.1 Modular Sign Systems

Provide manufactured pre-engineered component-based sign system, consisting of a combination of aluminum structural rail extrusions and ABS plastic injection molded parts, pre-engineered and designed to create an updatable sign system that allows for easy and inexpensive updates and changes. Provide system with incremental widths and heights that permit the assembly of multiple inserts of variable size to create a single sign. Provide a sign composed of rigid plastic for applied graphics. Provide continuous extruded aluminum removable endcaps in square 1/4 inch thick profile. Sign inserts are required to be side loading.

2.1.2 Standard Room Signs

Provide signs that include tactile letters, symbols and Braille for interior rooms or spaces where the sign is not likely to change over time. Tactile text descriptions are required for pictograms that are provided to identify a permanent room. Examples include interior signs that label restrooms, stairs, room numbers or letters, and room names. These permanent room signs can include paper inserts for updatable information.

2.1.2.1 Tactile Letters, Symbols and Braille

Provide ADA compliant material per 36 CFR 1191 which is raised 1/32 inch from the first surface, has a minimum 5/8 inch in height and is an ADA acceptable font. The color of the tactile letters is required to contrast with the sign face color per ADA standards. The ADA required Braille has a minimum durometer reading of 90. All raised letters, numbers and symbols are to comply.

2.1.3 Message Inserts

Provide updatable message inserts covered with a clear matte 0.015 inch vinyl protective overlay. The insert is typeset message laser printed on

paper card stock. Provide paper and software with message template for creating text and symbols for computers identified for Government production of paper inserts after project completion. Manufacturer is required to offer online ordering capabilities to facilitate and expedite ordering packages of replacement, color-coated paper inserts.

2.1.4 Type of Mounting for Signs

Provide surface mounted signs mounted with concealed mechanical fastening through the holders on all surfaces except glass Secure inserts in holders when captured by side profiles of extruded aluminum holders. Mount framed plaques with manufacturer's standard (1/6 inch) 1.59 mm thick closed cell vinyl foam with adhesive backing on glass. Provide opaque film for mounting on opposite side of glass to hide attachment. Adhesive must be transparent, long aging, high tech formulation on two sides of the vinyl foam. Double-faced tape consisting of acrylic adhesive on polyurethane foam used in conjunction with silicone adhesive.

2.1.5 Character Proportions and Heights

Letters and numbers on signs conform to 36 CFR 1191.

2.2 EXIT DOOR TACTILE SIGN

Provide tactile sign with the message EXIT at each exit door that requires an exit sign to conform with NFPA 101. Sign tactile message is to comply with ICC/ANSI A117.1.

2.3 MATERIALS

2.3.1 Aluminum Alloy Products

Aluminum extrusions are at least 1/8 inch thick, and aluminum plate or sheet are at least 0.0508 inch thick. Extrusions conform to ASTM B221; plate and sheet conforms to ASTM B209. Where anodic coatings are specified, alloy conforms to AA PK-1 alloy designation 514.0. Exposed anodized aluminum finishes are as shown. Welding for aluminum products conforms to AWS D1.2/D1.2M.

2.3.2 Anodic Coating

Anodized finish conforms to AA DAF45 as follows:

a. Clear (natural) designation AA-M10-C22-A31, Architectural Class II 0.4 mil or thicker.

2.3.3 Fabrication and Manufacture

2.3.3.1 Factory Workmanship

Holes for bolts and screws are drilled or punched. Drilling and punching produces clean, true lines and surfaces. Exposed surfaces of work have a smooth finish; exposed riveting is flush. Conceal fastenings where practicable.

2.3.3.2 Dissimilar Materials

Where dissimilar metals are in contact, protect surfaces prevent galvanic or corrosive action.

2.3.4 Typeface

ADA-ABA compliant font for Room Signs as indicated in the Drawings on Sheet No IG501 and IG502.

2.4 GRAPHICS

Provide signage graphics for modular signs to the following:

2.4.1 Photopolymer

Integral graphics and Braille achieved by photomechanical stratification processes. Provide photopolymer used for ADA compliant graphics of the type that has a minimum durometer reading of 90. Tactile graphics are raised 1/32 inch from the first surface of plaque by photomechanical stratification process.

2.5 COLOR, FINISH, AND CONTRAST

Provide color as specified in Section 09 06 00 SCHEDULES FOR FINISHES. Finish of eggshell, matte, or other non-glare finish for all signs as required in handicapped-accessible buildings.

PART 3 EXECUTION

3.1 INSTALLATION

Install signs plumb and true and in accordance with approved manufacturer's instructions at locations shown on the detail drawings sheet no IG101. Submit operating instructions outlining the step-by-step procedures required for system operation. The instructions include simplified diagrams for the system as installed, the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Provide each set permanently bound with a hard cover. The following identification must be inscribed on the covers: "OPERATING AND MAINTENANCE INSTRUCTIONS", name and location of the facility, name of the Contractor, and contract number. Submit in accordance with Section 01 78 23 OPERATING AND MAINTENANCE DATA. Mounting height and mounting location complies with 36 CFR 1191. Install required blocking. Do not install signs on doors or other surfaces until finishes on such surfaces have been installed. Signs installed on glass surfaces are installed with matching blank back-up plates in accordance with manufacturer's instructions.

Do not install items that show visual evidence of biological growth.

3.1.1 Anchorage

Provide anchorage in accordance with approved manufacturer's instructions. Anchorage not otherwise specified or shown includes slotted inserts, expansion shields, and powder-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; lag bolts and screws for wood. Provide exposed anchor and fastener materials compatible with metal to which applied with

matching color and finish.

a. Signs mounted to painted gypsum board surfaces must be removable for painting maintenance.

3.1.2 Protection and Cleaning

Protect the work against damage during construction. Adjust hardware and electrical equipment for proper operation. Clean glass, frames, and other sign surfaces at completion of signage installation in accordance with the manufacturer's written instructions.

-- End of Section --

SECTION 10 14 01

EXTERIOR SIGNAGE
04/06

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WELDING SOCIETY (AWS)

AWS C1.1M/C1.1	(2000; R 2006)Resistance Welding

ASTM INTERNATIONAL (ASTM)

ASTM B 108/B 108M	(2008) Standard Specification for Aluminum-Alloy Permanent Mold Castings
ASTM B 209	(2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 221	(2008) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B 26/B 26M	(2005) Standard Specification for Aluminum-Alloy Sand Castings
ASTM E 84	(2011a) Standard Test Method for Surface Burning Characteristics of Building Materials

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM AMP 500	(2006) Metal Finishes Manual

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2023; ERTA 7 2023; TIA 23-15) National Electrical Code

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED	(2002; R 2005) Leadership in Energy and Environmental Design(tm) Green Building Rating System for New Construction (LEED-NC)

1.2 SUSTAINABLE DESIGN REQUIREMENTS

1.2.1 Local/Regional Materials

See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total local

material requirements.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Approved Detail Drawings; G

Drawings showing elevations of each type of sign; dimensions, details, and methods of mounting or anchoring; shape and thickness of materials; and details of construction. A schedule showing the location, each sign type, and message shall be included.

SD-03 Product Data

Modular Exterior Signage System; G

Manufacturer's descriptive data and catalog cuts.

Installation

Manufacturer's installation instructions and cleaning instructions.

Exterior Signage; G

Exterior signage schedule in electronic media with spread sheet format. Spread sheet shall include sign location, sign type, and message.

Local/Regional Materials; (LEED)

Documentation indicating distance between manufacturing facility and the project site. Indicate distance of raw material origin from the project site. Indicate relative dollar value of local/regional materials to total dollar value of products included in project.

Waste Management; (LEED)

Documentation indicating percentages by weight of materials and products that are recycled and/or salvaged nonhazardous construction debris.

SD-04 Samples

Exterior Signage; G

One 12 inch length of framing for illuminated signs. One sample of each type of sign. Sample shall consist of a complete sign panel with letters and symbols. Sample may be installed in the work, provided each sample is identified and location recorded.

SD-10 Operation and Maintenance Data

Protection and Cleaning

Six copies of maintenance instructions listing routine maintenance procedures. The instructions shall include simplified diagrams for the equipment as installed.

1.4 GENERAL

All exterior signage shall be provided by a single manufacturer. Exterior signage shall be of the design, detail, sizes, types, and message content shown on the drawings, shall conform to the requirements specified, and shall be provided at the locations indicated. Signs shall be complete with lettering and related components for a complete installation. Recyclable materials shall conform to EPA requirements in accordance with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

1.5 CHARACTER PROPORTIONS AND HEIGHTS

Letters and numbers on indicated signs for handicapped-accessible buildings shall have a width-to-height ratio between 3:5 and 1:1 and a stroke-width-to-height ratio between 1:5 and 1:10. Characters and numbers on indicated signs shall be sized according to the viewing distance from which they are to be read. The minimum height is measured using an upper case letter "X". Lower case characters are permitted.

1.6 QUALIFICATIONS

Signs and plaques shall be the standard product of a manufacturer regularly engaged in the manufacture of the products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use at least 2 years prior to bid opening.

1.7 DELIVERY AND STORAGE

Materials shall be wrapped for shipment and storage, delivered to the jobsite in manufacturer's original packaging, and stored in a clean, dry area in accordance with manufacturer's instructions.

1.8 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period shall be provided.

PART 2 PRODUCTS

2.1 MODULAR EXTERIOR SIGNAGE SYSTEM

Exterior signage shall consist of a system of coordinated directional, identification, and regulatory type signs located where shown. Dimensions, details, materials, message content, and design of signage shall be as shown.

2.1.1 Building Entry Signs (Type 9)

2.1.1.1 Material

Signs shall consist of 6063-T5 extruded aluminum in accordance with

ASTM B 209 and shall be at least 1/8 inch thick.

2.1.1.2 Finish

Finish shall be two-component acrylic polyurethane. Color shall be dark bronze with white text.

2.1.2 Building Number Signs (Type 10)

2.1.2.1 Material

Signs shall consist of pressure sensitive vinyl lettering applied to entrance glazing.

2.1.2.2 Finish

Finish shall be two-component acrylic polyurethane. Color shall match dark bronze with white text.

2.1.3 Exterior Room Identification Signs (Type 6, 7 and 8)

2.1.3.1 Material

Signs shall consist of 6063-T5 extruded aluminum in accordance with ASTM B 209 and shall be at least 1/8 inch thick.

2.1.3.2 Finish

Finish shall be two-component acrylic polyurethane. Sign Types 6 and 7 shall be dark bronze with white text. Sign Type 8 shall be red with white text.

2.2 ILLUMINATED SQUADRON SIGNS

2.2.1 Material

Provide 0.125 inch 5052 aluminum backs, 0.125 inch 6063 1-1/2 inch aluminum square tube subframe, 0.63 inch 3003 8 inch aluminum returns.

a. For 13 by 13 foot sign, provide 3 by 0.125 inch 6061 aluminum angle retainer, digitally printed flexible face (panaflex) with UV laminate, "stretch" aluminum extrusion clips (retainer hides clips).

b. Seam for cabinet will be (2) piece bolt together butt seam. Seam for face will be sewn seam.

2.2.2 Finish

Aluminum finish shall be 6063-T5 clear anodized aluminum.

2.3 ILLUMINATION

Concealed lighting for Squadron signs shall be provided within panel framing members. Lighting shall be controlled by a photocell device. Back lighting shall be provided by LED, 120 volt, 60-hertz, single-phase . W iring within the sign shall be in metal raceways. Electrical equipment shall be UL or FM listed and comply with NFPA 70. Illumination shall be evenly distributed. A switch on the interior of the sign shall be provided to turn off power in the sign. Switch shall be readily

accessible when sign is open.

2.4 GRAPHICS FOR EXTERIOR SIGNAGE SYSTEMS

2.4.1 Graphics

Signage graphics shall conform to the following:

a. Pressure sensitive precision cut vinyl letters shall be provided in locations shown in the Drawings.

2.4.2 Messages

See drawings and schedule for message content, font type, and font size. . Colors shall match Base standard.

2.5 ALUMINUM ALLOY PRODUCTS

Aluminum alloy products shall conform to ASTM B 209 for sheet or plate, ASTM B 221 for extrusions and ASTM B 26/B 26M or ASTM B 108/B 108M for castings. Aluminum extrusions shall be provided at least 1/8 inch thick and aluminum plate or sheet at least 16 gauge thick. Welding for aluminum products shall conform to AWS C1.1M/C1.1.

2.6 ORGANIC COATING

Surfaces shall be cleaned, primed, and given a two-component acrylic polyurethane finish in accordance with NAAMM AMP 500, AMP 505, with total dry film thickness not less than 1.2 mils.

2.7 VINYL SHEETING FOR GRAPHICS

Vinyl sheeting shall be 5 to 7 year premium type and shall be in accordance with the flammability requirements of ASTM E 84 and shall be a minimum 0.003 inch film thickness. Film shall include a precoated pressure sensitive adhesive backing, Class 1, or positionable pressure sensitive adhesive backing, Class 3.

2.8 ANCHORS AND FASTENERS

Exposed anchor and fastener materials shall be compatible with metal to which applied and shall match in color and finish and shall be non-rusting, non-corroding, and non-staining. Exposed fasteners shall be tamper-proof.

2.9 SHOP FABRICATION AND MANUFACTURE

2.9.1 Factory Workmanship

Work shall be assembled in the shop, as far as practical, ready for installation at the site. Work that cannot be shop assembled shall be given a trial fit in the shop to ensure proper field assembly. Holes for bolts and screws shall be drilled or punched. Drilling and punching shall produce clean, true lines and surfaces. Exposed surfaces of work shall have a smooth finish.

2.9.2 Dissimilar Materials

Where dissimilar metals are in contact, or where aluminum is in contact

with masonry, the surfaces shall be protected with a coat of asphalt varnish or a coat of zinc-molybdate primer to prevent galvanic or corrosive action.

2.9.3 Shop Painting

Surfaces of miscellaneous metal work, except nonferrous metal, corrosion resisting steel, and zinc-coated work, shall be given one coat of zinc-molybdate primer or an approved rust-resisting treatment and metallic primer in accordance with manufacturer's standard practice. Surfaces of items to be embedded in concrete shall not be painted. Upon completion of work, damaged surfaces shall be recoated.

2.10 COLOR, FINISH, AND CONTRAST

Color shall be as indicated above and must meet Base Standards.. For buildings required to be handicapped-accessible, the characters and background of signs shall be eggshell, matte, or other non-glare finish. Characters and symbols shall contrast with their background - either light characters on a dark background or dark characters on a light background.

PART 3 EXECUTION

3.1 INSTALLATION

Signs and plaquesshall be installed in accordance with approved manufacturer's instructions at locations shown on the approved detail drawings. Illuminated signage mounted directly on buildings shall be in conformance with the requirements of Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Signs shall be installed plumb and true at mounting heights indicated, and by method shown or specified. Signs mounted on other surfaces shall not be installed until finishes on such surfaces have been completed.

3.1.1 Anchorage

Anchorage and fastener materials shall be in accordance with approved manufacturer's instructions for the indicated substrate. Anchorage not otherwise specified or indicated shall include slotted inserts, expansion shields, and powder-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry.

3.1.2 Protection and Cleaning

The work shall be protected against damage during construction. After signs are completed and inspected, the Contractor shall cover all project identification, directional, and other signs which may mislead the public. Covering shall be maintained until instructed to be removed by the Contracting Officer or until the facility is to be opened for business. Signs shall be cleaned, as required, at time of cover removal.

3.2 WASTE MANAGEMENT

Disposal and recycling of waste materials, including corrugated cardboard recycling, shall be in accordance with the Waste Management Plan specified in Section 01 74 19 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT. Identify manufacturer's policy for collection or return of construction scrap and unused material and packaging material. Institute construction waste separation and recycling to take advantage of manufacturer's

programs. When such a service is not available, seek local recyclers to reclaim the materials.

-- End of Section --

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SECTION 10 21 13

TOILET COMPARTMENTS
08/20

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A167	(2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A336/A336M	(2021) Standard Specification for Alloy Steel Forgings for Pressure and High-Temperature Parts
ASTM A385/A385M	(2022) Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)
ASTM B36/B36M	(2018) Standard Specification for Brass Plate, Sheet, Strip, and Rolled Bar
ASTM B86	(2022) Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings
ASTM B221	(2021) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B456	(2017; R 2022) Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium

INTERNATIONAL CODE COUNCIL (ICC)

ICC A117.1	(2017) Standard And Commentary Accessible and Usable Buildings and Facilities

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE AMS2460	(2023; Rev B) Plating, Chromium

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-60003	(Basic; Notice 1) Partitions, Toilet, Complete

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2022) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation Drawings; G

Fabrication Drawings; G

SD-03 Product Data

Cleaning and Maintenance Instructions; G

Anchoring Devices and Fasteners

Hardware and Fittings

Brackets

Door Hardware

Pilaster Shoes

Finishes; G

Recycled content for solid Polyethylene partitions and screens; S

Toilet Enclosures

Urinal Screens; G

Colors And Finishes

Partition Panels And Doors; G

SD-04 Samples

Hardware and Fittings

Anchoring Devices and Fasteners

SD-07 Certificates

Warranty

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality

1.3.1.1 Solid Polyethylene Products

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party program that products meet the requirements of this Section. Provide current product certification documentation from certification body.

1.4 REGULATORY REQUIREMENTS

Comply with to ICC A117.1 code for access for the handicapped operation of toilet compartment door and hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver materials in the manufacturer's original unopened packages with the brand, item identification, and project reference clearly marked. Store components in a dry location that is adequately ventilated; free from dust, water, other contaminants, and damage during delivery, storage, and construction.

1.6 WARRANTY

Provide manufacturer's warranty to repair or replace defective materials and workmanship for a period of 25 years from date of final acceptance of the work.

PART 2 PRODUCTS

2.1 SYSTEM REQUIREMENTS

Provide a complete and usable toilet partition system, including toilet enclosures, room entrance screens, urinal screens, system of panels, hardware, and support components. Furnish the partition system from a single manufacturer, with a standard product as shown in the most recent

catalog data. Submit Fabrication Drawings for toilet partitions and urinal screens consisting of fabrication and assembly details to be performed in the factory. Submit manufacturer's Cleaning and Maintenance Instructions in accordance with Section 01 78 23 OPERATIONS AND MAINTENANCE DATA.

2.2 MATERIALS

2.2.1 Solid Polyethylene Panels (Finish 5)

Provide high density polyethylene (HDPE) suitable for exposed application. Waterproof, non-absorbent and graffiti resistant textured surface with a that meets NFPA 286.

2.2.2 Anchoring Devices and Fasteners

Provide steel anchoring devices and fasteners hot-dipped galvanized after fabrication, in conformance with ASTM A385/A385M and ASTM A123/A123M. Conceal all galvanized anchoring devices.

2.2.3 Brackets

Provide two-ear panel wall brackets, T-style, 1 inch stock. Provide stirrup style panel-to-pilaster brackets.

2.2.4 Hardware and Fittings

2.2.4.1 General Requirements

Provide hardware for the toilet partition system that complies with CID A-A-60003 for the specified type and style of partitions. Provide hardware finish highly resistant to alkalis, urine, and other common toilet room acids. Comply with 36 CFR 1191 of latching devices and hinges for handicap compartments; provide stainless steel devices and hinges with door latches that operate without either tight grasping or twisting of the wrist of the operator. Submit three samples of each item, including anchoring devices and fasteners. Approved hardware samples may be installed in the work if properly identified.

Material	Conformance Standard
Cold-rolled sheet steel	ASTM A336/A336M, commercial quality
Zinc-base alloy	ASTM B86, Alloy AC41-A
Brass	ASTM B36/B36M, Alloy C26800
Aluminum	ASTM B221
Corrosion-resistant steel	ASTM A167, Type 304

2.2.4.2 Finishes

a. Provide chrome plating that complies with ASTM B456.

b. Provide finish that complies with SAE AMS2460, Class I, Type II.

c. Provide aluminum with clear anodic coating that complies with AA DAF45.

f. Provide exposed fasteners that match the hardware and fittings.

2.2.5 Door Hardware

2.2.5.1 Hinges

Provide adjustable hinges to hold in-swinging doors open at any angle up to 90 degrees and outswinging doors up to 10 degrees. Provide self-lubricating hinges with the indicated swing. Provide hinges that are surface-mounted typehave the following type of return movement:

b. Spring-action cam return movement

2.2.5.2 Latch and Pull

Provide latch and pull that is a combination rubber-faced door strike and keeper equipped with emergency access. Provide surface mounted latch.

2.2.5.3 Coat Hooks

Provide coat hooks that are combination units with hooks and rubber tipped pins.

2.3 PARTITION PANELS AND DOORS

Fabricate partition panels, and pilasters of materials and construction listed:

Provide plastic (HDPE) partition panels, doors and pilasters not less than 1 inch thick.
Provide solid polyethylene toilet partitions and screens with recycled content of 30 percent minimum. Provide data identifying percentage of recycled content for solid polyethylene partitions and screens. Provide certificate of indoor air quality for polyethlene partitions.

2.3.1 Toilet Enclosures

Provide toilet enclosures that comply with CID A-A-60003, Type I, Style C, overhead braced. Furnish width, length, and height of toilet enclosures as shown. Finish surface of panels are solid polyethylene (Finish 5); water resistant; graffiti resistant; non-absorbent radius beveled edges. Reinforce panels indicated to receive toilet paper holders or grab bars for mounting of the items required, and provide cut outs for through partition toilet accessories. Provide grab bars to withstand a bending stress, shear stress, shear force, and a tensile force induced by 250 lbf. Grab bars cannot rotate within their fittings.

2.3.2 Urinal Screens

Provide urinal screens that comply with CID A-A-60003, Type III, Style A, floor supported. Provide finish for surface of screens as solid polyethylene (Finish 5); water resistant; graffiti resistant; non-absorbent with radius beveled edges; with manufacturer's standard post design of materials matching the thickness and construction of pilasters. Furnish width and height of urinal screens as shown. Provide thickness to match toilet compartment panel construction. Secure wall hung urinal screens with 42 inches long, continuous flanges. Fabricate screens from

the same types of panels and pilasters as the toilet partitions. Use corrosion-resistant steel fittings and fasteners.

2.4 OVERHEAD-BRACED PARTITIONS

Provide pilasters in sizes indicated that are manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism. Provide anchoring device at the bottom of the pilaster consisting of a channel-shaped floor stirrup fabricated from not less than 0.0635 inch thick material and a leveling bolt. Secure the stirrup to the pilaster with not less than a 3/16 inch bolt and nut after the pilaster is leveled. Secure the stirrup to the floor with not less than two lead expansion shields and sheetmetal screws. Provide headrail constructed of heavy-duty extruded 6463-T5 alloy aluminum with anti-grip design. Fastened to headrail brackets with stainless steel tamper resistant Torx head sex bolt, and fastend at the top of the pilaster with stainless steel tamper resistant Torx head screws. Headrial bracket to be 20 gauge stainless steel with satin finish, secured to the wall with stainless steel tamper resistant Torx head screws. Fabricate overhead brace from a continuous extruded aluminum tube not less than 1 inch wide by 1-1/2 inch high, 0.125 inch wall thickness. Finish is AA-C22A31 in accordance with AA DAF45. Set and secure brace into the top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

2.5 PILASTER SHOES

Provide shoes at pilasters to conceal floor-mounted anchorage. Provide stainless steel pilaster shoes. Height is a minimum 3 inches.

2.6 HARDWARE

Provide hardware for the toilet partition system that complies with CID A-A-60003 for the specified type and style of partitions. Provide hardware pre-drilled by manufacturer. Use a hardware finish that is highly resistant to alkalis, urine, and other common toilet room acids. Provide latching devices and hinges for handicap compartments complying with 36 CFR 1191 door latches that operate without either tight grasping or twisting of the wrist of the operator. Use stainless steel, tamper proof type screws and bolts. Wall mounting brackets are continuous, full height, stainless steel, in accordance with toilet compartment manufacturer's instructions. Provide floor-mounted anchorage consisting of corrosion-resistant anchoring assemblies with threaded rods, lock washers, and leveling adjustment nuts at pilasters for structural connection to floor.

2.7 COLORS AND FINISHES

2.7.1 Colors

Provide color as specified in Section 09 06 00 SCHEDULES FOR FINISHES.

Submit three samples showing color and a finished edge on two adjacent sides and core construction, each not less than 12 inch square.

2.7.2 Finishes

2.7.2.1 Finishes No. 5

Provide manufacturer's standard fire rated solid polyethylene (Finish 5) formed under high pressure rendering a single component section not less than 1 inch thick. Colors extend throughout the panel thickness.

PART 3 EXECUTION

3.1 PREPARATION

Take field measurements prior to the preparation of drawing and fabrication to ensure proper fits. Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive work. Verify correct spacing of plumbing fixtures. Verify correct location of built in framing, anchorage, and bracing. Report in writing to Contracting Officer prevailing conditions that adversely affect satisfactory execution of the work of this section. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

Do not install items that show visual evidence of biological growth. Install partitions rigid, straight, plumb, and level, with the panels centered between the fixtures. Provide a panel clearance of not more than 1/2 inch and secure the panels to walls and pilasters with continuous full height wall brackets. Locate wall brackets so that holes for wall bolts occur in masonry or tile joints. Secure panels to pilasters with brackets matching the wall brackets. Provide for adjustment due to minor floor variations. Locate head rail joints at pilaster center lines. Install adjacent components for consistency of line and plane. Equip each door with hinges, one door latch, and one coat hook and bumper. Align hardware to uniform clearance at vertical edges of doors.

a. Secure panels to hollow plastered walls with toggle bolts using not less than 1/4-20 screws of the length required for the wall thickness. Provide toggle bolts with a load-carrying strength of not less than 600 pounds per anchor.

b. Secure panels to ceramic tile on hollow plastered walls or hollow concrete-masonry walls with toggle bolts using not less than 1/4-20 screws of the length required for the wall thickness. Provide toggle bolts with a load-carrying strength of not less than 600 pounds per anchor.

c. Secure panels to solid masonry or concrete with lead or brass expansion shields designed for use with not less than 1/4-20 screws, with a shield length of not less than 1-1/2 inches. Provide expansion shields with a load-carrying strength of not less than 600 pounds per anchor.

d. Submit Installation Drawings for toilet partitions, room entrance screens, and urinal screens showing plans, elevations, details of construction, hardware, reinforcing and blocking, fittings, mountings and escutcheons. Indicate on drawings the type of partition, location, mounting height, cutouts, and reinforcement required for toilet-room accessories.

3.3 OVERHEAD-BRACED PARTITIONS

Secure pilasters to the floor with the anchorage device specified. Make all leveling devices readily accessible for leveling, plumbing, and tightening the installation. Secure overhead brace to the pilaster face with not less than two fasteners per face. Expansion shields have a minimum 2 inch penetration into the concrete slab. Make tops of doors parallel with the overhead brace when doors are in a closed position.

3.4 FINAL ADJUSTMENT

After completion of the installation, make final adjustments to the pilaster-leveling devices, door hardware, and other working parts of the partition assembly. Doors have a uniform vertical edge clearance of approximately 3/16 inch and rest open at approximately 30 degrees when unlatched.

3.5 CLEANING

Clean all surfaces and adjacent surfaces soiled as a result of the work, in an approved manner compliant with the manufacturer's recommended cleaning and protection from damage procedures until accepted. Remove all equipment, tools, surplus materials, and work debris from the site.

-- End of Section --

SECTION 10 26 00

WALL AND DOOR PROTECTION
08/20

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A167	(2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2017; Version 1.2) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

GREEN SEAL (GS)

GS-36	(2013) Adhesives for Commercial Use

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2022) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Corner Guards; G

SD-03 Product Data

Corner Guards; G
Recycled content for steel component of corner guards; S

SD-04 Samples

Corner Guards; G
SD-06 Test Reports

SD-07 Certificates

Indoor air quality for adhesives; S

SD-10 Operation and Maintenance Data

Corner Guards, Data Package 1; G

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality

1.3.1.1 Adhesives and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party program that products meet the requirements of this section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the project site in manufacturer's original unopened containers with seals unbroken and labels and trademarks intact. Keep materials dry, protected from weather and damage, and stored under cover. Store materials at approximately 70 degrees F for at least 48 hours prior to installation.

1.5 WARRANTY

Provide manufacturer's warranty to repair or replace defective materials and workmanship for a 1 year period of one year from date of final acceptance of the work.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

To the maximum extent possible, provide wall and door protection items that are standard products of a single manufacturer and furnished as detailed. Drawings show general configuration of products required, and items differing in minor details from those shown are acceptable.

Submit detailed shop drawings of each wall and door protection item indicated. Include elevations, dimensions, clearances, details of

construction and anchorage, and details of joints and connections.

Submit manufacturers' descriptive product data for each wall and door protection item indicated. Include manufacturers' literature, finishes, profiles and thicknesses of materials.

Submit manufacturers' operations and maintenance data for each wall and door protection item indicated in accordance with Section 01 78 23 OPERATIONS AND MAINTENANCE DATA.

2.2 CORNER GUARDS

2.2.1 Stainless Steel Corner Guards

Provide stainless steel base material that contains a minimum of 60 percent recycled content. Provide data identifying percentage of recycled content for steel component of corner guards. Fabricate stainless steel base material of 16 gauge thick material conforming to ASTM A167, 304. Provide corner guards that are 4feet high. Form corner guard to dimensions shown.

2.3 FINISH

Submit samples indicating color and texture of materials requiring color and finish.

2.3.1 Stainless Steel Finish

Provide stainless steel finish in accordance with ASTM A167, Type 302 or 304, finish number 4.

2.4 ADHESIVES

Provide adhesive for resilient material in accordance with manufacturers recommendations. Provide sealants and non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) that meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) the VOC content requirements of SCAQMD Rule 1168, or VOC content requirements of GS-36. Provide certification of indoor air quality for adhesives.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install items that show visual evidence of biological growth. Install items on surfaces that are clean, smooth, and free of obstructions.

3.1.1 Corner Guards

a. Mount guards as indicated and in accordance with manufacturer's written installation instructions.

3.1.1.1 Stainless Steel Guards

a. Mount guards as indicated and in accordance with manufacturer's recommendations.

b. Where corner guards are installed on walls, partitions or columns finished with plaster or ceramic tile, anchor corner guards as indicated. Coat back surfaces of corner guards, where shown, with a non-flammable, sound deadening material.

c. Where corner guards are installed on exposed structural glazed facing tile units or masonry wall, partitions or columns, anchor corner guards as indicated. Grout spaces solid between guards and backing with portland cement and sand mortar.

d. Where corner guards are installed on gypsum board, clean surfaces and anchor guards with a neoprene solvent-type contact adhesive specifically manufactured for use on gypsum board construction. Remove excess adhesive from the guard edges and allow to cure undisturbed for 24 hours.

-- End of Section --

SECTION 10 28 13

TOILET ACCESSORIES
08/20

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-1691	(1994; Rev F) Construction and Material Schedule for Military Medical and Dental Facilities

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Product Schedule; G

Submit product Schedule indicating types, quantities, sizes, and installation locations by room for each toilet accessory item required. Identify locations using room designations indicated on the drawings.

SD-03 Product Data

Recycled content for stainless steel toilet accessories; S

Item A5083 Dispenser, Paper Towel, Recessed; G

Item A5090 Disposal, Sanitary Napkin, SS, Surface Mounted; G

Item A5109 Grab Bar, 1-1/4 inch Dia., SS, 2 Wall, W/C Accessible; G

Item A5135 Shelf, Utility W/ Mop/Broom Holders, SS, Surf Mntd; G

Item A5200 Dispenser, Toilet Tissue, SS, 2-Roll, Surface Mntd; G

Mirrors, Glass (MG); G

Paper Towel Dispenser Waste Receptacle (Ptdwr); G

Soap Dispenser, Counter-Mounted; G

Seat Cover Dispenser (Scd); G

Recycling Bins; G

Submit catalog numbers, literature, data sheets, construction details, profiles, anchoring and mounting requirements ,including cutouts in other work and substrate preparation, and other pertinent data for each toilet accessory item to evaluate function, materials, dimensions and appearance.

SD-10 Operation and Maintenance Data

Submit Data Package 1 for each toilet accessory item in accordance with Section 01 78 23 OPERATIONS AND MAINTENANCE DATA.

1.3 DELIVERY, STORAGE, AND HANDLING

Wrap toilet accessories for shipment and storage, then deliver to the jobsite in manufacturer's original packaging, and store in a clean, dry area protected from construction damage and vandalism.

1.4 WARRANTY

Provide manufacturer's warranty to repair or replace defective materials and workmanship for a period of one year from date of final acceptance of the work.

PART 2 PRODUCTS

2.1 ACCESSORY ITEMS

Provide toilet accessories where indicated in accordance with Contractor-provided product schedule. Conform to the requirements for accessory items specified herein which are based on MIL-STD-1691 Joint Schedule Numbers (JSN). Provide each accessory item complete with the necessary mounting plates of sturdy construction with corrosion resistant surface.

Provide stainless steel products listed herein manufactured from materials containing a minimum of 50 percent recycled content. Provide data identifying percentage of recycled content for stainless steel toilet accessories.

2.1.1 Anchors and Fasteners

Provide corrosion-resistant anchors and fasteners capable of developing a restraining force commensurate with the strength of the accessory to be mounted and suited for use with the supporting construction. Provide tamperproof design exposed fasteners with finish to match the accessory. Provide fasteners proposed for use for each type of wall construction and mounting.

2.1.2 Finishes

Except where noted otherwise, provide the following finishes on metal:

Metal	Finish
Stainless steel	No. 4 satin finish
Carbon steel, copper alloy, and brass	Chromium plated, bright

2.1.3 Item A5083 Dispenser, Paper Towel, Recessed

Recess mounted paper towel dispenser with. Unit constructed of heavy gauge stainless steel with satin finish, all welded construction, have full length piano hinge and tumbler lock. Unit dispenses 300 C-fold or 400 multifold paper towels and be self-feeding until supply is depleted. Towel dispensing slot is snag-free. Unit is ADA compliant.

Approximate size: 12 inches wide by 17 inches high by 4 inches deep.

2.1.4 Item A5090 Disposal, Sanitary Napkin, SS, Surface Mounted

Surface mounted sanitary napkin receptacle. Unit made of stainless steel with satin finish and all welded construction. Unit has piano hinge attached at the top and an integral finger depression for opening. For use with disposable paper liners, available separately. Unit may be attached to wall or toilet partition.

Approximate size: 7 inches wide by 4 inches deep by 10 inches high.

2.1.5 Item A5109 Grab Bar, 1-1/4 Inch Diameter, SS, 2 Wall, W/C Accessible

Grab bar of 1-1/4 inch diameter satin finish stainless steel with peened gripping surface for use in toilet stall/room. Snap-on flange covers for concealed mounting are stainless steel and equipped with two screw holes for attachment to wall. Grab bars designed to meet and exceed ADA requirements for structural strength. Grab bars designed to withstand loads of 900 pounds when properly installed. Clearance from wall to grab bar is 1-1/2 inches to meet ADA and ANSI codes.

2.1.6 Item A5135 Shelf, Utility W/ Mop/Broom Holders, SS, Surf Mounted (MH)

Surface mounted mop/broom holder with shelf made of 18 gauge stainless steel with all exposed surfaces in satin finish. Unit has shelf 36 inches wide by 8 inches deep with shelf support brackets of satin finish stainless steel welded to mounting base, and a minimum of 4 holders. Mop holders have spring-loaded rubber cams and hold mop or broom handle with a diameter between 5/8 inch and 1 inch.

Approximate size: 36 inches wide by 8 inches deep.

2.1.7 Item A5200 Dispenser, Toilet Tissue, SS, 2-Roll, Surface Mounted (TTD)

Concealed surface mounted, double roll, toilet tissue dispenser of stainless steel. Unit holds and dispenses two standard 5-1/4 inch diameter rolls of toilet tissue. Spindles are free-spinning for non-controlled delivery, chrome-plated plastic equipped with heavy-duty internal springs.

Approximate size: 7 inches diameter by 4 inches deep.

2.1.8 Mirrors, Glass (MG)

Provide Type I transparent flat type, Class 1-clear glass for mirrors. Glazing Quality q1 1/4 inch thick conforming to ASTM C1036. Coat glass on one surface with silver coating, copper protective coating, and mirror backing paint. Provide highly adhesive pure silver coating of a thickness which provides reflectivity of 83 percent or more of incident light when viewed through 1/4 inch thick glass, free of pinholes or other defects. Provide copper protective coating with pure bright reflective copper, homogeneous without sludge, pinholes or other defects, of proper thickness to prevent "adhesion pull" by mirror backing paint. Provide mirror backing paint with two coats of special scratch and abrasion-resistant paint and baked in uniform thickness to provide a protection for silver and copper coatings which will permit normal cutting and edge fabrication.

Frame to be 18-8 heavy-gauge stainless steel, 3/4 by 3/4 inch angle with satin finish. Frame will be one-piece, roll-formed construction forming continuous integral stiffener on all sides. Heliarc weld corners of frame and grind and polish smooth. Provide galvanized steel back fastened to back of frame with concealed screws. Equip frame with integral horizontal hanging brackets near top and bottom. Provide locking devices to secure mirror to concealed wall hanger.

2.1.9 Paper Towel Dispenser Waste Receptacle (PTDWR)

Provide paper towel dispenser / disposal with a capacity of 600 sheets of C-fold or multifold towels. Design waste receptacle will be locked in unit and removable for service. Provide tumbler key locking mechanism. Waste receptacle capacity will be 12 gallons. Fabricate a minimum 0.03 inch stainless steel welded construction unit with all exposed surfaes having a satin finish. Provide waste receptacle tha accepts reusable liner standard for unit manfacturer.

2.1.10 Soap Dispenser, Counter-Mounted

Provide counter-mounted, pump soap dispenser with 6 inch stainless steel spout with plunger that requires less than 5 lbs of force to activate. Soap dispenser to hold 32 ounces of liquid soap.

2.1.11 Seat Cover Dispenser (SCD)

Surface mounted unit constructed of stainless steel with satin finish, welded construction, and have full length piano hinge, tumbler lock, refill indicator. Unit has smooth corners, free of burrs and sharp edges. Unit has a capacity of 250 seat covers.

2.1.12 Recycling Bins

Provide heavy-duty, crack resistant, plastic recycling bins, 18 inches by 18 inches by 30 inches tall, minimum 30 gallons. Each bin to have a lid. Recycling containers to be blue with recycling symbol. Provide recycling for paper, glass, plastic, cardboard and metals.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install items that show visual evidence of biological growth. Provide the same finish for the surfaces of fastening devices exposed after installation as the attached accessory. Provide oval exposed screw heads. Install accessories at the location and height indicated. Protect exposed surfaces of accessories with strippable plastic or by other means until the installation is accepted. After acceptance of accessories, remove and dispose of strippable plastic protection. Coordinate accessory manufacturer's mounting details with other trades as their work progresses. Use sealants for brackets, plates, anchoring devices and similar items in showers (a silicone sealantsealant specified in Section 07 92 00 JOINT SEALANTS) as they are set to provide a watertight installation. After installation, thoroughly clean exposed surfaces and restore damaged work to its original condition or replace with new work.

3.1.1 Recessed Accessories

Fasten accessories with wood screws to studs, blocking or rough frame in wood construction. Set anchors in mortar in masonry construction. Fasten to metal studs or framing with sheet metal screws in metal construction.

3.1.2 Surface Mounted Accessories

Mount on concealed backplates, unless specified otherwise. Conceal fasteners on accessories without backplates. Install accessories with corrosion-resistant fasteners as required by the construction. Install backplates in the same manner, or provide with lugs or anchors set in mortar, as required by the construction. Fasten accessories mounted on gypsum board and plaster walls without solid backing into the metal or wood studs, or to backplates secured to metal studs.

3.2 CLEANING

Clean material in accordance with manufacturer's recommendations. Do not use alkaline or abrasive agents. Take precautions to avoid scratching or marring exposed surfaces.

-- End of Section --

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SECTION 10 44 16

FIRE EXTINGUISHERS
11/19

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 1	(2021) Fire Code
NFPA 10	(2022; ERTA 1 2021) Standard for Portable Fire Extinguishers
NFPA 101	(2021; TIA 21-1) Life Safety Code
NFPA 241	(2022) Standard for Safeguarding Construction, Alteration, and Demolition Operations
NFPA 385	(2022) Standard for Tank Vehicles for Flammable and Combustible Liquids
NFPA 409	(2022) Standard on Aircraft Hangars
NFPA 418	(2021; ERTA 1 2022; ERTA 2 2022) Standard for Heliports
NFPA 505	(2018) Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.106	Flammable Liquids
29 CFR 1910.157	(2003) Portable Fire Extinguishers

UNDERWRITERS LABORATORIES (UL)

UL 299	(2012; May 2021) Dry Chemical Fire Extinguishers
UL 2129	(2017; Reprint Apr 2021) UL Standard for Safety Halocarbon Clean Agent Fire Extinguishers

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality

Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop DrawingsSchedule; GSD-03 Product Data

Fire Extinguishers; G

Cabinets; G

Wall Brackets; G

Replacement Parts List; G

Equipment; G

SD-04 Samples

Wall Brackets; G

Accessories; G

Equipment Samples

SD-07 CertificatesFire Extinguishers Certifications; GManufacturer's Warranty with Inspection Tag; G

1.3 DELIVERY, STORAGE, AND HANDLING

Protect materials from weather, soil, and damage during delivery, storage, and construction.

Deliver materials in their original packages, containers, or bundles bearing the brand name and the name and type of the material.

Provide portable fire extinguishers in compliance with NFPA 505 for all ancillary vehicles where Fire Safety Standard for Powered Industrial Trucks, including type designations, special conditions relating to areas of use, conversions, maintenance, or specific operations apply.

1.3.1 Samples

Provide the following equipment samples: One of each type of fire extinguisher being installed; three samples of wall brackets and accessories of each type being used.

Use approved samples for installation, with proper identification and storage.

1.4 WARRANTY

Guarantee that Fire Extinguishers are free of defects in materials, fabrication, finish, and installation and that they will remain so for a period of not less than 6 years after completion.

Submit the manufacturer's warranty with inspection tag.

1.5 PROJECT SCHEDULE

For fire extinguishers. Coordinate final fire extinguisher schedule with fire protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

PART 2 PRODUCTS

Submit fabrication drawings consisting of fabrication and assembly details performed in the factory and product data for the following items: Fire Extinguishers; Accessories, cabinets,and Wall Brackets.

2.1 SYSTEM DESCRIPTION

2.1.1 Types

Submit fire extinguishers certifications showing compliance with local codes and regulations.

Provide fire extinguishers conforming to NFPA 10. Provide quantity and placement in compliance with the applicable sections of NFPA 1, NFPA 101, , NFPA 241, , NFPA 385, NFPA 409, NFPA 418,29 CFR 1910.106 and 29 CFR 1910.157.

Provide dry chemical type fire extinguishers compliant with UL 299.

Provide clean agent type fire extinguishers compliant with UL 2129.

2.1.2 Size

10 pounds extinguishers.

2.1.3 Accessories

Forged brass valve

Fusible plug

Safety release

Antifreeze

Pressure gage

2.2 EQUIPMENT

2.2.1 Cabinets

2.2.1.1 Material

Provide powder-coated steel or aluminum cabinets.
Color: Black

2.2.1.2 Type

Provide surface type cabinets.

2.2.1.3 Size

Dimension cabinets to accommodate the specified fire extinguishers.

2.2.2 Wall Brackets

Provide wall bracket and accessories as approved.

2.2.2.1 Identification

Provide lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by the drawings.

Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in black letter decals applied to mounting surface.

Orientation: Vertical.

PART 3 EXECUTION

3.1 INSTALLATION

Install Fire Extinguishers where indicated on the drawings. Verify exact locations prior to installation.

Provide extinguishers which are fully charged and ready for operation upon installation. Provide extinguishers complete with Manufacturer's Warranty with Inspection Tag attached.

Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

Comply with the manufacturer's recommendations for all installations.

3.2 PROTECTION

3.2.1 Repairing

Remove and replace damaged and unacceptable portions of completed work with new work at no additional cost to the Government.

Submit replacement parts list indicating specified items replacement part, replacement cost, and name, address and contact for replacement parts distributor.

3.2.2 Cleaning

Clean all surfaces of the work, and adjacent surfaces which are soiled as a result of the work. Remove from the site all construction equipment, tools, surplus materials and rubbish resulting from the work.

-- End of Section --

SECTION 10 51 16

CELL PHONE LOCKERS
03/22

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval.Submittals with an "S" are for inclusion inthe Sustainability eNotebook, in coformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Materials; G

SD-03 Product Data

Manufactured Units; G

1.2 QUALITY ASSURANCE

Manufacturer Qualifications: Manufacturer shall have a Quality System in place to ensure and be able to substantiate that manufactured units conform to requirements and match the approved design and must be ISO 9001:2015 certified.

1.3 DELIVERY, STORAGE, AND HANDLING

Store products in manufacturer's unopened packaging until ready for installation.

Cell phone locker components are shipped assembled. All finishes shall be protected from soiling and damage during handling.

1.4 WARRANTY

Manufacturer's standard warranty to repair or replace components of cell phone locker products that fail in materials or workmanship within 3 years from date of substantial completion.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Cell phone lockers with front access panel.

2.2 MATERIALS

Constructed entirely of heavy duty aluminum; durable powder coated finish.

2.3 MANUFACTURED UNITS

Cell Phone Locker with Front Access Panel.

a. Free standing

1. 7 door high by 5 door wide units, 35 total compartments.

b. Unit Width: 37 inches.

c. Unit Height: 66.5 inches.

d. Unit Depth

1. Overall Depth: 9-1/4 inches.

2. Compartment Depth: 8 inches.

e. Lock Type: Resettable combination locks with Master control key.

f. Unit Color: Aluminum.

g. Card Holder: Clear plastic, 2 x 5/8 inches.

h. Hinges: Built-in continuous.

PART 3 EXECUTION

3.1 EXAMINATION

Do not begin installation until substrates have been properly prepared.

If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

Clean surfaces thoroughly prior to installation. Clean surfaces with mild dish detergent. Do not use harsh abrasive cleaners. Lubricate locks with graphite type lubricants only. Contractor to coordinate placement of support blocking in the wall during construction if required. Freestanding locker is mounted to the wall for stability.

3.3 INSTALLATION

a. Install in accordance with manufacturer's installation instructions.

b. Anchor the units to the wall studs through the locker back.

3.4 PROTECTION

a. Protect installed products until completion of project.

b. Touch-up, repair or replace damaged products before substantial completion.

-- End of Section --

SECTION 10 53 01

MANUFACTURED CANOPY
10/23

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 621	(2002) Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) & Zinc-Aluminum Coated Steel Substrates

ASTM INTERNATIONAL (ASTM)

ASTM D 2244	(2011) Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D 4214	(2007) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Manufactured Canopy; G

Submit shop drawings showing structural component locations/positions, material dimensions and details of construction and assembly.

SD-03 Product Data

Manufactured Canopy; G

Submit manufacturer’s standard literature and specifications for canopy.

1.3 DESCRIPTION OF WORK

a. Work in this section includes furnishing and installation of extruded aluminum overhead hanger rod style canopy.

b. Related Items and Considerations:

1. Flashing of various designs may be required. Generic flashing supplied by manufacturer. Specialty flashing to be supplied by installer.

2. Determine wall construction, make-up and thickness.

1.4 FIELD MEASUREMENT

Confirm dimensions prior to preparation of shop drawings when possible.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver and store all canopy components in protected areas.

1.6 WARRANTY

1.6 Special Warranty on Panel Finishes

Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

a. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

1. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

2. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

3. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

b. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURED CANOPY

a. Decking shall be 2-3/4 inch square corrugated,3 inch extruded flat soffit, 0.078 inch aluminum decking.

b. Fascia shall be standard 10 inch extruded C-Channel style(minimum 0.125 inch aluminum).

c. Hanger rods, escutcheon plates and attachment hardware shall be powder coated to match canopy.

d. Intermediate framing members shall be extruded aluminum, alloy 6063-T6, in profile and thickness standard with the canopy manufacturer.

e. Decking and fascia shall be extruded aluminum, alloy 6063-T6, in profile and thickness specified and shown on the drawings.

f. Flashing shall be aluminum finished to match canopy.

2.2 FINISHES

Finish shall be 2-Coat Fluoropolymer, AAMA 621. Fluoropolymer finish shall contain not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

a. Color: As indicated in the Exterior Materials Legend on the Drawings.

2.3 FABRICATION

a. All connections shall be mechanically assembled utilizing 3/16 inch fasteners with a minimum shear stress of 350 lb. Pre-welded or factory-welded connections are not acceptable.

b. Decking shall be designed with interlocking extruded aluminum members with mechanical fasteners field applied to provide structural integrity for the completed assembly.

c. Concealed drainage: Water shall drain from covered surfaces into integral fascia gutter and be directed to the front outside corners for front drainage.

PART 3 EXECUTION

3.1 INSPECTION

a. Confirm that surrounding area is ready for the canopy installation.

b. Installer shall confirm dimensions and elevations to be as shown on drawings provided by manufacturer.

c. Erection shall be performed by an approved installer and scheduled after all concrete, masonry and roofing in the area is completed.

3.2 INSTALLATION

Installation shall be in strict accordance with manufacturer’s shop drawings. Particular attention shall be given to protecting the finish during handling and erection.

3.3 CLEANING

After installation, entire system shall be left in a clean condition.

-- End of Section --

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SECTION 11 01 50

FALL PROTECTION SYSTEMS
08/08

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this Specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z359	Fall Protection Code Package, Version 3.0
ANSI Z359.1	(2020) The Fall Protection Code

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

CFR 29 Part 1926	Safety and Health Regulations for Construction

1.2 SYSTEM DESCRIPTION

Provide fall arrest system components consisting of trolleys, decelerating devices, and harnesses which allow users to walk along the fuselage and wing of the aircraft. System and components shall provide user mobility to perform tasks.

1.2.1 Engineering Analysis Design Requirements

a. Fall protection systems to be designed by a Registered Professional Engineer experienced in the design of fall protection systems.

b. Fall protection system and components shall be rated for 900 pound maximum arresting force.

c. Fall protection systems shall be designed for the number of users per 2.1, each weighing up to 310 pounds with tools.

d. Dynamic and dead load reactions shall be generated for all intermediate and end supports of the fall protection system.

e. Design of all fall protection systems to safely resist the dynamically applied loads while maintaining a safety factor of two against failure. Systems shall support full impact of falls vertically and at inclines up to 30 degree angle.

f. Design of fall protection systems shall be based on the understanding that the overhead structural steel supports are adequate to support the imposed loads. Contractor shall coordinate fall protection requirements with metal building system.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation;

submittals not having a "G" designation are for for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fall Protection System; G, AE

Sealed an signed by licensed Professional Engineer responsible for preparation of engineering analysis who thereby certifies preparing or supervising preparation of data to comply with specified requirements and recognized engineering principles and practices. Show plans, elevations, sections, and large-scale details indicating coordination with building structure and relationships with other construction. Indicate maximum dynamic and static loads imposed on building structure at points of support. Indicate details of adjoining Work, even though not included in Work of this Section, to ensure coordination of Work and Work of other Sections. Schedule and describe anchorage assemblies and their related components. Include data for capacity of each type of fastener for its intended use. Reference detail numbers where applicable.

SD-03 Product Data

Deceleration Devices; G, AE

Trolleys; G, AE

Harness; G, AE

Include capacities, sizes, performances, test certifications, operations, safety features, finishes, and similar information.

SD-05 Design Data

Engineering Analysis; G, AE

Sealed and signed by licensed Professional Engineer who thereby certifies preparing or supervising preparation of data to comply with specified requirements and recognized engineering principles and practices. Include computations for justification of framing elements or sections, connections including fasteners and welds and anchorage assemblies required to support the fall protection system. Provide loads delivered to the roof framing system for verification by the Engineer of Record.

SD-07 Certificates

Fall Protection System; G

Signed by manufacturer certifying that system components comply with requirements and compliance with Contract Documents and approved Drawings and calculations.

SD-09 Manufacturer's Field Reports

Attendee List

Submit list of attendees at training class in the use care and maintenance of fall protection equipment.

Operational Test; G

Provide letter of certification from licensed Design Engineer indicating completion of operational testing on installed systems.

SD-10 Operation and Maintenance Data

Fall Protection System; G

For fall protection system to include in emergency, operation, and maintenance manuals. Include complete parts list. Include operation procedures for proper use of equipment for safe operation of systems.

1.4 QUALITY ASSURANCE

1.4.1 Manufacturer Qualifications

Manufacturer must have produced fall protection systems identical or similar to those required for this Project.

1.4.2 Installer Qualifications

System manufacturer or manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1.4.3 Professional Engineer Qualifications

Professional Engineer shall be registered in the State that the Work is to take place and be employed by the fall protection manufacturer as a full time fall arrest systems designer.

1.5 PROJECT CONDITIONS

1.5.1 Field Measurements

Verify field measurements and indicate measurements on Shop Drawings to ensure required fit.

1.6 DELIVERY, STORAGE, AND HANDLING

Deliver, store, and handle materials, components, and equipment in manufacturer's original unopened protective packaging. Store materials, components, and equipment in original unopened protective packaging off of ground, under cover, and in a dry location. Handle according to manufacturer's written recommendations to prevent damage, deterioration, or soiling.

1.7 WARRANTY

Provide 5 year warranty for fall protection system to cover defects in materials and workmanship.

PART 2 PRODUCTS

2.1 SYSTEM DESIGN

Fall arrest system manufacturer shall provide primary and secondary framing, and bracing required to transmit fall protection loads to the building structural system. Fall arrest system shall be designed to protect the user while they are attached to rail system. System shall be designed for three users per line, one each over fuselage and wings as illustrated on the structural drawings.

2.1.1 Components

2.1.1.1 Deceleration Devices

Provide (1) self retracting lanyard per user appropriately sized in accordance with ANSI Z359 and meeting the following requirements:

a. Maximum Load: 310 pounds.

b. Weight: 20 pounds.

c. Construction: Heavy duty sealed aluminum casing with 3/16 inch minimum stainless steel wire rope.

d. Fall Arrest Forces: Less than 900 pounds.

2.1.1.2 Access

a. Provide personnel access from the ground unless noted otherwise.

2.1.1.3 Harness

Provide one harness for each user for which the system is designed. Meet or exceed applicable standards of ANSI Z359.1, CFR 29 Part 1926.

2.1.1.4 Trolleys

Provide one trolley per user, compatible with the structural steel rigid beam rail illustrated on the structural drawings.

2.2 MATERIALS

Fasteners shall be designed and provided by fall protection system manufacturer. Fasteners shall be designed to support a load on the system of two times the maximum design load without failure. Structural steel supporting members supplied by the fall protection manufacturer shall comply with Section 05 12 00 STRUCTURAL STEEL.

2.3 FABRICATION

System components shall be of same material unless otherwise indicated. Exposed work shall be true to line and level with accurate angles, surfaces and with straight, square edges. Coordinate anchorage system with supporting structure. Fabricate anchoring devices as recommended by the manufacturer to provide adequate support for intended use.

PART 3 EXECUTION

3.1 INSTALLATION

Install according to the approved Shop Drawings and manufacturer's instructions. Install anchorage and fasteners in accordance with manufacturer's recommendations to obtain the allowable working loads published in the product literature and in accordance with this Section. Do not load or stress fall arrest system until all materials and fasteners are properly installed and ready for service.

3.2 FIELD QUALITY CONTROL

3.2.1 Post-Erection Inspection

After erection, Contractor and Contracting Office shall jointly inspect installed system and components to determine compliance with Specifications and approved submittals.

3.2.2 Operational Test

After erection and inspection, test the fall protection system in service to determine that each component of system operates as specified, is properly installed and adjusted, and is free from defects in material, manufacture, installation, and workmanship. Rectify deficiencies disclosed by testing and retest system or component to prove that system is fully operational.

3.2.3 Operator Training

Provide a minimum of four hours of operator training after system has been installed and proof tested. Training is to be for the users of the system conducted at the Installation Site. The Contractor shall submit attendee list.

3.3 CLEANING

Remove loose materials, crating, and packing materials from premises.

-- End of Section --

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SECTION 11 94 11

ROOFTOP CABLE FALL PROTECTION SYSTEM
05/23

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z359.1	(2020) The Fall Protection Code

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1926.104	(most current edition) Safety Belts, Lifelines, and Lanyards

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Design Drawings; G

SD-03 Product Data

Components; G

Provide manufacturer's data and product information for manufactured materials and products indicating the sizes, descriptions, capacities, test certifications, and other descriptive data showing in sufficient detail that the product complies with the contract requirements.

SD-07 Certificates

Certificates of insurance; G

Manufacturer's Certification; G

Material Test Certificates; G

SD-10 Operation and Maintenance Data

Systems Manuals; G

1.3 QUALITY ASSURANCE

1.3.1 Design Qualifications

System Layout, Design Analysis, and Calculations shall be prepared and certified by a Licensed Professional Engineer, registered in the state or jurisdiction where the job will be conducted. This engineer shall be employed by the Fall Protection Contractor as a full time fall arrest systems designer.

1.3.2 Design Requirements

1.3.2.1 Structural Review

The fall protection contractor's qualified engineer shall verify that the structural system to which the fall protection system will be attached is capable of supporting the potential loads imposed in a fall event.

1.3.3 Contractor Qualifications

1.3.3.1 Insurance

The Fall Protection Contractor shall maintain all appropriate insurances as applicable for the design and installation of fall protection systems. Proof of these insurance listings shall be supplied as part of Submittals listed in Article 1.2.

1.3.3.2 Certification

The Fall Protection Contractor shall be fully certified by the manufacturer in the design, installation and certification of the fall protection system and shall have a minimum of 5 years full time experience with similar systems. Proof of manufacturer's approval shall be in the form of a copy of the Contractor's current certificate issued by the manufacturer and supplied as part of Submittals listed in Article 1.2. Any subcontractors utilized by the Fall Protection Contractor shall meet the same qualifications required in this specification.

1.3.3.3 Licensing

The Fall Protection Contractor shall maintain contractor licensing as required by the state in which the project is performed.

1.3.3.4 Quality Control

The Fall Protection Contractor and the fall protection system manufacturer shall maintain quality control procedures in accordance with ISO 9001. For standards other than ISO 9001, the Contractor shall submit their quality control procedures to the Contracting Officer for approval prior to bid.

1.3.3.5 Installation Technicians

a. Lead installation technician shall be fully trained by manufacturer in the installation of the specific system to be installed.

b. The lead installer shall have performed a minimum of five previous similar projects.

c. The lead installer shall have current training and certification in first aid, CPR/AED, man lift operation and forklift operation.

d. The lead installer shall have current OSHA 30 hour certification.

e. Copies of training certificates shall be kept at the Fall Protection Contactors location and will be made available upon request.

1.4 PROJECT CONDITIONS

a. Preconstruction Site Survey: Contractor shall send a designated project manager to the site, prior to installation.

b. Form the basis of the design of the proposed solution.

c. Verify that the fall protection design proposed in the bid documents provides a safe and compliant system that fully protects the users.

d. Field verify system layout to ensure required fit and dimensions.

e. Review the construction schedule to ensure timely project execution.

f. Review site specific safety requirements and obtain a list of any site specific pre installation safety training requirements.

g. Coordinate any work done in conjunction with any other contractors. (i.e.. Roofers or Mechanical/Electrical/HVAC contractors).

1.5 DELIVERY, STORAGE, AND HANDLING

Store and stage materials in protective packaging at location specified. Prevent soiling, physical damage or wetting.

PART 2 PRODUCTS

2.1 SYSTEM DESIGN

Provide Fall Protection Systems to allow users to walk uninterrupted the entire length of each system and provide secure anchorage to arrest a fall by the users. All components, including user equipment, shall be included, so as to provide a complete and fully operational system. The fall protection systems shall be supported by rooftop anchors which are permanently attached to the roof structure. This system is not to be designed or utilized for suspended equipment operations.

a. The Fall Arrest Systems shall be designed to fully protect the user at all times while in the area of potential fall hazard.

b. The Fall Arrest Systems shall be designed for 2 simultaneous users for each system.

c. Deceleration Device: Provide 4 appropriate length lanyards that meet or exceed applicable standards of ANSI Z359.1 and 29 CFR 1926.104.

d. Harnesses: Provide 4 full body harnesses with single back D-ring

that meet or exceed applicable standards of ANSI Z359.1 and 29 CFR 1926.104.

2.1.1 Design Drawings

Submit pre-installation design drawings and system specifications, with each page stamped by the designing engineer. Include the following:

a. A statement defining the type of system: fall arrest, fall restraint, etc.

b. A drawing showing the layout of the system, including where it is located on the structure and the complete assembly of all components. The drawings shall be specific to the site and location of the project.

c. A specification of the number, location and qualifications of workers using the system.

d. Specifications for all components, including sizes and minimum breaking strengths. The specifications shall reference applicable standards and/or fully specify the makes and models of the components.

e. A description of any proof testing required before the system may be put into use.

f. A specification of any environmental limitations on the use of the fall protection system, such as chemical, temperature, radiation or weather factors that may temporarily or permanently render the system unsafe to use.

g. Information on the expected performance of the system:

1. Maximum arrest load
2. Maximum loadings of all components
3. Cable Sag
4. Deflection
5. Deployment of energy absorber
6. Maximum arrest force

2.2 SYSTEM DESCRIPTION

a. System shall not have internal components that cannot be visually inspected.

b. Cable system components shall be of stainless steel construction unless otherwise indicated. Exposed work shall be true to line and level with accurate angles, surfaces and with straight square edges.

c. All primary cable system components shall be of same material unless otherwise indicated. Exposed work shall be true to line and level with accurate angles, surfaces and with straight square edges. Coordinate anchorage system with supporting structure. Fabricate anchoring devices as recommended by the manufacturer to provide adequate support for intended use.

d. Fabricate Joints in a manner to discourage water accumulation. Provide weep holes to drain any water, which could accumulate in the exposed joints.

2.3 COMPONENTS

2.3.1 Rooftop Energy Absorbing Anchor Posts

Designed to limit load in the event of a fall and absorb the energy integrally. The body of the anchorage is to deploy in the event of a fall pulling the fixings in shear and preventing damage to the roof system. Based on compliance with the manufacturer's structural requirements, the posts shall be attached as follows:

Attachment to structure through base plate shall be by means of bolts through roof to structure below or by welding or bolting to roof support structure, as designed by system manufacturer.

2.3.2 Anchorage Fabrications

Carbon steel construction and designed to withstand the maximum fall arrest forces with a minimum safety factor of two. Steel shall be structural grade with material test certificates for full material traceability. The rooftop anchor posts shall not have internal components that cannot be visually inspected.

2.3.3 Horizontal Lifeline Cable

Stainless Steel AISI 316L 8mm diameter 7x7 or 1x19 wire rope with a minimum breaking strength >37kN.

2.3.4 Swaging

The cable shall be swaged in-line with the anchor point. Each swage is to be proof tested according to the manufacturer's requirements. Cable clamps shall not be utilized for termination of the engineered horizontal lifeline system.

2.3.5 Shock Absorber

When the engineering design dictates the use of load limiting in-line shock absorbers, the shock absorber shall visually display deployment in the event a fall has occurred on the system. In-line shock absorbers must be utilized in systems where the loads exceed the structural ability of the support structure. Shock Absorbers shall not have internal components that cannot be visually inspected.

2.3.6 Cable Trolley

Stainless Steel Z8CND17 04. The cable trolley shall allow for pass-through of intermediate support points without disconnecting from the system.

2.3.7 Tension Indicator

The system shall include a tension indicator that will allow the user to physically inspect and determine that the correct inline cable tension is achieved.

2.3.8 Fasteners

The Fall Arrest Systems shall be attached to the supporting structure with appropriate fasteners. The fasteners shall be designed to support a load on the system of 2 times the maximum design load without failure.

2.4 MATERIALS

a. All materials shall be new, and completed Fall Protection System shall be the product of one manufacturer or the manufacturer's authorized installer regularly engaged in the design and production of such equipment.

b. Primary cable assembly components shall be manufactured from stainless steel. Fabricated supports required for additional support shall be carbon steel with a corrosion resistant finish.

c. Material Control: All critical cable assembly components shall contain batch numbers or serial numbers, permanently stamped or engraved, identifying the specific job and system they are used for. These numbers shall be recorded in the system manual as described in Article 1.2 and forwarded to the Contracting Officer upon completion of the project.

PART 3 EXECUTION

3.1 EXAMINATION

a. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of fall protection equipment.

b. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

a. Fall Protection Systems shall be installed by Fall Protection Contractor's authorized and trained personnel that have been certified by the manufacturer. Install anchorage and fasteners in accordance with the approved design drawings. Posts attached to roof support structure shall be centered over the structural member below. If the installation of the anchor posts is not performed by the fall protection contractor, then the posts installation shall be inspected, load tested and verified by the fall protection contractor.

b. Install engineered horizontal lifeline systems according to the approved design drawings and manufacturer's instructions. Do not load or stress the Fall Protection Systems until all materials and fasteners are properly installed and ready for service. Only an installation technician that is fully trained by manufacturer in the installation of the specific system shall perform the installation of the engineered lifeline system.

3.3 OPERATOR TRAINING

a. Fall Protection Contractor will provide operator orientation training on the inspection, use and maintenance of the supplied system after it has been installed and proof tested. Training is to be for the users of the system conducted at the installation site.

b. Depending on the complexity and scope of the project, operator orientation training may take a minimum of 30 minutes up to a maximum of one hour per class. Fall Protection Contractor shall provide

multiple classes up to a four hour maximum.

3.4 CLEANING

Remove all loose materials, crating and packing materials from premises.

3.5 CLOSEOUT ACTIVITIES

3.5.1 Systems Manuals

Contractor shall furnish a manual including the following:

a. Maintenance Procedures: Including parts list and maintenance requirements for all equipment.

b. Operation Procedures: Indicating proper use of equipment for safe operation of the systems.

c. Test Certificate: Indicating completion of proof load testing on installed systems.

d. Product Certificate: Containing the manufacturer's serial number, name and part number of each individual component used in the systems. Manufacturer's catalog data indicating the sizes, descriptions, capacities, test certifications, and other descriptive data showing sufficient detail that the product complies with the contract requirements shall be submitted for approval.

3.5.1.1 Record Drawings

A copy of as-constructed drawings and system specifications, with each page stamped by the designing engineer, shall also be included in the systems manual.

3.5.1.2 Manufacturer's Instructions

Instructions for use of the supplied fall protection system and user equipment.

a. Horizontal lifeline system
b. Rooftop Energy Absorbing Anchor Post
c. Cable Trolley
d. Full body harness
e. Lanyards

3.5.2 Demonstration

Demonstrate operation of system to Owner's personnel.

a. Briefly describe function, operation, and inspection of each component.

3.5.3 Training

Train Owner's personnel on operation and inspection of system at the completion of the installation.

a. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

b. Provide minimum of one hour of training.

c. Location: At project site.

-- End of Section --

SECTION 12 24 13

ROLLER WINDOW SHADES
08/20

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI/WCMA A100.1	(2018) American National Standard for Safety of Window Covering Products

ASTM INTERNATIONAL (ASTM)

ASTM G21	(2015; R 2021; E 2021) Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 701	(2023; ERTA 1 2023) Standard Methods of Fire Tests for Flame Propagation of Textiles and Films

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

UNDERWRITERS LABORATORIES (UL)

UL 325	(2017; Reprint Feb 2020) UL Standard for Safety Door, Drapery, Gate, Louver, and Window Operators and Systems
UL 2818	(2022) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" classification. Submittals not having a "G" classification are for Contractor Quality Control approval. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES

SD-02 Shop Drawings

Detailed Drawings; G

Location Schedule; G

SD-03 Product Data

Window Shades; G

Recycled Content for various fiber components; S

SD-04 Samples

Window Shades; G

SD-06 Test Reports

Flammability Requirements; G

SD-07 Certificates

Indoor Air Quality for roller window shades; S

Qualifications

SD-10 Operation and Maintenance Data

Window Shades, Data Package 1; G

SD-11 Closeout Submittals

Submit Data Package 1 for roller window shades, and Data Package 2 for electrical operators, in accordance with Section 01 78 23 OPERATIONS AND MAINTENANCE DATA.

1.3 CERTIFICATES

1.3.1 Indoor Air Quality Certifications

1.3.1.1 Roller Window Shades

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide validation by other third-party program that products meet the requirements of this paragraph. Provide current product certification documentation from certification body.

1.4 QUALITY ASSURANCE

1.4.1 Qualifications

1.4.1.1 Installer's Qualifications

Installer trained and certified by the manufacturer with a minimum of ten years of experience in installing products comparable to those specified in this section.

1.4.2 Flammability Requirements

Passes in accordance with NFPA 701 small and large-scale vertical burn. Materials tested are identical to products proposed for use.

1.4.3 Electrical Requirements

NFPA Article 100 listed and labeled in accordance with UL 325 or other testing agency acceptable to authorities having jurisdiction, marked for intended use, and tested as a system. Individual testing of components is not acceptable in lieu of system testing.

1.4.4 Anti-Microbial Requirements

'No Growth' per ASTM G21 results for fungi ATCC9642, ATCC 9644, ATCC9645.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver components to the jobsite in the manufacturer's original packaging with the brand or company name, item identification, and project reference clearly marked. Store components in a dry location that is adequately ventilated and free from dust, water, or other contaminants and has easy access for inspection and handling. Store materials flat in a clean dry area with temperature maintained above 50 degrees F. Do not open containers until needed for installation unless verification inspection is required. Handle and store shades in accordance with manufacturer's recommendations.

1.6 WARRANTY

Provide manufacturer's warranty to repair or replace defective materials and workmanship for a period of 10 years from date of final acceptance of the work.

PART 2 PRODUCTS

2.1 WINDOW SHADES

Submit drawings showing plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to work. Submit a location schedule showing location, size and quantity of shades. Include the use of same room designations as indicated on the drawings.

Provide product data composed of catalog cuts, brochures, and operating and maintenance instructions on each product to be used. Include styles, profiles and features.

Furnish samples of each type and color of roller shade fabric and roller shade channel. Provide shade material minimum 6 by 6 inches in size. Mark face of material to indicate interior faces.

Submit fire resistance data, flame spread and smoke contribution data.

Provide roller tube that operates smoothly and of sufficient diameter and thickness to prevent excessive deflection. Provide brackets that are appropriate for ceiling mount. Provide shade cloth meeting the performance described in NFPA 701, small scale test. Treat steel features for corrosion resistance.

Provide Various Fiber Components with a minimum of 60 percent recycled content. Provide data identifying percentage of recycled content for various fiber components.
Provide certification of indoor air quality for roller window shades.

2.1.1 Manufacturer's Qualifications

Obtain roller shades through one source from a single manufacturer with a minimum of twenty years of experience and minimum of three projects of similar scope and size in manufacturing products comparable to those specified in this section. Furnish manual and motorized shades produced by the same manufacturer to provide matching appearance.

2.1.2 Manually Operated Shades with Single Rollers (RS1)

2.1.2.1 Chain-and-Clutch Operating Mechanisms

Provide continuous-loop bead chain and clutch that stops shade movement when bead chain is released; shade to be permanently adjusted and lubricated.

2.1.2.2 Bead Chains

Provide bead chain from #10 stainless steel rated to 90 lb. minimum breaking strength with pull chain tensioning device complying with ANSI/WCMA A100.1

a. Loop Length: 5 feet.

b. Limit Stops: Allows shade to stop when chain is released. Provide limit stops to prevent shade from being raised or lowered too far.

c. Chain-Retainer Type: Chain tensioner, jamb mounted.

2.1.2.3 Rollers

Provide corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shade bands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shade cloth for service.

a. Roller Drive-End Location: Right side of interior face of shades.

b. Direction of Shade cloth Roll: Regular, from back (exterior face) of roller.

c. Shade cloth-to-Roller Attachment: Manufacturer's standard method. Adhesive attachment is not acceptable.

2.1.2.4 Mounting Hardware

Provide corrosion resistant brackets or endcaps compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated. Provide hardware that allows for field adjustment or removal of shade roller tube and other operable hardware component without removal of brackets and end or center supports.

2.1.2.5 Shade Cloth

a. Shade Material: Light-filtering fabric: Openness 5 percent.

b. Shade Cloth Bottom (Hem) Bar: Steel or extruded aluminum. Provide

shade bar exposed with endcaps.

2.1.2.6 Installation Accessories

a. Front Fascia: L-shaped aluminum extrusion to conceal shade roller and hardware that snaps onto end caps without requiring exposed fasteners of any kind. Fascia can be mounted continuously across two or more shade bands. Provide manufacturers standard height fascia as required to conceal roller and shade band assembly when shade is fully open.

c. Endcaps: Extruded aluminum with universal design suitable for mounting to window mullions. Provide size compatible with roller size. Provide end cap covers matching fascia/headbox finish.

2.2 COLOR

Provide color, pattern and texture for metal trim and shade fabric as indicated in the Section 09 06 00 SCHEDULE FOR FINISHES; colors listed are not intended to limit the selection of equal colors from other manufacturers.

PART 3 EXECUTION

3.1 FIELD MEASUREMENTS

After becoming familiar with details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

3.2 ROLLER WINDOW SHADE PLACEMENT SCHEDULE

Provide window covering on all windows in CLS Office 103 and Admin 104.

3.3 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

Provide roller window shades, complete with necessary brackets, fittings, and hardware as indicated.

Perform installation in accordance with the approved detailed drawings and manufacturer's installation instructions. Install units level, plumb, secure, and at proper height and location relative to window units. Provide and install supplementary or miscellaneous items in total, including clips, brackets, or anchorages incidental to or necessary for a sound, secure, and complete installation. Do not start installation until completion of room painting and finishing operations.

3.4 CLEAN-UP

Upon completion of the installation, clean window treatments and exposed components as recommended by manufacturer. Adjust window treatment for form and appearance and proper operating condition. Repair or replace damaged units as directed by the Contracting Officer. Isolate metal parts from direct contact with concrete, mortar, or dissimilar metals. Ensure shades installed in recessed pockets can be removed without disturbing the pocket. The entire shade, when retracted, is contained inside the

pocket. For shades installed outside the jambs and mullions, overlap each jamb and mullion 0.75 inch or more when the jamb and mullion sizes permit. Include all hardware, brackets, anchors, fasteners, and accessories necessary for a complete, finished installation.

-- End of Section --

SECTION 21 13 13

WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION
05/09

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1015	(2011) Performance Requirements for Double Check Backflow Prevention Assemblies and Double Check Fire Protection Backflow Prevention Assemblies - (ANSI approved 2010)

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C104/A21.4	(2022) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C110/A21.10	(2021) Ductile-Iron and Gray-Iron Fittings
AWWA C111/A21.11	(2017) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C203	(2020) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME A13.1	(2023) Scheme for the Identification of Piping Systems
ASME B16.1	(2020) Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250
ASME B16.11	(2022) Forged Fittings, Socket-Welding and Threaded
ASME B16.21	(2021) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.3	(2021) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.4	(2021) Gray Iron Threaded Fittings; Classes 125 and 250
ASME B16.9	(2018) Factory-Made Wrought Buttwelding Fittings

ASME B18.2.2	(2022) Nuts for General Applications: Machine Screw Nuts, and Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM A135/A135M	(2009; R2014) Standard Specification for Electric-Resistance-Welded Steel Pipe
ASTM A183	(2014; R 2020) Standard Specification for Carbon Steel Track Bolts and Nuts
ASTM A193/A193M	(2023) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications
ASTM A449	(2014) Standard Specification for Hex Cap Screws, Bolts, and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
ASTM A47/A47M	(1999; R 2022; E 2022) Standard Specification for Ferritic Malleable Iron Castings
ASTM A53/A53M	(2022) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A536	(1984; R 2019; E 2019) Standard Specification for Ductile Iron Castings
ASTM A563	(2021; E 2022a) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A795/A795M	(2013) Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use
ASTM F436	(2011) Hardened Steel Washers

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-101	(2014; Rev C) Color Code for Pipelines and for Compressed Gas Cylinders

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-71	(2018) Gray Iron Swing Check Valves, Flanged and Threaded Ends

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2021; TIA 21-1) Life Safety Code
NFPA 13	(2022) Standard for the Installation of Sprinkler Systems
NFPA 20	(2022;TIA 21-1; TIA 21-2) Standard for the Installation of Stationary Pumps for Fire Protection
NFPA 1963	(2014) Standard for Fire Hose Connections
NFPA 24	(2022) Standard for the Installation of Private Fire Service Mains and Their Appurtenances

NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES (NICET)

NICET 1014-7	(2010) Program Detail Manual for Certification in the Field of Fire Protection Engineering Technology (Field Code 003) Subfield of Automatic Sprinkler System Layout

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-600-01	(2016; with Change 6, 2021) Fire Protection Engineering for Facilities

UNDERWRITERS LABORATORIES (UL)

UL 668	(2004; Reprint Jul 2016) UL Standard for Safety Hose Valves for Fire-Protection Service
UL Bld Mat Dir	(updated continuously online) Building Materials Directory
UL Fire Prot Dir	(2012) Fire Protection Equipment Directory

1.2 SYSTEM DESCRIPTION

Furnish piping, offsets, fittings, and any other accessories as required to provide a complete installation and to eliminate interference with other construction. Install sprinkler system over and under ducts, piping and platforms when such equipment can negatively effect or disrupt the sprinkler discharge pattern and coverage. Provide wet pipe sprinkler system in all areas of the building. The system shall be designed and installed in accordance with UFC 3-600-01 and NFPA 13. Pipe sizes shall be determined by hydraulic calculation. Design any portions of the sprinkler system that are not indicated on the drawings including locating sprinklers, piping and equipment, and size piping and equipment when this information is not indicated on the drawings or is not specified herein. The design of the sprinkler system shall be based on hydraulic calculations, UFC 3-600-01, and the other provisions specified herein.

1.2.1 Hydraulic Design

Hydraulically design the system to discharge a minimum density over the hydraulically most demanding floor area, determined as required by UFC 3-600-01 and the drawings. Light Hazard areas shall be 0.1 gpm/sf over 1,500, k=5.6 sprinklers. Ordinary Hazard shall be 0.2 gpm/sf over 2,500 sf with k=8 sprinklers. Do not use area reductions below those in UFC 3-600-01 Table 9-3. For areas with ceiling heights over 30 feet, utilize K=11.2 sprinklers. The minimum pipe size for branch lines in gridded systems shall be 1-1/4 inch. Hydraulic calculations shall be in accordance with the Area/Density Method of NFPA 13.

1.2.1.1 Hose Demand

Add an allowance for exterior hose streams of 250 gpm to the sprinkler system demand at the point of connection to the existing system.

1.2.1.2 Basis for Calculations

The design of the system shall be based upon Contractor performed Hydrant flow test per NFPA 291 under the direction of the Qualified Fire Protection Engineer. Historic water supply from 8/27/2019 has a static pressure of 75 psi, and a flow of 1,118 gpm at a residual pressure of 50 psi. Water supply shall be presumed available at the flange of the pressure hydrant. Hydraulic calculations shall be based upon the Hazen-Williams formula with a "C" value of 120 for steel piping, 150 for PVC and stainless steel piping, and 140 for new cement-lined ductile-iron piping. Calculations shall include a minimum pressure drop of 8 psi across the backflow preventer and a minimum 10 psi margin of safety to accomodate changes in the water supply.

1.2.1.3 Hydraulic Calculations

Submit hydraulic calculations, including a drawing showing hydraulic reference points and pipe segments and as outlined in NFPA 13, except that calculations shall be performed by computer using software intended specifically for fire protection system design using the design data shown on the drawings and shall utilize the Area/Density Method of NFPA 13. Software that uses k-factors for typical branch lines is not acceptable. Calculations shall substantiate that the design area used in the calculations is the most demanding hydraulically. Reductions in design area below those in UFC 3-600-01 Table 9-3 are not permitted.

Water supply curves and system requirements shall be plotted on semi-logarithmic graph paper so as to present a summary of the complete hydraulic calculation. Provide a summary sheet listing sprinklers in the design area and their respective hydraulic reference points, elevations, actual discharge pressures and actual flows. Elevations of hydraulic reference points (nodes) shall be indicated. Documentation shall identify each pipe individually and the nodes connected thereto. Indicate the diameter, length, flow, velocity, friction loss, number and type fittings, total friction loss in the pipe, equivalent pipe length and Hazen-Williams coefficient for each pipe. For gridded systems, calculations shall show peaking of demand area friction loss to verify that the hydraulically most demanding area is being used. Also for gridded systems, a flow diagram indicating the quantity and direction of flows shall be included. A drawing showing hydraulic reference points (nodes) and pipe designations used in the calculations shall be included and shall be independent of shop drawings.

1.2.2 Sprinkler Coverage

Sprinklers shall be uniformly spaced on branch lines. Sprinklers shall provide coverage throughout 100 percent of the building. This includes, but is not limited to, telephone rooms, electrical equipment rooms, boiler rooms, switchgear rooms, transformer rooms, and other electrical and mechanical spaces. Coverage per sprinkler shall be in accordance with NFPA 13, but shall not exceed 130 square feet for ordinary hazard occupancies, and 225 square feet for light hazard occupancies. Exceptions are as follows:

a. Sprinklers may be omitted from small rooms which are exempted for specific occupancies in accordance with NFPA 101.

1.3 SUBMITTALS

Government approval is required for all submittals. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Qualified Fire Protection Engineer (QFPE); G

Sprinkler System Designer; G

Sprinkler System Installer; G

SD-02 Shop Drawings

Shop Drawings; G

As-Built Drawings; G

Hydrant Flow Test; G

SD-03 Product Data

Materials and Equipment; G

Spare Parts

Onsite Training

SD-05 Design Data

Hydraulic Calculations; G

SD-06 Test Reports

Preliminary Test Procedures; G

Preliminary Test Report; G

Final Acceptance Test Procedures; G

Final Acceptance Test Report; G

SD-07 Certificates

Certification by Qualified Fire Protection Engineer (QFPE); G

SD-10 Operation and Maintenance Data

Operating and Maintenance Manuals; G

Posted Operating and Maintenance Instructions

1.4 QUALITY ASSURANCE

Compliance with referenced NFPA standards is mandatory. In the event of a conflict between specific provisions of this specification and applicable NFPA standards, this specification governs. Interpret reference to "authority having jurisdiction" to mean the Contracting Officer.

1.4.1 Qualified Fire Protection Engineer (QFPE)

Perform work specified in this section under the supervision of and certified by the Qualified Fire Protection Engineer who is an individual registered professional engineer who has passed the fire protection engineering written examination administered by the National Council of Examiners for Engineering and Surveys (NCEES), and that has a minimum of 5 years relevant experience dedicated to fire protection engineering that can be verified with documentation. Submit the name and documentation of certification of the proposed Qualified Fire Protection Engineer, no later than 14 days after the Notice to Proceed and prior to the submittal of the sprinkler system drawings and hydraulic calculations.

1.4.2 Sprinkler System Designer

The Sprinkler System designer shall be certified as a Level III Technician by the National Institute for Certification in Engineering Technologies (NICET) in the Water-Based Systems Layout subfield of Fire Protection Engineering Technology in accordance with NICET 1014-7.

1.4.3 Sprinkler System Installer

Work specified in this section shall be performed by the Sprinkler System Installer who is regularly engaged in the installation of the type and complexity of system specified in the contract documents, and who has served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months. Submit the name and documentation of certification of the proposed Sprinkler System Installer, concurrent with submittal of the Qualified Fire Protection Engineer qualifications.

1.4.4 Shop Drawings

Shop Drawings shall conform to the requirements established for working plans as prescribed in NFPA 13. Submit the Sprinkler System shop drawings, no later than 30 days prior to the start of sprinkler system installation. Drawings shall include plan and elevation views demonstrating that the equipment will fit the allotted spaces with clearance for installation and maintenance. Each set of drawings shall include the following:

a. Descriptive index of drawings in the submittal with drawings listed in sequence by drawing number. A legend identifying device symbols,

nomenclature, and conventions used.

b. Floor plans drawn to a scale not less than 1/8" = 1'-0" which clearly show locations of sprinklers, risers, pipe hangers, inspector's test connections, drains, and other applicable details necessary to clearly describe the proposed arrangement. Each type of fitting used and the locations of reducing couplings and welded joints shall be indicated.

c. Actual center-to-center dimensions between sprinklers on branch lines and between branch lines; from end sprinklers to adjacent walls; from walls to branch lines; from sprinkler feed mains, cross-mains and branch lines to finished floor and roof or ceiling. A detail shall show the dimension from the sprinkler and sprinkler deflector to the ceiling in finished areas.

d. Longitudinal and transverse building sections showing typical branch line and cross-main pipe routing as well as elevation of each typical sprinkler above finished floor.

e. Details of each type of riser assembly; pipe hanger; restraint of underground water main at point-of-entry into the building, and electrical devices and interconnecting wiring.

f. Shop drawings and hydraulic calculations shall be prepared by a NICET III or IV technician and reviewed and stamped by the QFPE before submitting for review.

1.5 DELIVERY, STORAGE, AND HANDLING

All equipment delivered and placed in storage shall be housed in a manner to preclude any damage from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Additionally, all pipes shall either be capped or plugged until installed.

1.6 SPARE PARTS (EXTRA MATERIALS)

Submit spare parts data for each different item of material and equipment specified. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of parts recommended by the manufacturer to be replaced after 1 year and 3 years of service. Include a list of special tools and test equipment required for maintenance and testing of the products supplied.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Provide materials and equipment which are standard products of a manufacturer regularly engaged in the manufacture of such products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

2.2 NAMEPLATES

All equipment shall have a nameplate that identifies the manufacturer's name, address, type or style, model or serial number, and catalog number.

2.3 REQUIREMENTS FOR FIRE PROTECTION SERVICE

Provide Materials and Equipment that have been tested by Underwriters Laboratories, Inc. and are listed in UL Fire Prot Dir or approved by Factory Mutual and listed in FM APP GUIDE. Where the terms "listed" or "approved" appear in this specification, such shall mean listed in UL Fire Prot Dir or FM APP GUIDE. Submit manufacturer's catalog data included with the Sprinkler System Drawings for all items specified herein. The data shall be highlighted to show model, size, options, etc., that are intended for consideration. Data shall be adequate to demonstrate compliance with all contract requirements. In addition, provide a complete equipment list that includes equipment description, model number and quantity.

2.4 UNDERGROUND PIPING COMPONENTS

2.4.1 Pipe

Piping from a point 6 inches above the floor to 5 feet outside the building wall shall be a welded, continuous stainless steel lead-in terminating with a flange at 12" above the finished floor.

2.4.2 Fittings and Gaskets

Fittings shall be ductile iron conforming to AWWA C110/A21.10 with cement mortar lining conforming to AWWA C104/A21.4. Gaskets shall be suitable in design and size for the pipe with which such gaskets are to be used. Gaskets for ductile iron pipe joints shall conform to AWWA C111/A21.11.

2.4.3 Gate Valve and Indicator Posts

Gate valves for underground installation shall be of the inside screw type with counter-clockwise rotation to open. Where indicating type valves are shown or required, indicating valves shall be gate valves with an approved indicator post of a length to permit the top of the post to be located 3 feet above finished grade. Gate valves and indicator posts shall be listed in UL Fire Prot Dir or FM APP GUIDE and shall be provided with a tamper switch monitored by the fire alarm system, with conduit routed to the building.

2.5 ABOVEGROUND PIPING COMPONENTS

Aboveground piping shall be steel.

2.5.1 Steel Piping Components

2.5.1.1 Steel Pipe

Except as modified herein, pipe shall be black steel as permitted by NFPA 13 and shall conform to applicable provisions of ASTM A795/A795M, ASTM A53/A53M, or ASTM A135/A135M. Piping shall be Schedule 40. Pipe shall be marked with the name of the manufacturer, kind of pipe, and ASTM designation.

2.5.1.2 Fittings for Non-Grooved Steel Pipe

Fittings shall be cast iron conforming to ASME B16.4, steel conforming to ASME B16.9 or ASME B16.11, or malleable iron conforming to ASME B16.3. Fittings into which sprinklers, drop nipples or riser nipples (sprigs) are

screwed shall be threaded type. Plain-end fittings with mechanical couplings, press fittings, saddle tees, fittings that use steel gripping devices to bite into the pipe and segmented welded fittings shall not be used.

2.5.1.3 Grooved Mechanical Joints and Fittings

Joints and fittings shall be designed for not less than 175 psi service and shall be the product of the same manufacturer;segmented welded fittings shall not be used. Fitting and coupling houses shall be malleable iron conforming to ASTM A47/A47M, Grade 32510; ductile iron conforming to ASTM A536, Grade 65-45-12. Gasket shall be the flush type that fills the entire cavity between the fitting and the pipe. Nuts and bolts shall be heat-treated steel conforming to ASTM A183 and shall be cadmium plated or zinc electroplated.

2.5.1.4 Flanges

Flanges shall conform to NFPA 13 and ASME B16.1. Gaskets shall be non-asbestos compressed material in accordance with ASME B16.21, 1/16 inch thick, and full face or self-centering flat ring type.

2.5.1.5 Bolts, Nut, and Washers

Bolts shall be conform to ASTM A449, Type 1 and shall extend no less than three full threads beyond the nut with bolts tightened to the required torque. Nuts shall be hexagon type conforming to ASME B18.2.2, ASTM A193/A193M, Grade 5 or ASTM A563, Grade C3. Washers shall meet the requirements of ASTM F436. Flat circular washers shall be provided under all bolt heads and nuts.

2.5.1.6 Flexible Sprinkler Hose Fittings

Flexible Sprinkler fittings shall not be used.

2.5.2 Pipe Hangers

Hangers shall be listed in UL Fire Prot Dir or FM APP GUIDE and of the type suitable for the application, construction, and pipe type and sized to be supported.

2.5.3 Valves

2.5.3.1 Control Valve and Gate Valve

Manually operated sprinkler control valve and gate valve shall be outside stem and yoke (OS&Y) type and shall be listed in UL Bld Mat Dir or FM APP GUIDE.

2.5.3.2 Check Valve

Check valve 2 inches and larger shall be listed in UL Bld Mat Dir or FM APP GUIDE. Check valves 4 inches and larger shall be of the swing type with flanged cast iron body and flanged inspection plate, shall have a clear waterway and shall meet the requirements of MSS SP-71, for Type 3 or 4.

2.5.3.3 Hose Valve

Valve shall comply with UL 668 and shall have a minimum rating of 300 psi. Valve shall be non-rising stem, all bronze, 90 degree angle type, with 2-1/2 inch American National Standard Fire Hose Screw Thread (NH) male outlet in accordance with NFPA 1963. Hose valve shall be provided with 2-1/2 to 1-1/2 inch reducer. Hose valves shall be equipped with lugged cap with drip drain, cap gasket and chain. Valve finish shall be polished chrome plated.

2.6 RISER CHECK VALVE ASSEMBLY

Assembly shall include a riser check valve, standard trim piping, pressure gauges, testing valves, main drain, and other components as required for a fully operational system.

2.7 WATERFLOW ALARM

Electrically operated, exterior-mounted, waterflow alarm shall be as provided in Section 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM.

2.8 ALARM INITIATING AND SUPERVISORY DEVICES

2.8.1 Sprinkler Waterflow Indicator Switch, Vane Type

Switch shall be vane type with a pipe saddle and cast aluminum housing. The electro-mechanical device shall include a flexible, low-density polyethylene paddle conforming to the inside diameter of the fire protection pipe. The device shall sense water movements and be capable of detecting a sustained flow of 10 gpm or greater. The device shall contain a retard device adjustable from 0 to 90 seconds to reduce the possibility of false alarms caused by transient flow surges. The switch shall be tamper resistant and contain two SPDT (Form C) contacts arranged to transfer upon removal of the housing cover, and shall be equipped with a silicone rubber gasket to assure positive water seal and a dustproof cover and gasket to seal the mechanism from dirt and moisture.

2.8.2 Valve Supervisory (Tamper) Switch

Switch shall be suitable for mounting to the type of control valve to be supervised open. The switch shall be tamper resistant and contain one set of SPDT (Form C) contacts arranged to transfer upon removal of the housing cover or closure of the valve of more than two rotations of the valve stem.

2.9 DOUBLE-CHECK VALVE BACKFLOW PREVENTION ASSEMBLY

Double-check backflow prevention assembly shall comply with ASSE 1015. The assembly shall have a bronze, cast-iron or stainless steel body with flanged ends. The assembly shall include pressure gauge test ports and OS&Y shutoff valves on the inlet and outlet, 2-positive-seating check valves for continuous pressure application, and four test cocks. Assemblies shall be rated for working pressure of 175 psi The maximum pressure loss shall be 6 psi at a flow rate equal to the sprinkler water demand, at the location of the assembly. A test port for a pressure gauge shall be provided both upstream and downstream of the double check backflow prevention assembly valves.

2.10 BACKFLOW PREVENTER TEST CONNECTION

Connection shall be pipe mounted with signage lettered "TEST". The connection shall have three outlets, (max 250 gpm/outlet), hose valves, caps with drip drains and chains. Female outlets, shall have 2-1/2 inch diameter American National Fire Hose Connection Screw Threads (NH) per NFPA 1963. Drain valve and discharge piping shall slope to nearest floor drain. Connection may be the same as provided for fire pump testing if configured for testing of both systems.

2.11 FIRE DEPARTMENT CONNECTION

Fire department connection shall be projecting type with cast brass body, matching wall escutcheon lettered "Auto Spkr" with a polished chromium plated finish. the connection shall have three inlets with individual self-closing clappers, caps with drip drains and chains. Female inlets shall have 2-1/2 inch diameter American National Fire Hose Connection Screw Threads (NH) per NFPA 1963.

2.12 SPRINKLERS

Sprinklers with internal O-rings shall not be used. Sprinklers shall be used in accordance with their listed coverage limitations. Temperature classification shall be ordinary. Sprinklers in high heat areas including attic spaces or in close proximity to unit heaters shall have temperature classification in accordance with NFPA 13. Extended coverage sprinklers shall not be used. Sprinklers for server rooms shall be standard response, intermediate temperature classification, and shall be provided with a control valve, flow switch, ITC piped to building exterior, and tamper switch, monitored by the fire alarm system.

2.12.1 Concealed Sprinkler

Concealed sprinkler shall be white polyester quick-response type and shall have a nominal 1/2 inch or 17/32 inch orifice. Sim bay sprinlers shall be flat black to match interior walls and ceiling of the Sim bay.

2.12.2 Recessed Sprinkler

Recessed sprinkler shall be chrome-plated or white polyester quick-response type and shall have a nominal 1/2 inch or 17/32 inch orifice.

2.12.3 Pendent Sprinkler

Pendent sprinkler shall be of the fusible strut or glass bulb type, recessed quick-response type with nominal 1/2 inch or 17/32 inch orifice. Pendent sprinklers shall have a polished chrome or white polyester finish.

2.12.4 Upright Sprinkler

Upright sprinkler shall be brass, chrome-plated, or white polyester quick-response type and shall have a nominal 1/2 inch or 17/32 inch orifice.

2.12.5 Sidewall Sprinkler

Sidewall sprinkler shall have a nominal 1/2 inch orifice. Sidewall sprinkler shall have a polished chrome or white polyester finish.

Sidewall sprinkler shall be the quick-response type.

2.13 ACCESSORIES

2.13.1 Sprinkler Cabinet

Spare sprinklers shall be provided in accordance with NFPA 13 and shall be packed in suitable metal or plastic cabinets. Spare sprinklers shall be representative of, and in proportion to, the number of each type and temperature rating of the sprinklers installed. At least one wrench of each type required shall be provided.

2.13.2 Pendent Sprinkler Escutcheon

Escutcheon shall be one-piece metallic type with a depth of less than 3/4 inch and suitable for installation on pendent sprinklers. The escutcheon shall have a factory finish that matches the pendent sprinkler heads.

2.13.3 Pipe Escutcheon

Escutcheon shall be polished chromium-plated zinc alloy, or polished chromium-plated copper alloy. Escutcheons shall be either one-piece or split-pattern, held in place by internal spring tension or set screw.

2.13.4 Sprinkler Guard

Guard shall be a steel wire cage designed to encase the sprinkler and protect it from mechanical damage. Guards shall be provided on sprinklers located below 7' above the floor and as indicated.

2.13.5 Identification Sign

Valve identification sign shall be minimum 6 inches wide by 2 inches high with enamel baked finish on minimum 18 gauge steel or 0.024 inch aluminum with red letters on a white background or white letters on red background. Wording of sign shall include, but not be limited to "main drain," "auxiliary drain," "inspector's test," "alarm test," "alarm line," and similar wording as required to identify operational components. All control valves shall be identified with permanent signs stating "NORMALLY OPEN" or "NORMALLY CLOSED". Provide permanent engraved hydraulic sign.

PART 3 EXECUTION

3.1 FIELD MEASUREMENTS

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

3.2 INSTALLATION REQUIREMENTS

The installation shall be in accordance with the applicable provisions of NFPA 13, NFPA 20, NFPA 24, UFC 3-600-01 and publications referenced therein.

3.3 Certification by Qualified Fire Protection Engineer (QFPE)

Prior to ceiling installation and concurrent with the Final Acceptance Test Report, certification by the QFPE that the sprinkler system is

installed in accordance with the contract requirements, including signed approval of the Preliminary and Final Acceptance Test Reports. The QFPE shall:

1) Inspect the sprinkler system periodically during the installation to assure that the sprinkler system is being provided and installed in accordance with the contract requirements.

2) Witness the preliminary and final tests, and sign the test results.

3) After completion of the system inspections and a successful final test, certify in writing that the system has been installed in accordance with the contract requirements. Any discrepancy shall be brought to the attention of the Contracting Officer in writing, no later than three working days after the discrepancy is discovered.

3.4 ABOVEGROUND PIPING INSTALLATION

3.4.1 Piping in Exposed Areas

Install exposed piping in areas without ceilings without diminishing exit access widths, corridors or equipment access. Exposed horizontal piping, including drain piping, shall be installed to provide maximum headroom.

3.4.2 Piping in Finished Areas

In areas with suspended or dropped ceilings and in areas with concealed spaces above the ceiling, piping shall be concealed above ceilings. Piping shall be inspected, tested and approved before being concealed. Risers and similar vertical runs of piping in finished areas shall be concealed.

3.4.3 Pendent Sprinklers

Concealed or recessed sprinklers shall be provided in all areas with suspended ceilings. Drop nipples to pendent sprinklers shall consist of minimum 1 inch pipe with a reducing coupling into which the sprinkler shall be threaded. Hangers shall be provided on arm-overs to drop nipples supplying pendent sprinklers when the arm-over exceeds 12 inches for steel pipe. Sprinklers shall not be installed below suspended or dropped ceilings. Recessed pendent sprinklers shall be installed such that the distance from the sprinkler deflector to the underside of the ceiling shall not exceed the manufacturer's listed range and shall be of uniform depth throughout the finished area. Pendent sprinklers in suspended ceilings shall be a minimum of 6 inches from ceiling grid.

3.4.4 Upright Sprinklers

Riser nipples or "sprigs" to upright sprinklers shall contain no fittings between the branch line tee and the reducing coupling at the sprinkler. Riser nipples exceeding 30 inches in length shall be individually supported.

3.4.5 Pipe Joints

Pipe joints shall conform to NFPA 13, and to the requirements specified herein. Not more than four threads shall show after joint is made up. Welded joints will be permitted, only if welding operations are performed as required by NFPA 13 at the Contractor's fabrication shop, not at the

project construction site. Flanged joints shall be provided where indicated or required by NFPA 13. Grooved pipe and fittings shall be prepared in accordance with the manufacturer's latest published specification according to pipe material, wall thickness and size. Grooved couplings, fittings and grooving tools shall be products of the same manufacturer. The diameter of grooves made in the field shall be measured using a "go/no-go" gauge, vernier or dial caliper, narrow-land micrometer, or other method specifically approved by the coupling manufacturer for the intended application. Groove width and dimension of groove from end of pipe shall be measured and recorded for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances. Grooved joints shall not be used in concealed locations, such as behind solid walls or ceilings, unless an access panel is provided and shown on the drawings for servicing or adjusting the joint.

3.4.6 Reducers

Reductions in pipe sizes shall be made with one-piece tapered reducing fittings. The use of grooved-end or rubber-gasketed reducing couplings or bushings will not be permitted.

3.4.7 Pipe Penetrations

Cutting structural members for passage of pipes or for pipe-hanger fastenings will not be permitted. Pipes that must penetrate concrete or masonry walls or concrete floors shall be core-drilled and provided with pipe sleeves. Each sleeve shall be Schedule 40 galvanized steel, ductile iron or cast iron pipe and shall extend through its respective wall or floor and be cut flush with each wall surface. Sleeves shall provide required clearance between the pipe and the sleeve per NFPA 13. The space between the sleeve and the pipe shall be firmly packed with mineral wool insulation. Where pipes penetrate fire walls, fire partitions, or floors, pipes shall be fire stopped by the approved firestop installer per the approved firestop designs and shop drawings in accordance with Section 07 84 00 FIRESTOPPING. In penetrations that are not fire-rated or not a floor penetration, the space between the sleeve and the pipe shall be sealed at both ends with plastic waterproof cement that will dry to a firm but pliable mass or with a mechanically adjustable segmented elastomer seal. Penetrations through the secure perimeter shall be in the approved location only, grounded within 2" of the inside of the secure perimeter with #4 copper wire to the building ground per ICD 705 requirements. Penetrations through STC rated walls shall be grounded on each side of the wall within 2" of the wall with #4 wire to earth per ICD 705.

3.4.8 Escutcheons

Escutcheons shall be provided for pipe penetration of ceilings and walls. Escutcheons shall be securely fastened to the pipe at surfaces through which piping passes.

3.4.9 Automatic Air Vents

Provide automatic air vents at high points in the system to vent at least 95% of the volumetric capacity of the system. Reduce the quantity of air vents by connecting branch lines or providing cross main at the peak.

3.4.10 Inspector's Test Connection

Unless otherwise indicated, test connection shall consist of 1 inch pipe

connected at the riser as a combination test and drain valve or a test valve located approximately 7 feet above the floor; shall be a smooth bore brass outlet equivalent to the smallest orifice sprinkler used in the system; and a painted metal identification sign affixed to the valve with the words "Inspector's Test." The discharge orifice shall be located outside the building wall 12" to 18" above grade directed onto a concrete splash block and so as not to cross pedestrian traffic or cause damage to adjacent construction or landscaping during full flow discharge. ITC in corridor shall be located in a recessed enclosure, with the piping in the interior wall.

3.4.11 Drains

Main drain piping shall be provided to discharge at a safe point maximum 18" above grade onto a concrete splash block outside the building. Auxiliary drains shall be provided as required by NFPA 13. Drain valves shall be fully accessible and no higher than 7 feet above finish floor.

3.4.12 Installation of Backflow Preventer Test Connection

Connection shall be mounted on the exterior wall approximately 3 feet above finished grade. Provide sleeve, seal and escutcheon at wall penetration. Provide drain valve for any trapped piping. Test connection may be combined with fire pump test connection.

3.4.13 Identification Signs

Signs shall be affixed to each control valve, inspector test valve, main drain, auxiliary drain, test valve, and similar valves as appropriate or as required by NFPA 13. Hydraulic design data nameplates shall be engraved and permanently affixed to each sprinkler riser as specified in NFPA 13. Provide sign at FDC and at backflow preventer test connection.

3.5 UNDERGROUND PIPING INSTALLATION

The fire protection water main shall be laid, and joints anchored, in accordance with NFPA 24. Minimum depth of cover shall be 4feet. The supply line shall be a welded stainless steel elbow, terminating inside the building with a flanged piece, the bottom of which shall be set not less than 10 inches and not more than 14 inches above the finished floor. A blind flange shall be installed temporarily on top of the flanged piece to prevent the entrance of foreign matter into the supply line. A concrete thrust block shall be provided at the elbow where the pipe turns up toward the floor. In addition, joints shall be anchored in accordance with NFPA 24 and per manufacturer's instructions. Buried steel components shall be provided with a corrosion protective coating in accordance with AWWA C203. Piping more than 5 feet outside the building walls shall meet the requirements of Section 33 11 00 WATER UTILITY DISTRIBUTION PIPING.

3.6 ELECTRICAL WORK

Except as modified herein, electric equipment and wiring shall be in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Alarm signal wiring connected to the building fire alarm control system shall be in accordance with Section 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM. All wiring for supervisory and alarm circuits shall be #14 or #16 AWG solid copper installed in metallic tubing or conduit. Wiring color code shall remain uniform throughout the system.

3.7 PIPE COLOR CODE MARKING AND LABELING

Color code mark piping red as specified in Section 09 90 00 PAINTS AND COATINGS. Mark all exposed interior supply piping, mains and cross mains with plastic wrap-around type pipe labels conforming to MIL-STD-101 and ASME A13.1. Indicate type of fluid and direction of flow. Labels shall read: "FIRE PROTECTION WATER" for water supply piping, "FIRE SPRINKLER" for sprinkler piping, "FIRE DEPARTMENT CONNECTION" and "TEST." Mark valves with permanent tags indicating normally open or normally closed. Provide flow arrows on piping.

3.8 PRELIMINARY TEST PROCEDURES

The system, including the underground and aboveground piping and system components, shall be flushed and tested to assure that equipment and components function as intended. Submit proposed procedures for Preliminary Tests, no later than 30 days prior to the proposed start of the tests and include proposed date and time to begin the Preliminary Tests. The underground and aboveground interior piping systems and attached appurtenances subjected to system working pressure shall be flushed and tested in accordance with NFPA 13 and NFPA 24.

3.8.1 Underground Piping

3.8.1.1 Flushing

Underground piping shall be flushed in accordance with NFPA 24 and NFPA 20. All water shall be dechlorinated before it is released to the ground or storm water drain using a dechlor demon or dechlorinated equivalent. This includes the requirement to flush the lead-in connection to the fire protection system at a flow rate not less than 150% of the fire pump rated flow for pump suction and discharge piping. The lead-in to the pump enclosure shall be flushed per NFPA 20 without the use of the fire pump since it serves as the suction of the fire pump. Photograph flushing and document the flow rate used for the flushing each underground pipe segment.

3.8.1.2 Hydrostatic Testing

New underground piping shall be hydrostatically tested in accordance with NFPA 24. The allowable leakage shall be measured at the specified test pressure by pumping from a calibrated container. The amount of leakage at the joints shall not exceed 2 quarts per hour per 100 gaskets or joints, regardless of pipe diameter.

3.8.2 Aboveground Piping

3.8.2.1 Hydrostatic Testing

Aboveground piping shall be hydrostatically tested in accordance with NFPA 13 at not less than the greater of 200 psi or 50 psi in excess of maximum system operating pressure and shall maintain that pressure without loss for 2 hours. There shall be no drop in gauge pressure or visible leakage when the system is subjected to the hydrostatic test. The test pressure shall be read from a gauge located at the low elevation point of the system or portion being tested.

3.8.2.2 Backflow Prevention Assembly Forward Flow Test and Cross Connection Control Test

Each backflow prevention assembly shall be tested at system flow demand, including all applicable hose streams, as specified in NFPA 13. Provide all equipment and instruments necessary to conduct a complete forward flow test, including 2.5 inch diameter hoses, playpipe nozzles, calibrated pressure gauges, pitot tube gauge, plus all necessary supports to safely secure hoses and nozzles during the test. At the system demand flow, the pressure readings and pressure drop (friction) across the assembly shall be recorded. All water shall be dechlorinated before it is released to the ground or storm water drain. Provide a metal placard on the backflow prevention assembly that lists the pressure readings both upstream and downstream of the assembly, total pressure drop, and the system test flow rate. The pressure drop shall be compared to the manufacturer's data. Provide cross connection control testing in accordance with ASSE 1015. Provide forward flow test and cross connection control test reports with preliminary and final test reports.

3.8.3 Testing of Alarm Devices

Each alarm switch shall be tested by flowing water through the inspector's test connection. Each water-operated alarm device shall be tested to verify proper operation.

3.8.4 Main Drain Flow Test

Following flushing of the underground piping, a main drain test shall be made to verify the adequacy of the water supply. Static and residual pressures shall be recorded on the certificate specified in paragraph SUBMITTALS. In addition, a main drain test shall be conducted each time after a main control valve is shut and opened.

3.9 PRELIMINARY TEST REPORT

Upon completion of specified tests, submit 3 copies of the completed Preliminary Test Report, no later than 10 days after the completion of the Tests. The Report shall include the Contractor's Material and Test Certificates for Aboveground and Underground Piping, as well as the flushing report, Cross Connection Control Certificates for Backflow Preventers and the sign-in sheet identifying test personnel and contact information. All items in the Preliminary Test Report shall be signed by the QFPE.

3.10 FINAL ACCEPTANCE TEST PROCEDURES

Begin the Final Acceptance Test only when the Preliminary Test Report has been approved. Submit proposed procedures for Final Acceptance Test, no later than 30 days prior to the proposed start of the tests. Submit proposed date and time to begin the Test with the procedures. Notification shall be provided at least 30 days prior to the proposed start of the test. Notification shall include a copy of the Contractor's Material & Test Certificate. The QFPE shall conduct the Final Acceptance Test and shall provide a complete demonstration of the operation of the system. This shall include operation of control valves and flowing of inspector's test connections to verify operation of associated waterflow alarm switches. After operation of control valves has been completed, the main drain test shall be repeated to assure that control valves are in the open position. Testring shall be coordinated with fire pump, fire alarm,

and underground piping system testing.

3.11 FINAL ACCEPTANCE TEST REPORT

The installation shall not be considered accepted until identified discrepancies have been corrected and test documentation is properly completed and received. Submit 3 copies of the completed Final Acceptance Test Report no later than 14 days after the completion of the Final Acceptance Tests. All items in the Final Acceptance Report shall be signed by the Qualified Fire Protection Engineer.

3.12 AS-BUILT SHOP DRAWINGS

Submit as-built shop drawings, 14 days after completion of the Final Tests, updated to reflect as-built conditions after all related work is completed. Drawings shall be on electronic media with two full size paper copies. In addition, during final testing, the representative shall have available paper copies of as-built drawings and Preliminary Test Report during final testing.

3.13 ONSITE TRAINING

The QFPE shall conduct a training course for operating and maintenance personnel as designated by the Contracting Officer. Submit proposed schedule, at least 14 days prior to the start of related training. Training shall be provided for a period of 2 hours of normal working time, divided into two shifts, and shall start after the system is functionally complete and after the Final Acceptance Test. As-built Shop Drawings and O&M Manuals shall be available during training.

3.14 POSTED OPERATING AND MAINTENANCE INSTRUCTIONS

Submit Posted Operating and Maintenance Instructions Provide posted O&M instructions, framed in heavy gauge extruded metal frames, under glass, weatherproof, permanently mounted on the wall adjacent to the sprinkler riser. Utilize professionally prepared graphics, in color, on full sized sheets, minimum 18"x24".

3.15 OPERATING AND MAINTENANCE MANUALS

Submit 6 Operating and Maintenance Manuals and an electronic file listing step-by-step procedures required for system startup, operation, shutdown, and routine maintenance, at least 14 days prior to field training. Update manuals with changes made during acceptance testing. The manuals shall include the manufacturer's name, model number, parts list, list of parts and tools that should be kept in stock by the owner for routine maintenance including the name of a local supplier, simplified wiring and controls diagrams, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment. Each service organization submitted shall be capable of providing 4 hour on-site response to a service call on an emergency basis. Include a copy of the Final Acceptance Test Report, a copy of the as-built drawings, a copy of the Posted O&M Instructions and a copy of the hydraulic signs. The Onsite Training shall cover all of the items contained in the approved manuals.

-- End of Section --

SECTION 21 30 00

FIRE PUMPS
04/08

PART 1 GENERAL

1.1 SUMMARY

Provide fire pumps in conformance with UFC 3-600-01, NFPA 20, NFPA 70, NFPA 24 and NFPA 72 and the Contract Documents. Devices and equipment for fire protection service must be UL Fire Prot Dir listed or FM APP GUIDE approved, including packaged fire pump assembly. Interpret all reference to the authority having jurisdiction to mean the Contracting Officer's Technical Representative.

1.2 SEQUENCING

1.2.1 Primary Fire Pump

Primary fire pump shall automatically operate when the pressure drops to its NFPA 20 setpoint or manually when the starter is operated. Pump shall continue to run until shut down manually or until its stop setpoint and minimum run time have been satisfied.

1.2.2 Pressure Maintenance Pump

Pressure maintenance pump shall operate when the system pressure drops to its NFPA 20 setpoint. Pump shall automatically stop when the system pressure reaches its NFPA 20 stop setpoint and after the pump has operated for the minimum pump run time specified herein.

1.2.3 System Pressure Settings

It is the fire sprinkler contractor's responsibility to provide pressure set points to maintain the system in accordance with NFPA 20 requirements for a complete and code compliant operation.

1.3 FIRE PUMP INSTALLATION RELATED SUBMITTALS

The Qualified Fire Protection Engineer shall prepare a list of the submittals, from the Contract Submittal Register, that relate to the successful installation of the fire pump(s), no later than 7 days after the approval of the Qualified Fire Protection Engineer (QFPE) and the Manufacturer's Representative. The submittals identified on this list shall be accompanied by a letter of approval signed and dated by the QFPE when submitted to the Government.

1.4 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C110/A21.10 (2021) Ductile-Iron and Gray-Iron Fittings

AWWA C111/A21.11	(2017) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C500	(2019) Metal-Seated Gate Valves for Water Supply Service

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B16.3	(2021) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.39	(2020) Standard for Malleable Iron Threaded Pipe Unions; Classes 150, 250, and 300
ASME B16.5	(2020) Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B31.1	(2022) Power Piping

ASTM INTERNATIONAL (ASTM)

ASTM A183	(2014; R 2020) Standard Specification for Carbon Steel Track Bolts and Nuts
ASTM A193/A193M	(2023) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications
ASTM A194/A194M	(2023) Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both
ASTM A449	(2014) Standard Specification for Hex Cap Screws, Bolts, and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
ASTM A47/A47M	(1999; R 2022; E 2022) Standard Specification for Ferritic Malleable Iron Castings
ASTM A536	(1984; R 2019; E 2019) Standard Specification for Ductile Iron Castings
ASTM A563	(2021; E 2022a) Standard Specification for Carbon and Alloy Steel Nuts
ASTM B135	(2010) Standard Specification for Seamless Brass Tube
ASTM F436	(2011) Hardened Steel Washers

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide

http://www.approvalguide.com/

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA MG 1	(2021) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 1963	(2014) Standard for Fire Hose Connections
NFPA 20	(2022;TIA 21-1; TIA 21-2) Standard for the Installation of Stationary Pumps for Fire Protection
NFPA 24	(2022) Standard for the Installation of Private Fire Service Mains and Their Appurtenances
NFPA 70	(2023; ERTA 7 2023; TIA 23-15) National Electrical Code
NFPA 72	(2022; ERTA 22-1) National Fire Alarm and Signaling Code

UNDERWRITERS LABORATORIES (UL)

UL 262	(2004; Reprint Jul 2023) Gate Valves for Fire-Protection Service
UL 448	(2020) Centrifugal Stationary Pumps for Fire-Protection Service
UL 1247	(2023) Diesel Engines for Driving Stationary Fire Pumps
UL Fire Prot Dir	(2012) Fire Protection Equipment Directory

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-101	(2014; Rev C) Color Code for Pipelines and for Compressed Gas Cylinders
UFC 3-600-01	(2016; with Change 6, 2021) Fire Protection Engineering for Facilities

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Fire Pump Installation Related Submittals; G

Qualifications of Welders; G

Qualifications of Installer; G

Qualified Fire Protection Engineer; G

No later than 14 days after the Notice to Proceed and prior to the submittal of the fire pump installation drawings

SD-02 Shop Drawings

Installation Drawings; G

3 copies

As-Built Drawings; G

Piping Layout; G

Pump Room; G

SD-03 Product Data

Catalog Data; G

Spare Parts

Manufacturer's Representative; G

Field Training; G

SD-06 Test Reports

Preliminary Test Procedures; G

At least 14 days prior to the proposed date and time to begin Preliminary Tests

Preliminary Test Report; G

3 copies of the completed Test Report, no later than 7 days after the completion of the Preliminary Tests.

Final Test Procedures; G

At least 3 weeks before starting final tests

Final Test Report; G

SD-07 Certificates

Preliminary Test Certification; G

Final Test Certification; G

SD-10 Operation and Maintenance Data

Operating and Maintenance Instructions; G

At least 14 days prior to conducting field training

Posted Operating and Maintenance Instructions; G

Flow Meter; G

Submit Data Package 2 for flow meter and controllers in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.6 EXTRA MATERIALS

Submit Spare Parts data for each different item of equipment and material specified. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of parts recommended by the manufacturer to be replaced after 1 year and 3 years of service. Include a list of special tools and test equipment required for maintenance and testing of the products supplied by the Contractor.

1.7 QUALITY ASSURANCE

1.7.1 Qualified Fire Protection Engineer

Work specified in this section shall be performed under the supervision of and certified by the Qualified Fire Protection Engineer (QFPE). The QFPE shall be regularly engaged in the design and installation of the type and complexity of system specified in the Contract documents, and shall have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months. The Qualified Fire Protection Engineer shall be as approved in Section 21 13 13.00 10 WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION paragraph 1.4.1, with the same duties noted in Division 21 specifications. The QFPE shall approve all submittals and certify the installation meets the requirements of the contract documents and referenced criteria.

1.7.2 Qualifications of Welders

Submit certificates of each welder's qualifications prior to site welding; certifications shall not be more than one year old.

1.7.3 Qualifications of Installer

Prior to installation, submit data for approval showing that the Contractor has successfully installed fire pumps and associated equipment of the same type and design as specified herein, or that he has a firm contractual agreement with a subcontractor having such required experience. The data shall include the names and locations of at least two installations where the Contractor, or the subcontractor referred to above, has installed such systems. Indicate the type and design of each system and certify that each system has performed satisfactorily in the manner intended for a period of not less than 18 months.

1.7.4 Preliminary Test Certification

When preliminary tests have been completed and corrections made, submit a signed and dated certificate with a request for a formal inspection and tests.

1.7.5 Final Test Certification

Concurrent with the Final Acceptance Test Report, submit certification by the QFPE that the fire pump installation is in accordance with the contract requirements, including signed approval of the Preliminary and Final Acceptance Test Reports. Submit data for approval showing the name and certification of all involved individuals with such qualifications at or prior to submittal of drawings.

1.7.6 Manufacturer's Representative

Work specified in this section shall be performed under the supervision of and certified by a representative of the fire pump manufacturer. Submit the name and documentation of certification of the proposed Manufacturer's Representative, concurrent with submittal of the Qualified Fire Protection Engineer's Qualifications. The Manufacturer's Representative shall be regularly engaged in the installation of the type and complexity of fire pump(s) specified in the Contract documents, and shall have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months.

1.8 DELIVERY, STORAGE, AND HANDLING

Protect all equipment delivered and placed in storage from the weather, excessive humidity and temperature variations, dirt and dust, or other contaminants. Additionally, all pipes shall be either capped or plugged until installed.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

a. Materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

b. Submit manufacturer's catalog data included with the Fire Pump Installation Drawings for each separate piece of equipment proposed for use in the system. Catalog data shall indicate the name of the manufacturer of each item of equipment, with data annotated to indicate model to be provided. In addition, a complete equipment list that includes equipment description, model number and quantity shall be provided. Catalog data for material and equipment shall include, but not be limited to, the following:

(1) Fire pumps, drivers and controllers including manufacturer's certified shop test characteristic curve for each pump. Shop test curve may be submitted after approval of catalog data but shall be submitted prior to the final tests.

(2) Pressure maintenance pump and controller.

(3) Piping components.

(4) Valves, including gate, check, globe and relief valves.

(5) Gauges.

(6) Hose valve manifold test header and hose valves.

(7) Flow meter.

(8) Restrictive orifice union.

(9) Associated devices and equipment.

(10) Fire Pump Enclosure

c. All equipment shall have a nameplate that identifies the manufacturer's name, address, type or style, model or serial number, contract number and accepted date; capacity or size; system in which installed and system which it controls and catalog number. Pumps and motors shall have standard nameplates securely affixed in a conspicuous place and easy to read. Fire pump shall have nameplates and markings in accordance with UL 448. Diesel driver shall have nameplate and markings in accordance with UL 1247. Electric motor nameplates shall provide the minimum information required by NFPA 70, Section 430-7.

2.2 FIRE PUMP

Fire pumps shall be electric motor driven. Fire pump capacity shall be rated at 750 gpm with a rated net pressure as required to satisfy the fire protection demand. Fire pump shall furnish not less than 150 percent of rated flow capacity at not less than 65 percent of rated net pressure. Pump shall be centrifugal vertical or horizontal split case fire pump. Pump shall be equipped with automatic air release devices. Pump shall be automatic start and stop. Pump shall conform to the requirements of UL 448.

2.2.1 Fire Pump

The fire pump shall be provided as a turn-key pre-packaged unit complete with fire pump electric motor driven, fire pump controller, jockey pump, jockey pump controller, double check valve backflow preventer, pre-manufactured fire pump enclosure, pump test header, fire department connection, and all required accessories and appurtenances as required for a complete fire pump installation in accordance with the requirements of UFC 3-600-01 and NFPA 20. The pre-packaged fire pump shall be skid mounted with enclosure, delivered to site ready for connection to the water distribution network. Power will be provided to a single point of connection to the fire pump enclosure.

2.3 FIRE PUMP ENCLOSURE

A. The fire pump enclosure shall be a 1 hour fire rated pre-manufactured enclosure that is enclosed with a roof and exterior metal panels applied to cold formed metal framing components with fiberglass insulation in the interior side of the structure with exterior pair of gasketed steel doors and frame with lock compatible with building keying. Provide heat and fan with wall mounted louvers and dampers for exhaust air and for ventilation. Floor shall be a minimum 5" reinforced concrete, poured following enclosure installation on the foundation. Refer to material color schedule Division 9.

B. Enclosure shall be supplied complete with all necessary component parts, including drill in foundation anchors, to for a complete

enclosure system and all parts shall be new and free from all defects or imperfections. The enclosure width and length shall be measured from the inside of the building wall panels and the height of the enclosure shall be the distance measured from the finished floor to the interior juncture of the roof and sidewall panels.

C. The enclosure supplier shall supply a complete set of enclosure erection drawings showing step-by-step construction sequence for the erection of the enclosure. The erection drawings shall be prepared specifically for the enclosure covered by these specifications showing the location of all roof and wall accessories and the exact anchor bolt locations required for each accessory.

D. The enclosure shall be designed in accordance with the applicable sections of the latest edition of the AISC "Specifications for Structural Steel Buildings" and the AISI "Specification for the Design of Cold-Formed Steel Structural Members". Refer Structural design criteria on sheet S-001.

E. Each enclosure shall be designed for vertical live, ground snow, and horizontal wind loads, in addition to the stationary weight of the enclosure. Reduction of loads due to tributary loaded areas will not be permitted. All combining and distributing of auxiliary equipment loads imposed on the enclosure system shall be done in accordance with the applicable section of the IBC, 2021 edition. Refer Structural design criteria on sheet S-001.

F. Enclosure shall be designed for heating to maintain minimum 50F with the doors closed on a design winter day with the pump off, and ventilation to maintain maximum 10F above ambient with the fire pump operating. Provide single point electrical power for all electrical loads except the fire pump. Lighting shall maintain average 50 footcandles when switched on. Provide two duplex receptacles. Provide wet pipe sprinkler system designed to Ordinary Hazard per UFC 3-600-01. Provide floor drain for pump drip, piped to enclosure exterior.

G. The manufacturer shall submit complete design certification signed and sealed by a registered professional engineer.

2.4 REQUIREMENTS FOR FIRE PROTECTION SERVICE

2.4.1 General Requirements

Materials and Equipment shall have been tested by Underwriters Laboratories, Inc. and listed in UL Fire Prot Dir or approved by Factory Mutual and listed in FM APP GUIDE. Where the terms "listed" or "approved" appear in this specification, such shall mean listed in UL Fire Prot Dir or FM APP GUIDE.

2.4.2 Alarms

Provide audible and visual alarms as required by NFPA 20 on the controller. Provide remote supervision as required by NFPA 20, in accordance with NFPA 72 under Section 23.8.5.9. Alarm signal shall be activated upon the following conditions: electric motor controller has operated into a pump running condition, loss of electrical power to electric motor starter, and phase reversal on line side of motor starter. Exterior alarm devices shall be weatherproof type. Provide alarm

silencing switch and red signal lamp, with signal lamp arranged to come on when switch is placed in OFF position.

2.5 UNDERGROUND PIPING COMPONENTS

2.5.1 Pipe and Fittings

Provide welded stainless steel lead-ins and per NFPA 24 for piping under the building and less than 5 feet outside of the building walls. Provide flange at 12" above finished floor for each lead-in. Anchor the joints in accordance with NFPA 24; provide concrete thrust block at the elbow where the pipe turns up toward the floor, and restrain the pipe riser per NFPA 24 and manufacturer's instructions. Minimum pipe size shall be 6 inches. Minimum depth of cover shall be as required by NFPA 24, but no less than 4 feet. Piping more than 5 feet outside of the building walls shall be provided under Section 33 11 00 WATER UTILITY DISTRIBUTION PIPING.

2.5.2 Fittings and Gaskets

Fittings shall be ductile iron conforming to AWWA C110/A21.10. Gaskets shall be suitable in design and size for the pipe with which such gaskets are to be used. Gaskets for ductile iron pipe joints shall conform to AWWA C111/A21.11.

2.5.3 Valves and Valve Boxes

Valves shall be gate valves conforming to AWWA C500 or UL 262. Valves shall have cast-iron body and bronze trim. Valve shall open by counterclockwise rotation. Except for post indicator valves, all underground valves shall be provided with an adjustable cast-iron or ductile iron valve box of a size suitable for the valve on which the box is to be used, but not less than 5.25 inches in diameter. The box shall be coated with bituminous coating. A cast-iron or ductile-iron cover with the word "WATER" cast on the cover shall be provided for each box.

2.5.4 Gate Valve and Indicator Posts

Gate valves for underground installation shall be of the inside screw type with counterclockwise rotation to open. Where indicating type valves are shown or required, indicating valves shall be gate valves with an approved indicator post of a length to permit the top of the post to be located 3 feet above finished grade and a tamper switch, monitored by the fire alarm system. Gate valves and indicator posts shall be provided with one coat of primer and two coats of red enamel paint and shall be listed in UL Fire Prot Dir or FM APP GUIDE.

2.5.5 Buried Utility Warning and Identification Tape

Detectable aluminum foil plastic-backed tape or detectable magnetic plastic tape manufactured specifically for warning and identification of buried piping shall be provided for all buried piping. Tape shall be detectable by an electronic detection instrument. Tape shall be provided in rolls, 3 inches minimum width, color-coded for the utility involved and imprinted in bold black letters continuously and repeatedly over the entire tape length. Warning and identification shall be "CAUTION BURIED WATER PIPING BELOW" or similar wording. Code and lettering shall be permanent and unaffected by moisture and other substances contained in the trench backfill material. Tape shall be buried at a depth of 12 inches below the top surface of earth or the top surface of the subgrade under

pavement.

2.6 ABOVEGROUND PIPING COMPONENTS

2.6.1 Pipe Sizes 2 inches and Larger

2.6.1.1 Pipe

Piping shall be ASTM A53/A53M or ASTM A795/A795M, Weight Class STD (Standard), Schedule 40 (except for Schedule 30 for pipe sizes 8 inches and greater in diameter), Type E or Type S, Grade A; black steel pipe. Steel pipe shall be joined by means of flanges welded to the pipe or mechanical grooved joints only. Piping shall not be jointed by welding or weld fittings. Suction piping shall be galvanized on the inside in accordance with NFPA 20.

2.6.1.2 Grooved Mechanical Joints and Fittings

Joints and fittings shall be designed for not less than 175 psi service and shall be the product of the same manufacturer. Fitting and coupling houses shall be malleable iron conforming to ASTM A47/A47M, Grade 32510; ductile iron conforming to ASTM A536, Grade 65-45-12. Gasket shall be the flush type that fills the entire cavity between the fitting and the pipe. Nuts and bolts shall be heat-treated steel conforming to ASTM A183 and shall be cadmium plated or zinc electroplated.

2.6.1.3 Flanges

Flanges shall be ASME B16.5, Class 150 flanges. Flanges shall be provided at valves, connections to equipment, and where indicated.

2.6.1.4 Gaskets

Gaskets shall be AWWA C111/A21.11, cloth inserted red rubber gaskets.

2.6.1.5 Bolts

Bolts shall be ASTM A449, Type 1, or 2, orASTM A193/A193M, Grade B7. Bolts shall extend no less than three full threads beyond the nut with bolts tightened to the required torque.

2.6.1.6 Nuts

Nuts shall be ASTM A194/A194M, Grade 7, ASTM A193/A193M, Grade 5 ASTM A563, Grade C3, or DH3.

2.6.1.7 Washers

Washers shall meet the requirements of ASTM F436. Flat circular washers shall be provided under all bolt heads and nuts.

2.6.1.8 High Pressure Components

Pipe, fittings, components, etc., subject to pressure greater than 175 psi shall be listed for high pressure use.

2.6.2 Piping Sizes 2 inches and Smaller

2.6.2.1 Steel Pipe

Steel piping shall be ASTM A795/A795M, Weight Class STD (Standard), Schedule 40, Type E or Type S, Grade A or ASTM A53/A53M, Weight Class XS (Extra Strong), zinc-coated steel pipe with threaded end connections. Fittings shall be ASME B16.3, Class 150, zinc-coated threaded fittings. Unions shall be ASME B16.39, Class 150, zinc-coated unions.

2.6.2.2 High Pressure Components

Pipe, fittings, components, etc., subject to pressure greater than 175 psi shall be listed for high pressure use.

2.6.3 Pipe Hangers and Supports

Pipe hangers and support shall be MSS SP-58 or UL listed UL Fire Prot Dir or FM approved FM APP GUIDE and shall be the adjustable type. Finish of rods, nuts, washers, hangers, and supports shall be zinc-plated after fabrication.

2.6.4 Valves

Valves shall be UL listed UL Fire Prot Dir or FM approved FM APP GUIDE for fire protection service. Valves shall have flange or threaded end connections.

2.6.4.1 Gate Valves and Control Valves

Gate valves and control valves shall be outside screw and yoke (O.S.&Y.) type which open by counterclockwise rotation. Butterfly-type control valves are not permitted.

2.6.4.2 Tamper Switch

The suction control valves, the discharge control valves, valves to test header and flow meter, and the by-pass control valves shall be equipped with valve tamper switches for monitoring by the fire alarm system.

2.6.4.3 Check Valve

Check valve shall be clear open, swing type check valve with flange or threaded inspection plate.

2.6.4.4 Circulating Relief Valve

An adjustable circulating relief valve shall be provided for each fire pump in accordance with NFPA 20.

2.6.5 Hose Valve Manifold Test Header

Construct header of steel pipe. Provide ASME B16.5, Class 150 flanged inlet connection to hose valve manifold assembly. Provide approved bronze hose gate valve with 2.5 inch National Standard male hose threads with cap and chain; locate 3 feet above grade in the horizontal position for each test header outlet. Welding shall be metallic arc process in accordance with ASME B31.1. Prime and paint red per Division 09.

2.6.6 Fire Department Connection

Fire department connection shall be projecting type with cast brass body, matching wall escutcheon lettered "Auto Spkr" with a polished chromium plated finish. the connection shall have three inlets with individual self-closing clappers, caps with drip drains and chains. Female inlets shall have 2-1/2 inch diameter American National Fire Hose Connection Screw Threads (NH) per NFPA 1963.

2.6.7 Pipe Sleeves

A pipe sleeve shall be provided at each location where piping passes entirely through walls, ceilings, roofs, and floors, including pipe entering buildings from the exterior. Secure sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, ceilings, and floors. Provide one inch minimum clearance between exterior of piping or pipe insulation, and interior of sleeve or core-drilled hole. Firmly pack space with mineral wool insulation. Seal space at both ends of the sleeve or core-drilled hole with plastic waterproof cement which will dry to a firm but pliable mass, or provide a mechanically adjustable segmented elastomeric seal. In fire walls and fire floors, a fire seal shall be provided between the pipe and the sleeve in accordance with Section 07 84 00 FIRESTOPPING. Firestopping materials must be furnished and installed by the Firestopping installer and shall conform to the requirements in Section 07 84 00 FIRESTOPPING.

a. Sleeves in Masonry and Concrete Walls, Ceilings, Roofs, and Floors: Provide hot-dip galvanized steel, ductile-iron, or cast-iron pipe sleeves. Core drilling of masonry and concrete may be provided in lieu of pipe sleeves provided that cavities in the core-drilled hole be completely grouted smooth.

b. Sleeves in Other Than Masonry and Concrete Walls, Ceilings, Roofs, and Floors: Provide galvanized steel sheet pipe not less than 0.90 psf.

2.6.8 Escutcheon Plates

Provide one-piece or split-hinge metal plates for piping entering floors, walls, and ceilings in exposed areas. Provide polished stainless steel or chromium-plated finish on copper alloy plates in finished spaces. Provide paint finish on plates in unfinished spaces. Plates shall be secured in place.

2.7 ELECTRIC MOTOR DRIVER

Motors, controllers, contactors, and disconnects shall be provided with their respective pieces of equipment, as specified herein and shall have electrical connections provided under Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Controllers and contactors shall have a maximum of 120-volt control circuits, and auxiliary contacts for use with the controls furnished. When motors and equipment furnished are larger than sizes indicated, the cost of providing additional electrical service and related work shall be included under this section. Motor shall conform to NEMA MG 1 Design B type. Integral size motors shall be the premium efficiency type in accordance with NEMA MG 1. Motor horsepower shall be of sufficient size so that the nameplate horsepower rating will not be exceeded throughout the entire published pump characteristic curve. The motor and fire pump controller shall be fully compatible. All controllers

shall be solid state, soft start drive.

2.8 FIRE PUMP CONTROLLERS

Controllers shall be the automatic type and UL listed UL Fire Prot Dir or FM approved FM APP GUIDE for fire pump service. Pump shall be arranged for automatic start, automatic stop and manual push-button stop. Controllers shall be completely terminally wired, ready for field connections, and mounted in a NEMA Type 4 watertight and dust tight enclosure arranged so that controller current carrying parts will not be less than 12 inches above the floor. Controller shall be provided with voltage surge arresters installed in accordance with NFPA 20. Controllers shall be equipped with a bourdon tube pressure switch or a solid state pressure switch with independent high and low adjustments, automatic starting relay actuated from normally closed contacts, visual alarm lamps and supervisory power light. Controller shall be equipped with a thermostat switch with adjustable setting to monitor the pump room temperature and to provide an alarm when temperatures falls below 40 degrees F.

2.8.1 Controllers for Electric Motor Driven Fire Pump

Controllers shall be electronic soft start starting type. Controllers shall be designed for 25 HP at 480 volts. Controllers and transfer switches shall have a short circuit rating of 100,000 amps r.m.s. symmetrical at 480 volts a.c. as indicated. Controller shall monitor pump running, loss of a phase or line power, phase reversal, low reservoir and pump room temperature. Alarms shall be individually displayed in front of panel by lighting of visual lamps. Each lamp shall be labeled with rigid etched plastic labels. Controller shall be equipped with terminals for remote monitoring of pump running, pump power supply trouble (loss of power or phase and phase reversal), and pump room trouble (pump room temperature). Controller shall be equipped with a 7-day electric pressure recorder with 24-hour spring wound back-up. The pressure recorder shall provide a readout of the system pressure, time, and date. The controller shall be equipped with an externally operable isolating switch which manually operates the motor circuit. Means shall be provided in the controller for measuring current for all motor circuit conductors.

2.9 PRESSURE SENSING LINE

A completely separate pressure sensing line shall be provided for each fire pump and for the jockey pump. The sensing line shall be arranged in accordance with Figure A.4.32(a) of NFPA 20. The sensing line shall be 1/2 inch H58 brass tubing complying with ASTM B135. The sensing line shall be equipped with two restrictive orifice unions each. Restricted orifice unions shall be ground-face unions with brass restricted diaphragms drilled for a 3/32 inch. Restricted orifice unions shall be mounted in the horizontal position, not less than 5 feet apart on the sensing line. Two test connections shall be provided for each sensing line. Test connections shall consist of two brass 1/2 inch globe valves and 1/4 inch gauge connection tee arranged in accordance with NFPA 20. One of the test connections shall be equipped with a 0 to 300 psi water oil-filled gauge. Sensing line shall be connected to the pump discharge piping between the discharge piping control valve and the check valve.

2.10 PRESSURE MAINTENANCE PUMP

2.10.1 General

Pressure maintenance pump shall be electric motor driven, horizontal shaft or in-line vertical shaft, centrifugal type. Pump shall draft from the suction supply side of the suction pipe gate valve of the fire pump and shall discharge into the system at the downstream side of the pump discharge gate valve. An approved indicating gate valve of the outside screw and yoke (O.S.&Y.) type shall be provided in the maintenance pump discharge and suction piping. Pressure gauge and approved check valve in the maintenance pump discharge piping shall be provided. Check valve shall be swing type with removable inspection plate.

2.10.2 Pressure Maintenance Pump Controller

Pressure maintenance pump controller shall be arranged for automatic and manual starting and stopping and equipped with a "manual-off-automatic" switch. The controller shall be completely prewired, ready for field connections, and wall-mounted in a NEMA Type 2 drip-proof enclosure. The controller shall be equipped with a bourdon tube pressure switch or a solid state pressure switch with independent high and low adjustments for automatic starting and stopping. A sensing line shall be provided connected to the pressure maintenance pump discharge piping between the control valve and the check valve. The sensing line shall conform to paragraph, PRESSURE SENSING LINE. The sensing line shall be completely separate from the fire pump sensing lines. An adjustable run timer shall be provided to prevent frequent starting and stopping of the pump motor. The run timer shall be set for 2 minutes.

2.11 PUMP BASE PLATE AND PAD

Provide a common base plate for each horizontal-shaft fire pump for mounting pump and driver unit. Construct the base plate of cast iron with raised lip tapped for drainage or welded steel shapes with suitable drainage. Provide each base plate for the horizontal fire pumps with a 1 inch galvanized steel drain line piped to the nearest floor drain. For vertical shaft pumps, pump head shall be provided with a cast-iron base plate and shall serve as the sole plate for mounting the discharge head assembly. Mount pump units and bases on a raised 4 or 6 inches reinforced concrete pad that is an integral part of the reinforced concrete floor.

2.12 HOSE VALVE MANIFOLD TEST HEADER

Hose valve test header shall be connected by ASME B16.5, Class 150 flange inlet connection. Hose valves shall be UL listed UL Fire Prot Dir or FM approved FM APP GUIDE bronze hose gate valves with 2.5 inches American National Fire Hose Connection Screw Standard Threads (NH) in accordance with NFPA 1963. Each shall be equipped with a cap and chain, and located no more than 3 feet and no less than 2 feet above grade. Provide drain valve for any trapped piping.

2.13 FLOW METER

Meter shall be UL listed UL Fire Prot Dir or FM approved FM APP GUIDE as flow meters for fire pump installation with direct flow readout device. Flow meter shall be capable of metering any waterflow quantities between 50 percent and 150 percent of the rated flow of one pump. Arrange piping to permit flow meter to discharge to pump suction and to discharge through

test header. The meter throttle valve and the meter control valves shall be O.S.&Y. valves. Provide automatic air release if flow meter piping between pump discharge and pump suction forms an inverted "U". Meter shall be of the venturi type.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

3.2 INSPECTION BY QUALIFIED FIRE PROTECTION ENGINEER

The Qualified Fire Protection Engineer shall periodically perform a thorough inspection of the fire pump installation, including visual observation of the pump while running, to assure that the installation conforms to the contract requirements. There shall be no excessive vibration, leaks, unusual noises, overheating, or other potential problems. Inspection shall include piping and equipment clearance, access, supports, and guards. Any discrepancy shall be brought to the attention of the Contracting Officer in writing, no later than three working days after the discrepancy is discovered. The QFPE shall witness the preliminary and final acceptance tests and, after completion of the inspections and a successful final acceptance test, shall sign test results and certify in writing that the installation the fire pump installation is in accordance with the contract requirements.

3.3 INSTALLATION

Equipment, materials, workmanship, fabrication, assembly, erection, installation, examination, inspection and testing shall be in accordance NFPA 20, and the requirements of teh contract documents. In addition, the fire pump shall be installed in accordance with the written instructions of the manufacturer.

3.3.1 Installation Drawings

Submit Fire Pump Installation Drawings consisting of a detailed plan view, detailed elevations and sections of the pump room, equipment and piping, drawn to a scale of not less than 1/2 inch = 1 foot. Drawings shall indicate equipment, piping, and associated pump equipment to scale. Indicate all clearance, such as those between piping and equipment; between equipment and walls, ceiling and floors; and for electrical working distance clearance around all electrical equipment. Include a legend identifying all symbols, nomenclatures, and abbreviations. Indicate a complete piping and equipment layout including elevations and/or section views of the following:

a. Fire pumps, controllers, piping, valves, and associated equipment.

b. Sensing line for each pump including the pressure maintenance pump.

c. Pipe hangers and supports.

d. Restraint of underground water main at entry-and exit-points to the building including details of pipe clamps, tie rods, mechanical retainer glands, and thrust blocks.

e. A one-line schematic diagram indicating layout and sizes of all piping, devices, valves and fittings.

f. A complete point-to-point connection drawing of the pump power, control and alarm systems, as well as interior wiring schematics of each controller.

3.3.2 Pump Room Configuration

Provide detail plan view of the pump enclosure including elevations and sections showing the fire pumps, associated equipment, and piping. Submit working drawings on sheets not smaller than 24 by 36 inches; include data for the proper installation of each system. Show piping schematic of pumps, devices, valves, pipe, and fittings. Provide an isometric drawing of the fire pump and all associated piping. Show point to point electrical wiring diagrams. Show piping layout and sensing piping arrangement. Include:

a. Pumps, drivers, and controllers

b. Hose valve manifold test header

c. Circuit diagrams for pumps

d. Wiring diagrams of each controller

3.3.3 Accessories

Tank supports, piping offsets, fittings, and any other accessories required shall be furnished as specified to provide a complete installation and to eliminate interference with other construction.

3.4 PIPE AND FITTINGS

Piping shall be inspected, tested and approved before burying, covering, or concealing. Fittings shall be provided for changes in direction of piping and for all connections. Changes in piping sizes shall be made using tapered reducing pipe fittings. Bushings shall not be used. Photograph all piping prior to burying, covering, or concealing.

3.4.1 Cleaning of Piping

Interior and ends of piping shall be clean and free of any water or foreign material. Piping shall be kept clean during installation by means of plugs or other approved methods. When work is not in progress, open ends of the piping shall be securely closed so that no water or foreign matter will enter the pipes or fittings. Piping shall be inspected before placing in position.

3.4.2 Threaded Connections

Jointing compound for pipe threads shall be polytetrafluoroethylene (PTFE) pipe thread tape conforming to ASTM D3308 or Teflon pipe thread paste and shall be applied to male threads only. Exposed ferrous pipe threads shall be provided with one coat of zinc molybdate primer applied to a minimum of dry film thickness of 1 mil.

3.4.3 Pipe Hangers and Supports

Additional hangers and supports shall be provided for concentrated loads in aboveground piping, such as for valves and risers.

3.4.3.1 Vertical Piping

Piping shall be supported at each floor, at not more than 10 foot intervals.

3.4.4 Underground Piping

Installation of underground piping and fittings shall conform to NFPA 24. Joints shall be anchored in accordance with NFPA 24. Concrete thrust block shall be provided at elbow where pipe turns up towards floor, and the pipe riser shall be restrained with steel rods from the elbow to the flange above the floor. After installation in accordance with NFPA 24, rods and nuts shall be thoroughly cleaned and coated with asphalt or other corrosion-retard material approved by the Contracting Officer. Minimum depth of cover shall be 4 feet.

3.4.5 Grooved Mechanical Joint

Grooves shall be prepared according to the coupling manufacturer's instructions. Grooved fittings, couplings, and grooving tools shall be products of the same manufacturer. Pipe and groove dimensions shall comply with the tolerances specified by the coupling manufacturer. The diameter of grooves made in the field shall be measured using a "go/no-go" gauge, vernier or dial caliper, narrow-land micrometer, or other method specifically approved by the coupling manufacturer for the intended application. Groove width and dimension of groove from end of pipe shall be measured for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances. Grooved joints shall not be used in concealed locations, such as behind solid walls or ceilings, unless an access panel is shown on the drawings for servicing or adjusting the joint.

3.5 ELECTRICAL WORK

Electric motor and controls shall be in accordance with NFPA 20, NFPA 72 and NFPA 70, unless more stringent requirements are specified herein or are indicated on the drawings. Electrical wiring and associated equipment shall be provided in accordance with NFPA 20 and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Provide wiring in rigid metal conduit or intermediate metal conduit, except electrical metallic tubing conduit may be provided in dry locations not enclosed in concrete or where not subject to mechanical damage.

3.6 PIPE COLOR CODE MARKING

Color code marking of piping red as specified in Section 09 90 00 PAINTS AND COATINGS. Provide wrap around labels per MIL-STD-101 indicating direction of flow and type of fluid.

3.7 FLUSHING

The fire pump suction and discharge piping shall be flushed at 150 percent of rated capacity of each pump. All water shall be dechlorinated before it is released to the ground or storm water drain using a dechlor demon or dechlorinated equivalent. The underground piping upstream of the pump shall

not be flushed by using the fire pumps. Flushing operations shall continue until water is clear, but not less than 10 minutes. Submit a signed and dated flushing certificate before requesting field testing.

3.8 Preliminary Test Procedures

Submit proposed procedures for Preliminary Tests at least 14 days prior to the proposed date and time to begin Preliminary Tests. Include test agenda indicating tests to be performed, duration of tests, test personnel and witnesses, flushing procedures, flow rates, method of measurement, flushing layout and apparatus, pump test apparatus and blank test forms.

3.9 Preliminary Tests

The Qualified Fire Protection Engineer shall take all readings and measurements. The Manufacturer's Representative and a representative of the fire pump controller manufacturer shall witness the complete operational testing of the fire pump and drivers. The fire pump controller manufacturer's representative shall be an experienced technician employed by the respective manufacturers and capable of demonstrating operation of all features of respective components including trouble alarms and operating features. Fire pumps, drivers and equipment shall be thoroughly inspected and tested to insure that the system is correct, complete, and ready for operation.

Tests shall ensure that pumps are operating at rated capacity, pressure and speed. Tests shall include manual starting and running to ensure proper operation and to detect leakage or other abnormal conditions, flow testing, automatic start testing, testing of automatic settings, sequence of operation check, test of required accessories; test of pump alarms devices and supervisory signals, test of pump cooling, operational test of relief valves, and test of automatic power transfer, if provided. Pumps shall run without abnormal noise, vibration or heating. If any component or system was found to be defective, inoperative, or not in compliance with the contract requirements during the tests and inspection, the corrections shall be made and the entire preliminary test shall be repeated.

Piping shall be hydrostatically tested at 200 psig for a period of 2-hours, or at least 50 psi in excess of the maximum pressure, when the maximum pressure in the system is in excess of 150 psi in accordance with NFPA 20.

Test Equipment: Provide all equipment and instruments necessary to conduct a complete final test, including 2.5 inch diameter hoses, playpipe nozzles, pitot tube gauges, portable digital tachometer, voltage and ampere meters, and calibrated oil-filled water pressure gauges. Provide all necessary supports to safely secure hoses and nozzles during the test. The Government will furnish water for the tests. All water shall be dechlorinated before it is released to the ground or storm water drain.

Fully enclose or properly guard coupling, rotating parts, gears, projecting equipment, etc. so as to prevent possible injury to persons that come in close proximity of the equipment. Conduct testing of the fire pumps in a safe manner and ensure that all equipment is safely secured. Hoses and nozzles used to conduct flow tests shall be in excellent condition and shall be safely anchored and secured to prevent any misdirection of the hose streams.

3.10 Preliminary Tests

Submit Preliminary Test Report, to include the Contractor's Material and Test Certificate for Underground Piping and the Contractor's Material and Test Certificate for Aboveground Piping, as well as the NFPA 20 Contractor's Material and Test Certificate for Fire Pump Systems, fire pump test data, gauge calibration certificates, sign-in sheet and Certified Curve. Include flushing test results. All items in the Report shall be signed by the QFPE and the Manufacturer's Representative.

3.11 Final Test Procedures

Submit proposed procedures for Final Tests at least 21 days prior to the proposed date and time to begin Final Tests. Include test agenda indicating tests to be performed, duration of tests, test personnel and witnesses, pump test apparatus and pump test forms from preliminary testing. Final Tests shall be witnessed by the QFPE and the Contring Officer's Representative.

3.12 Final Tests

Tests shall ensure that pumps are operating at rated capacity, pressure and speed. Tests shall include manual starting and running to ensure proper operation and to detect leakage or other abnormal conditions, flow testing, automatic start testing, testing of automatic settings, sequence of operation check, test of required accessories; test of pump alarms, devices and supervisory signals, test of pump cooling, operational test of relief valves, and test of automatic power transfer, if provided. Pumps shall run without abnormal noise, vibration or heating. If any component or system was found to be defective, inoperative, or not in compliance with the contract requirements during the tests and inspection, the corrections shall be made and the entire final test shall be repeated.

Test Equipment: Provide all equipment and instruments necessary to conduct a complete final test, including 2.5 inch diameter hoses, playpipe nozzles, pitot tube gauges, dechlor demon or dechlorinate equivalent portable digital tachometer, voltage and ampere meters, and calibrated oil-filled water pressure gauges. Provide all necessary supports to safely secure hoses and nozzles during the test. The Government will furnish water for the tests.

Flushing of the underground and hydrostatic testing are not required to be repeated during final testing. If the quantity of NFPA 20 required starts and stops were accomplished in Preliminary Testing, they are not required to be repeated in Final Testing, otherwise, complete the series.

3.13 Final Test Report

Submit Final Test Report, to include the Contractor's Material and Test Certificate for Underground Piping and the Contractor's Material and Test Certificate for Aboveground Piping, as well as the NFPA 20 Contractor's Material and Test Certificate for Fire Pump Systems, fire pump test data, gauge calibration certificates, sign-in sheet and Certified Curve. Include flushing test results. All items in the Report shall be signed by the QFPE. Include a copy of the Test Reports in the Operation and Maintenance Manual.

3.14 Posted Operating and Maintenance Instructions

Submit system diagrams that show the layout of equipment, piping, and storage units, and typed condensed sequence of operation, wiring and control diagrams, and operation manuals explaining preventative maintenance procedures, methods of checking the system for normal, safe operation, and procedures for safely starting and stopping the system shall be framed under glass or laminated plastic. After approval, these Posted Operating and Maintenance Instructions shall be posted where directed. Posted O&M Instructions shall be framed, under glass, for pumps, drivers, controllers, and flow meters. Include system schematic, plans and sections, HVAC and their controls.

3.15 CLOSEOUT ACTIVITIES

3.15.1 Field Training

The QFPE and the Manufacturer's Representative shall conduct a training course for operating and maintenance personnel as designated by the Contracting Officer. Submit the proposed schedule for field training at least 14 days prior to the start of related training. Training shall be provided for a period of 8 hours of normal working time and shall start after the fire pump installation is functionally complete and after the Final Acceptance Test. The field instruction shall cover all of the items contained in the approved Operating and Maintenance Instructions. Submit manuals listing step-by-step procedures required for system startup, operation, shutdown, and routine maintenance. The manuals shall include the manufacturer's name, model number, parts list, list of parts and tools that should be kept in stock by the owner for routine maintenance including the name of a local supplier, simplified wiring and controls diagrams, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment. Data Package 3 shall be submitted for fire pumps and drivers in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA. Each service organization submitted shall be capable of providing 4 hour onsite response to a service call on an emergency basis.

3.15.2 As-Built Drawings

Submit As-Built Drawings, no later than 14 days after completion of the Final Tests. Update the Fire Pump Installation Drawings to reflect as-built conditions after all related work is completed and shall be electronic on CDs.

3.16 PROTECTION

Carefully remove materials so as not to damage material which is to remain. Replace existing work damaged by the Contractor's operations with new work of the same construction.

-- End of Section --