Construction Documents – 100% CD Submittal: Specifications

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Electronic Health Record Modernization (EHRM) Infrastructure Upgrades – Togus, ME

Project No. 402-22-700

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Togus VA Medical Center

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US Department of Veterans Affairs

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SECTION 00 01 00
TABLE OF CONTENTS – 100% CONSTRUCTION DOCUMENTS

The following listed documents comprise the Project Manual for Electronic Health Record Modernization (EHRM) Infrastructure Upgrades at the Togus VA Medical Center in Augusta, Maine. Numbering of Divisions conforms to CSI Format for Building Specifications; Divisions and Sections not appearing are not applicable.

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VOLUME ONE
00 01 00 Table of Contents

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS
00 01 15 List of Drawing Sheets

DIVISION 01 - GENERAL REQUIREMENTS
01 00 00 General Requirements
01 14 00 Project Phasing
01 32 16.15 Project Schedule
01 33 23 Shop Drawings, Product Data, and Samples
01 35 26 Safety Requirements
01 42 19 Reference Standards
01 45 00 Quality Control
01 45 29 Testing Laboratory Services
01 56 00 Temporary Barriers and Enclosures
01 57 19 Temporary Environmental Controls
01 74 19 Construction Waste Management
01 81 11 Sustainable Construction Requirements
01 91 00 General Commissioning Requirements

END VOLUME ONE

VOLUME TWO
00 01 00 Table of Contents

DIVISION 02 – EXISTING CONDITIONS
02 41 19 Selective Demolition
02 81 00 Transportation and Disposal of Hazardous Materials
02 82 00 Asbestos Remediation
02 83 00 Lead Remediation

DIVISION 03 – CONCRETE
03 30 00 Cast-In-Place Concrete

DIVISION 04 – MASONRY
04 20 00 Unit Masonry
04 26 13 Masonry Veneer
04 72 00 Cast Stone Masonry

DIVISION 05 – METALS
05 12 00 Structural Steel Framing
05 21 00 Steel Joist Framing
05 31 00 Steel Decking
05 40 00 Cold-Formed Metal Framing

05 50 00 Metal Fabrications
05 52 13 PIPE AND TUBE RAILINGS

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES
06 10 53 Miscellaneous Rough Carpentry
06 16 00 Sheathing
06 41 16 Plastic-Laminate-Clad Architectural Cabinets
06 64 00 Plastic Paneling

DIVISION 07 – THERMAL AND MOISTURE PROTECTION
07 13 26 Self-Adhering Sheet Waterproofing
07 19 00 Water Repellents
07 21 00 Thermal Insulation
07 21 19 Foamed-In-Place Insulation
07 26 50 Underslab Vapor Barrier
07 27 26 Fluid-Applied Membrane Air Barriers
07 42 93 Soffit Panels
07 52 00 Modified Bitumen Membrane Roofing
07 62 00 Sheet Metal Flashing And Trim
07 72 00 Roof Accessories
07 84 00 Firestopping General Requirements
07 84 43 Joint Firestopping
07 92 00 Joint Sealants
07 92 19 Acoustic Joint Sealants

DIVISION 08 – OPENINGS
08 11 13 Hollow Metal Doors And Frames
08 31 13 Access Doors And Frames
08 33 23 Overhead Coiling Doors
08 34 00 Hot Aisle Containment System
08 41 13 Aluminum-Framed Entrances And Storefronts
08 41 23 Fire-Rated Aluminum Framed Entrances And Storefronts
08 71 00 Door Hardware
08 71 00A Door Hardware Groups
08 80 00 Glazing
08 88 13 Fire-Rated Glass
08 90 00 Louvers And Vents

DIVISION 09 – FINISHES
09 22 16 Non-Structural Metal Framing
09 29 00 Gypsum Board
09 30 13 Ceramic Tiling
09 51 13 Acoustic Panel Ceilings
09 65 13 Resilient Base And Accessories
09 65 36 Static-Control Resilient Flooring
09 68 13 Tile Carpeting
09 91 14 Exterior Painting
09 91 24 Interior Painting

DIVISION 10 – SPECIALTIES
10 26 00 Wall And Door Protection
10 28 00 Toilet, Bath And Laundry Accessories
10 44 13 Fire Protection Cabinets
10 44 19 Fire Extinguishers

DIVISION 11 – EQUIPMENT
11 13 19 Stationary Loading Dock Equipment

DIVISION 12 – FURNISHINGS
12 36 23.13 Plastic-Laminate-Clad Countertops

DIVISION 13 – SPECIAL CONSTRUCTION
13 05 41 Seismic Restraint Requirements For Non-Structural Components

DIVISION 14 – CONVEYING EQUIPMENT - NA
END OF VOLUME TWO

VOLUME THREE
00 01 00 Table Of Contents

DIVISION 21 – FIRE SUPPRESSION
21 08 00 Commissioning Of Fire Suppression Systems
21 13 13 Wet-Pipe Sprinkler Systems
21 13 45 Sprinkler Guards
21 22 00 Clean Agent Fire Suppression Systems

DIVISION 22 – PLUMBING
22 05 11 Common Work Results For Plumbing
22 05 12 General Motor Requirements For Plumbing Equipment
22 05 19 Meters And Gages For Plumbing Piping
22 05 23 General-Duty Valves For Plumbing Piping
22 05 33 Heat Tracing For Plumbing Piping
22 07 11 Plumbing Insulation
22 08 00 Commissioning Of Plumbing Systems
22 11 00 Facility Water Distribution
22 11 23 Domestic Water Pumps
22 13 00 Facility Sanitary And Vent Piping
22 14 00 Facility Storm Drainage
22 40 00 Plumbing Fixtures
22 62 00 Vacuum Systems For Laboratory And Healthcare Facilities
22 63 00 Gas Systems For Laboratory And Healthcare Facilities

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
23 05 11 Common Work Results For Hvac
23 05 12 General Motor Requirements For Hvac And Steam Generation Equipment
23 05 41 Noise And Vibration Control For Hvac Piping And Equipment
23 05 93 Testing, Adjusting, And Balancing For Hvac
23 07 11 Hvac And Boiler Plant Insulation
23 08 00 Commissioning Of Hvac Systems
23 09 23 Direct-Digital Control System For Hvac
23 09 27 Data Center Cooling Optimization System
23 10 00 Facility Fuel Oil Systems
23 21 13 Hydronic Piping
23 22 13 Steam And Condensate Heating Piping
23 23 00 Refrigerant Piping
23 25 00 Hvac Water Treatment
23 31 00 Hvac Ducts And Casings
23 34 00 Hvac Fans
23 37 00 Air Outlets And Inlets
23 81 00 Decentralized Unitary Hvac Equipment
23 81 23 Computer-Room Air-Conditioners
23 81 45 Variable Refrigerant Flow Systems
23 82 00 Convection Heating And Cooling Units
23 85 00 Radon Mitigation Systems

DIVISION 26 – ELECTRICAL
26 05 11 - Requirements for Electrical Installations
26 05 13 - Medium-Voltage Cables
26 05 19 - Low-Voltage Electrical Power Conductors and Cables
26 05 26 - Grounding and Bonding for Electrical Systems
26 05 33 - Raceways and Boxes for Electrical Systems
26 05 41 - Underground Electrical Construction
26 05 73 - Overcurrent Protective Device Coordination Study
26 08 00 - Commissioning of Electrical Systems

26 09 23 - Lighting Controls
26 12 19 - Pad-Mounted Liquid-Filled Medium-Voltage Transformers
26 13 16 - Medium-Voltage Fusible Interrupter Switches
26 22 00 - Low-Voltage Transformers
26 24 13 - Distribution Switchboards
26 24 16 - Panelboards
26 27 26 - Wiring Devices
26 29 21 - Enclosed Switches and Circuit Breakers
26 32 13 - Engine Generators
26 33 53 - Static Uninterruptible Power Supply
26 36 23 - Automatic Transfer Switches
26 41 00 - Facility Lightning Protection
26 43 13 - Surge Protective Devices
26 51 00 - Interior Lighting
26 56 00 - Exterior Lighting

VOLUME FOUR
DIVISION 27 – COMMUNICATIONS
270511 - Requirements for Communications Installations
270526 - Grounding and Bonding for Communications Systems
270533 - Conduits and Backboxes for Communications Systems
270536 - Cable Trays for Communications Systems
270553 - Identification for Communications Systems
270800 - Commissioning of Communications Systems
271000 - Structured Cabling
271116 - Communications Cabinets, Racks, Frames, and Enclosures
271119 - Communications Termination Blocks and Patch Panels
271126 - Communications Rack Mounted Power Protection and Power Strips
271313 - Communications Copper Backbone Cabling
271313.13 - Communications Copper Cable Splicing and Terminations
271323 - Communications Optical Fiber Backbone Cabling
271323.13 - Communications Optical Fiber Cable Splicing and Terminations
271513 - Communications Copper Horizontal Cabling
271619 - Communications Patch Cords, Station Cords, and Cross Connect Wire
275116 - Public Address and Mass Notification Systems

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY
280500 - Common Work Results for Electronic Safety and Security
280513 - Conductors and Cables for Electronic Safety and Security
280526 - Grounding and Bonding for Electronic Safety and Security
280528.33 - Conduits and Backboxes for Electronic Safety and Security
280800 - Commissioning of Electronic Safety and Security Systems
281300 - Physical Access Control System
281353 - Security Access Detection
281600 - Intrusion Detection System
282300 - Video Surveillance
28 31 00 - Fire Detection And Alarm

DIVISION 31 – EARTHWORK
31 20 00 Earthwork
31 23 19 Dewatering
31 32 19 Mechanically Stabilized Earth (MSE) Segmental Retaining Wall

DIVISION 32 – EXTERIOR IMPROVEMENTS
32 05 23 Cement And Concrete For Exterior Improvements
32 12 16 Asphalt Paving
32 17 13 Pavement Markings
32 90 00 Planting

DIVISION 33 – SITE UTILITIES
33 08 00 Commissioning Of Site Utilities
33 10 00 Water Utilities
33 30 00 Sanitary Sewer Utilities

33 40 00 Storm Sewer Utilities

APPENDIX
40 00 00 Geotechnical Engineering Report

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 01 10 00 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse or store as indicated in drawings.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

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1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.4 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site .

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.5 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property , for environmental protection , for dust control and , for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

C. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by salvage and demolition operations.

1.6 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

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1.7 FIELD CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1. Before selective demolition, Owner will remove the following items:
a. Existing furniture, furnishings, and equipment .

B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Hazardous Materials: Reference and/or request owner provided hazardous material report.

1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

D. Storage or sale of removed items or materials on-site is not permitted.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.8 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:

1. Obtain list of existing products under warranty from owner.

1.9 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

E. Survey of Existing Conditions: Record existing conditions by use of measured drawings .

1. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

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3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
   a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
   b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
   c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
   d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
   e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
   f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
   g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

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3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 50 00 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least one hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

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9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials. Comply with Section 01 74 19 VA Construction Waste Management.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area on-site .
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

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D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction. and recycle or dispose of them according to Section 01 74 19 "Construction Waste Management and Disposal."

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 01 74 19 "Construction Waste Management."

B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

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SECTION 02 81 00

TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS

PART 1 - GENERAL

1.1. CONTRACT DOCUMENTS AND RELATED REQUIREMENTS

A. Drawings, general provisions of the contract, including general and supplementary conditions and other Division 01 specifications, shall apply to the work of this section. The contract documents show or describe the work to be done under the contract and related requirements and conditions impacting the project. Related requirements and conditions include applicable codes and regulations, notices and permits, existing site conditions and restrictions on use of the site, requirements for partial owner occupancy during the work, coordination with other work and the phasing of the work. In the event the Contractor/Sub-Contractor discovers a conflict in the contract documents and/or requirements or codes, the conflict must be brought to the immediate attention of the COR for resolution. Whenever there is a conflict or overlap in the requirements, the most stringent shall apply. Any actions taken by the Contractor/Sub-Contractor without obtaining guidance from the COR shall become the sole risk and responsibility of the Contractor/Sub-Contractor. All costs incurred due to such action are also the responsibility of the Contractor/Sub-Contractor.

1.2. RELATED WORK

A. 01 35 26 SAFETY REQUIREMENTS

B. 02 41 00 SELECTIVE DEMOLITION

C. 02 82 00 ASBESTOS REMEDIATION

D. 02 83 00 LEAD REMEDIATION

E. 07 84 00 FIRESTOPPING

F. Division 09 FINISHES

1.3. REFERENCES

A. 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.

B. All work under this contract shall be done in strict accordance with all applicable federal, state, and local regulations, standards and codes governing hazardous materials-related work, and any other trade work done in conjunction with the project. All applicable codes, regulations and standards are adopted into this specification and will have the same force and effect as this specification.

C. The most recent edition of any relevant regulation, standard, document, or code shall be in effect. Where conflict among the requirements or with these specifications exists, the most stringent requirement(s) shall be utilized.

D. All related regulations, statutes, public laws, registers, and regulatory guidance are incorporated by reference.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA)

IATA DGR	(2018) Dangerous Goods Regulations

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1926.59	Hazard Communication
29 CFR 1926.65	Hazardous Waste Operations and Emergency Response
40 CFR 61	National Emission Standards for Hazardous Air Pollutants
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
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 270	EPA Administered Permit Programs: The Hazardous Waste Permit Program
40 CFR 300	National Oil and Hazardous Substances Pollution Contingency Plan
40 CFR 302	Designation, Reportable Quantities, and Notification
40 CFR 761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
49 CFR 107	Hazardous Materials Program Procedures
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

1.4. DEFINITIONS

A. Contracting Officer Representative (COR)

1. The VA official responsible for monitoring on-going project work.

B. Hazardous Material

1. A substance or material which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and

which has been so designated pursuant to the Hazardous Materials Transportation Act, 49 U.S.C. Appendix Section 1801 et seq. The term includes materials designated as hazardous materials under the provisions of 49 CFR 172, Sections .101 and .102 and materials which meet the defining criteria for hazard classes and divisions in 49 CFR 173. EPA designated hazardous wastes are also hazardous materials.

C. Hazardous Waste

1. A waste which meets criteria established in RCRA or specified by the EPA in 40 CFR 261, or the criteria established by the applicable state of Maine Administrative Rules; or the criteria established by the applicable sections of the Maine Codified Laws.

1.5. SUBMITTALS

A. Submit the following in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES:

1. Preconstruction Submittals

a. Asbestos Abatement Plan, prepared in accordance with the requirements of Maine Department of Environmental Protection (DEP)

b. Lead Based Paint Abatement Plan, prepared in accordance with the requirements of Maine Department of Environmental Protection (DEP)

c. Packaging Notifications

d. Hazardous Waste Management Plan

e. Onsite Hazardous Waste Management

f. Notices of Non-Compliance and Notices of Violation

g. Transportation and Disposal Coordinator

h. Organization Chart, Qualifications, Training, Licenses Certification

i. Security Plan

j. Spill Response Plan

k. Waste Minimization Plan

2. Periodic Submittals

a. Updates to any of the preconstruction submittals

3. Closeout Submittals

a. Recordkeeping

b. Exception Report

c. Shipping Documents and Packagings Certification

d. Certificates of Disposal

e. In addition to these submittals, the closeout submittals shall include all updates to previously submitted information as necessary to ensure the documentation requirements of this section are fulfilled.

1.6. QUALITY ASSURANCE

A. Transportation and Disposal Coordinator

1. Designate, by position and title, one person to act as the Transportation and Disposal Coordinator (TDC) for this contract. The TDC must serve as the single point of contact for all environmental regulatory matters and have overall responsibility for total environmental compliance at the site including, but not limited to, accurate identification and classification of hazardous waste and hazardous materials; determination of proper shipping names; identification of marking, labeling, packaging and placarding requirements; completion of waste profiles, hazardous waste manifests, asbestos waste shipment records, PCB manifests, bill of ladings, exception and discrepancy reports; and all other environmental documentation. The TDC must have, at a minimum, five years of specialized experience in the management and transportation of hazardous waste and have been Department of Transportation certified under 49 CFR 172, Subpart H.

B. Training

1. Hazardous materials employees must be trained, tested, and certified to safely and effectively carry out their assigned duties in accordance with 29 CFR 1926.59, 29 CFR 1926.65, and 49 CFR 172, Subpart H. Employees transporting hazardous materials or preparing hazardous materials for transportation, including samples, must be trained, tested, and certified in accordance with 49 CFR 172, Subpart H, including security awareness and any applicable security plans. Hazardous material employees must also be trained in accordance with IATA DGR when shipping hazardous materials by air.

C. Certification

1. The hazardous materials transporter must possess a current certificate of registration issued by the Research and Special Programs Administration (RSPA), U.S. Department of Transportation, when required by 49 CFR 107, Subpart G. Submit copies of the certificates or written statements certifying exemption from these requirements.

1.7. LAWS AND REGULATIONS REQUIREMENTS

A. Comply with Federal, state, and local laws and regulations which are applicable. These requirements are amended frequently and compliance with amendments is required as they become effective. Notify the Contracting Officer immediately if compliance exceeds the scope of work or conflicts with specific requirements of the contract.

PART 2 - PRODUCTS

2.1. MATERIALS

A. Provide all the materials required for the packaging, labeling, marking, placarding and transportation of hazardous wastes and hazardous materials in conformance with Department of Transportation standards and IATA DGR. Details in this specification must not be construed as establishing the limits of the Contractor's responsibility.

2.2. PACKAGINGS

A. Provide bulk and non-bulk containers for packaging hazardous materials/wastes consistent with the authorizations referenced in the Hazardous Materials Table in 49 CFR 172, Section .101, Column 8. Bulk and non-bulk packaging must meet the corresponding specifications in 49 CFR 173 referenced in the Hazardous Materials Table, 49 CFR 172, Section .101. Packaging must conform to the general packaging requirements of Subpart B of 49 CFR 173, to the requirements of 49 CFR 178 at the specified packing group performance level, to the requirements of special provisions of column 7 of the Hazardous Materials Table in 49 CFR 172, Section .101, and be compatible with the material to be packaged as required by 40 CFR 262. Also provide other packaging related materials such as materials used to cushion or fill voids in overpacked containers. The hazardous materials being packaged must not react dangerously with, decompose, or ignite the sorbent packaging materials. Additionally, sorbents used to treat free liquids to be disposed of in landfills must be non-biodegradable as specified in 40 CFR 264, Section .314. In addition, packaging notifications will be provided to the Government in accordance with 49 CFR 172, Section .178.2(c) regarding type and dimensions of closures, including gaskets, needed to satisfy performance test requirements.

2.3. MARKINGS

A. Provide markings for each hazardous material/waste package, freight container, and transport vehicle consistent with the requirements of 49 CFR 172, Subpart D; 40 CFR 262, Section .32 (for hazardous waste); 40 CFR 761, Section .45 (for PCBs); and 40 CFR 61, Section .149(d) (for asbestos). Markings must withstand a 180-day exposure to conditions reasonably expected to be encountered during container storage and transportation, without deterioration or substantial color change.

2.4. LABELING

A. Provide primary and subsidiary labels for hazardous materials/wastes consistent with the requirements in the Hazardous Materials Table in 49 CFR 172, Section .101, Column 6. Labels must meet design specifications required by 49 CFR 172, Subpart E including size,

shape, color, printing, and symbol requirements. Labels must be durable weather resistant and withstanding a 180-day exposure to conditions reasonably expected to be encountered during container storage and transportation, without deterioration or substantial color change.

2.5. PLACARDS

A. For each offsite shipment of hazardous material/waste, provide primary and subsidiary placards consistent with the requirements of 49 CFR 172, Subpart F. Provide placards for each side and each end of bulk packaging, freight containers, transport vehicles, and rail cars requiring such placarding. Placards may be plastic, metal, or other material capable of withstanding, without deterioration, a 30-day exposure to open weather conditions and must meet design requirements specified in 49 CFR 172, Subpart F.

2.6. SPILL RESPONSE MATERIALS

A. Provide spill response materials including, but not limited to, containers, adsorbent, shovels, and personal protective equipment. Spill response materials must be available at all times when hazardous materials/wastes are being handled or transported. Spill response materials must be compatible with the type of material being handled.

2.7. EQUIPMENT AND TOOLS

A. Provide miscellaneous equipment and tools necessary to handle hazardous materials and hazardous wastes in a safe and environmentally sound manner.

PART 3 - EXECUTION

3.1. HAZARDOUS WASTE MANAGEMENT PLAN

A. Prepare a Hazardous Waste Management Plan detailing the manner in which hazardous wastes will be managed and describing the types and volumes of hazardous wastes anticipated to be managed. The plan must address both onsite and offsite hazardous waste management. Describe the methods to be used to ensure accurate piece counts or weights of shipments; describe waste minimization methods; identify and describe

facilities to be used for treatment, storage, and disposal (TSD); identify areas onsite where hazardous wastes are to be handled; and identify whether transfer facilities are to be used; and if so, how the wastes will be tracked to ultimate disposal. Submit the plan to the Contracting Officer for approval prior to start of work. Submit written documentation of weekly hazardous waste inspections on a monthly basis.

3.2. ONSITE HAZARDOUS WASTE MANAGEMENT

A. Coordinate the onsite management of all hazardous materials and waste with the COR. These paragraphs apply to Government owned waste only. The Contractor is responsible for ensuring compliance with federal, state, and local hazardous waste laws and regulations and verifying those requirements when preparing reports, waste shipment records, hazardous waste manifests, or other documents. Identify hazardous wastes using criteria set forth in 40 CFR 261 or applicable state and local laws, regulations, and ordinances. Comply with generator requirements in 40 CFR 262 when accumulating hazardous waste onsite. Onsite accumulation times must be restricted to applicable time frames referenced in 40 CFR 262, Section .34 or as otherwise directed by the COR. Accumulation start dates commence when waste container is transferred into a 90 day accumulation site or permitted storage facility. Only use containers in good condition and compatible with the waste to be stored. Ensure containers are closed except when adding or removing waste, and immediately mark all hazardous waste containers with the words "hazardous waste" and other information required by 40 CFR 262, Section .32 as soon as the waste is containerized. An additional marking must be placed on containers of "unknowns" designating the date sampled, and the suspected hazard. Inspect containers for signs of deterioration and for responding to any spills or leaks. Inspect all hazardous waste areas weekly and provide written documentation of the inspection. Include date and time of inspection, name of individual conducting the inspection, problems noted, and corrective actions taken on the inspection logs.

3.3. HAZARDOUS WASTE CLASSIFICATION

A. Identify all waste codes applicable to each hazardous waste stream based on requirements in 40 CFR 261 or applicable state or local law or regulation. Also identify applicable treatment standards in 40 CFR 268 and state land disposal restrictions and make a determination as to whether or not the waste meets or exceeds the standards. Submit waste profiles, analyses, classification, and treatment standards information to COR for review and approval.

3.4. OFFSITE HAZARDOUS WASTE MANAGEMENT

A. Coordinate the offsite transfer of all hazardous materials and waste with the COR. Use RCRA Subtitle C permitted facilities which meet the requirements of 40 CFR 264 or facilities operating under interim status which meet the requirements of 40 CFR 265. Do not use offsite treatment, storage, and disposal facilities with significant RCRA violations or compliance problems (such as facilities known to be releasing hazardous constituents into ground water, surface water, soil, or air). Submit Notices of Non-Compliance and Notices of Violation by a federal, state, or local regulatory agency issued to the Contractor in relation to any work performed under this contract. Immediately provide copies of such notices to the Contracting Officer. Also furnish relevant documents regarding the incident and any information requested by the COR and coordinate its response to the notice with the COR prior to submission to the notifying authority. Also furnish a copy to the COR of all documents submitted to the regulatory authority, including the final reply to the notice, and all other materials, until the matter is resolved.

3.5. TREATMENT, STORAGE, AND DISPOSAL FACILITY AND TRANSPORTER

A. Provide the COR with EPA ID numbers, names, locations, and telephone numbers of TSD facilities and transporters. This information must be contained in the Hazardous Waste Management Plan and be approved by the COR prior to waste disposal.

3.6. FACILITY STATUS INFORMATION

A. Facilities receiving hazardous waste must be permitted in accordance with 40 CFR 270 or operating under interim status in accordance with

40 CFR 265 requirements or permitted by a state authorized by the Environmental Protection Agency to administer the RCRA permit program. Additionally, prior to using a TSD Facility, contact the EPA Regional Offsite Coordinator specified in 40 CFR 300, Section .440, to determine the facility's status, and document all information necessary to satisfy the requirements of the EPA Offsite policy and submit this information to the COR in the Hazardous Waste Management Plan.

3.7. SHIPPING DOCUMENTS AND PACKAGINGS CERTIFICATION

A. Prior to shipment of any hazardous material offsite, and a minimum of 5 days prior to anticipated pickup, provide for review written certification to the COR that hazardous materials have been properly packaged, labeled, and marked in accordance with Department of Transportation and EPA requirements. Furnish designated disposal facility packaging assurances not later than 35 days after acceptance of the shipment. The Contractor's TDC must also provide written certification regarding waste minimization efforts documenting that efforts have been taken to reduce the volume and toxicity of waste to the degree economically practicable and that the method of treatment, storage, or disposal selected minimizes threats to human health and the environment.

3.8. TRANSPORTATION

A. Prior to conducting hazardous materials activities, the Contractor responsible for pre-transportation activities must either certify to the Government that a Security Plan is in place which meets the requirements of 49 CFR 172, Subpart I or in the event that the types or amounts of hazardous materials are excluded from the security planning requirements, a written statement to that effect detailing the basis for the exception. Use manifests for transporting hazardous wastes as required by 40 CFR 263 or applicable state or local law or regulation. Transportation must comply with all requirements in the Department of Transportation referenced regulations in the 49 CFR series. Prepare hazardous waste manifests for each shipment of hazardous waste shipped offsite. Complete manifests using instructions in 40 CFR 262, Subpart B and applicable state or local

law or regulation. Submit manifests and waste profiles to the COR for review and approval. Prepare land disposal restriction notifications as required by 40 CFR 268 or applicable state or local law or regulation for each shipment of hazardous waste. Submit notifications with the manifest to the COR for review and approval.

3.9. TREATMENT AND DISPOSAL OF HAZARDOUS WASTES

A. Coordinate any offsite shipments of hazardous materials or hazardous wastes with the COR. Initial, or satellite hazardous waste accumulation is limited to 55 gallons (or 1 quart of acutely hazardous waste). Once a waste stream exceeds 55 gallons, it must be transferred to an on-site 90-day (180-day small quantity generator) accumulation area, or a permitted hazardous waste treatment, storage, or disposal facility within three days. Ship hazardous wastes only to facilities which are properly permitted to accept the hazardous waste or operating under interim status. Ensure wastes are treated to meet land disposal treatment standards in 40 CFR 268 prior to land disposal. Propose TSD facilities via submission of the Hazardous Waste Management Plan, subject to the approval of the COR. Submit Certificates of Disposal documenting the ultimate disposal, destruction or placement of hazardous wastes, polychlorinated biphenyls (PCBs), and asbestos within 90 days of initial shipment. Receipt of these certificates will be required for final payment.

3.10. IDENTIFICATION OF PROPER SHIPPING NAMES

A. Use 49 CFR 172, Section .101 to identify proper shipping names for each hazardous material (including hazardous wastes) to be shipped offsite. Submit proper shipping names to the COR in the form of draft shipping documents for review and approval.

3.11. PACKAGING, LABELING, AND MARKING

A. Package, label, and mark hazardous materials/wastes using the specified materials and in accordance with the referenced authorizations. Mark each container of hazardous waste of 110 gallons or less with the following:

1. "HAZARDOUS WASTE - Federal Law Prohibits Improper Disposal.

2. If found, contact the nearest police or public safety authority or the U.S. Environmental Protection Agency.

3. Generator's name _____.

4. Manifest Document Number _____.

3.12. OTHER HAZARDOUS MATERIAL SHIPMENT DOCUMENTS

A. Prepare a bill of lading for each shipment of hazardous material which is not accompanied by a hazardous waste manifest which fulfills the shipping paper requirements. The bill of lading must satisfy the requirements of 49 CFR 172, Subpart C, and applicable state or local law or regulation, and must be submitted to the COR for review and approval. For laboratory samples and treatability study samples, prepare bills of lading and other documentation as necessary to satisfy conditions of the sample exclusions in 40 CFR 261, Section .4(d) and (e) and any applicable state or local law or regulation. Bill of ladings requiring shipper's certifications must be signed by the Government.

3.13. SHIPPING DOCUMENTS

A. Ensure that each shipment of hazardous material sent offsite is accompanied by properly completed shipping documents. This includes shipments of samples that may potentially meet the definition of a Department of Transportation regulated hazardous material.

3.14. WASTE MINIMIZATION

A. Minimize the generation of hazardous waste to the maximum extent practicable and take all necessary precautions to avoid mixing clean and contaminated wastes. Identify and evaluate recycling and reclamation options as alternatives to land disposal. Requirements of 40 CFR 266 apply to: hazardous wastes recycled in a manner constituting disposal; hazardous waste burned for energy recovery; lead-acid battery recycling; and hazardous wastes with economically recoverable precious metals. Submit written certification that waste minimization efforts have been undertaken to reduce the volume and toxicity of waste to the degree economically practicable and that the

method of treatment, storage, or disposal selected minimizes threats to human health and the environment.

3.15. RECORDKEEPING

A. Maintain adequate records to support information provided to the COR regarding exception reports, annual reports, and biennial reports; and maintain bill of ladings for a minimum of 375 days from the date of shipment or longer period required by applicable law or regulation or other provision of this contract. Submit information necessary to file state annual or EPA biennial reports for hazardous waste transported, treated, stored, or disposed of under this contract. Do not forward these data directly to the regulatory agency but to the COR at the specified time. Submit the information necessary for filing of the formal reports in the form and format required by the governing federal or state regulatory agency. A cover letter must accompany the data to include the contract number, Contractor name, and project location. In the events that a manifest copy documenting receipt of hazardous waste at the treatment storage and disposal facility is not received within 35 days of shipment initiation, or that a manifest copy documenting receipt of PCB waste at the designated facility is not received within 35 days of shipment initiation, prepare and submit an exception report to the COR within 37 days of shipment initiation.

3.16. SPILL RESPONSE

A. In the event of a spill or release of a hazardous substance (as designated in 40 CFR 302), or pollutant or contaminant, or oil (as governed by the Oil Pollution Act (OPA), 33 U.S.C. 2701 et seq.), notify the COR immediately. Direction from the COR concerning a spill or release is not considered a change under the contract. If the spill exceeds a reporting threshold, follow the pre-established procedures for immediate reporting to the COR. Comply with applicable requirements of federal, state, or local laws or regulations regarding any spill incident.

3.17. EMERGENCY CONTACTS

A. Comply with the emergency contact provisions in 49 CFR 172, Section .604. Whenever the Contractor ships hazardous materials, provide a 24-hour emergency response contact and phone number of a person knowledgeable about the hazardous materials being shipped and who has comprehensive emergency response and incident mitigation information for that material, or has immediate access to a person who possesses such knowledge and information. Monitor the phone on a 24-hour basis at all times when the hazardous materials are in transportation, including during storage incidental to transportation. Ensure that information regarding this emergency contact and phone number are placed on all hazardous material shipping documents. Designate an emergency coordinator and post the following information at areas in which hazardous wastes are managed:

1. The name of the emergency coordinator.

2. Phone number through which the emergency coordinator can be contacted on a 24-hour basis.

3. The telephone number of the local fire department.

4. The location of fire extinguishers and spill control materials.

- - - END - - -

SECTION 02 82 00

ASBESTOS REMEDIATION

PART 1 – GENERAL

1.1.CONTRACT DOCUMENTS AND RELATED REQUIREMENTS:

A. Drawings, general provisions of the contract, including general and supplementary conditions and other Division 01 specifications, shall apply to the work of this section. The contract documents show or describe the work to be done under the contract and related requirements and conditions impacting the project. Related requirements and conditions include applicable codes and regulations, notices and permits, existing site conditions and restrictions on use of the site, requirements for partial owner occupancy during the work, coordination with other work and the phasing of the work. In the event the Contractor/Sub-Contractor discovers a conflict in the contract documents and/or requirements or codes, the conflict must be brought to the immediate attention of the COR for resolution. Whenever there is a conflict or overlap in the requirements, the most stringent shall apply. Any actions taken by the Contractor/Sub-Contractor without obtaining guidance from the COR shall become the sole risk and responsibility of the Contractor/Sub-Contractor. All costs incurred due to such action are also the responsibility of the Contractor/Sub-Contractor.

1.2.RELATED WORK

A. 01 35 26 SAFETY REQUIREMENTS

B. 02 41 00 SELECTIVE DEMOLITION

C. 02 81 00 TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS

D. 02 83 00 LEAD REMEDIATION

E. 07 84 00 FIRESTOPPING

F. Division 09 FINISHES

1.3.REFERENCES

A. 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.

B. All work under this contract shall be done in strict accordance with all applicable federal, state, and local regulations, standards and codes governing asbestos work, and any other trade work done in conjunction with the project. All applicable codes, regulations and standards are adopted into this specification and will have the same force and effect as this specification.

C. The most recent edition of any relevant regulation, standard, document, or code shall be in effect. Where conflict among the requirements or with these specifications exists, the most stringent requirement(s) shall be utilized.

D. All related regulations, statutes, public laws, registers, and regulatory guidance are incorporated by reference.

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP Z9.2	(2018) Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems

ASTM INTERNATIONAL (ASTM)

ASTM C732	(2006; R 2012) Aging Effects of Artificial Weathering on Latex Sealants
ASTM D522/D522M	(2017) Mandrel Bend Test of Attached Organic Coatings
ASTM D2794	(1993; R 2019) Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)

ASTM D4397	(2016) Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E96/E96M	(2016) Standard Test Methods for Water Vapor Transmission of Materials
ASTM E119	(2020) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E736/E736M	(2017) Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
ASTM E1368	(2014) Visual Inspection of Asbestos Abatement Projects

COMPRESSED GAS ASSOCIATION (CGA)

CGA G-7	(2014) Compressed Air for Human Respiration; 6th Edition

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 701	(2019) Standard Methods of Fire Tests for Flame Propagation of Textiles and Films

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

NIOSH NMAM	(2016; 5th Ed) NIOSH Manual of Analytical Methods

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 340/1-90/018	(1990) Asbestos/NESHAP Regulated Asbestos Containing Materials Guidance

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.147	The Control of Hazardous Energy (Lock Out/Tag Out)
29 CFR 1926.33	Access to Employee Exposure and Medical Records
29 CFR 1926.55	Gases, Vapors, Fumes, Dusts, and Mists
29 CFR 1926.59	Hazard Communication
29 CFR 1926.103	Respiratory Protection
29 CFR 1926.1101	Asbestos
40 CFR 61-SUBPART A	General Provisions
40 CFR 61-SUBPART M	National Emission Standard for Asbestos
40 CFR 763	Asbestos
49 CFR 107	Hazardous Materials Program Procedures
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

Protection Act (324.101-324.90106)

UNDERWRITERS LABORATORIES (UL)

UL 586	(2009; Reprint Dec 2017) UL Standard for Safety High-Efficiency Particulate, Air Filter Units

1.4.DEFINITIONS

A. ACM

1. Asbestos Containing Materials.

B. Amended Water

1. Water containing a wetting agent or surfactant with a maximum surface tension of 0.00042 psi.

C. Area Sampling

1. Sampling of asbestos fiber concentrations which approximates the concentrations of asbestos in the theoretical breathing zone but is not actually collected in the breathing zone of an employee.

D. Asbestos

1. The term asbestos includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, and actinolite asbestos and any of these minerals that has been chemically treated or altered. Materials are considered to contain asbestos if the asbestos content of the material is determined to be at least one percent.

E. Asbestos Control Area

1. That area where asbestos removal operations are performed which is isolated by physical boundaries which assist in the prevention of the uncontrolled release of asbestos dust, fibers, or debris.

F. Asbestos Fibers

1. Those fibers having an aspect ratio of at least 3:1 and longer than 5 micrometers as determined by National Institute for Occupational Safety and Health (NIOSH) Method 7400.

G. Asbestos Permissible Exposure Limit

1. 0.1 fibers per cubic centimeter of air as an 8-hour time weighted average measured in the breathing zone as defined by 29 CFR 1926.1101 or other Federal legislation having legal jurisdiction for the protection of workers health.

H. Authorized Person

1. Any person authorized by the Contractor and required by work duties to be present in the regulated areas.

I. Background

1. The ambient airborne asbestos concentration in an uncontaminated area as measured prior to any asbestos hazard abatement efforts. Background concentrations for other (contaminated) areas are measured in similar but asbestos free locations.

J. Competent Person (CP)

1. A person meeting the requirements for competent person as specified in 29 CFR 1926.1101 including a person capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them and is specifically trained in a training course which meet the criteria of EPA's Model Accreditation Plan (40 CFR 763) for project designer and supervisor.

K. Contracting Officer Representative (COR)

1. The VA official responsible for monitoring on-going project work.

L. Contractor/Sub-Contractor

1. The Contractor/Sub-Contractor is that individual or entity under contract to perform the herein listed work.

M. Contractor's Professional Industrial Hygienist (CPIH/CIH)

1. The Contractor's industrial hygienist who is trained in the recognition and control of asbestos hazards in accordance with current federal, state, and local regulations. The CPIH/CIH must be independent of the Contractor and must have no employee or employer relationship which could constitute a conflict of interest.

N. Disposal Bag

1. A 6-mil thick, leak-tight plastic bag, pre-labeled in accordance with 29 CFR 1926.1101, used for transporting asbestos waste from containment to disposal site.

O. Disturbance

1. Activities that disrupt the matrix of ACM, crumble or pulverize ACM, or generate visible debris from ACM. Disturbance includes cutting away small amounts of ACM, no greater than the amount which can be contained in one standard sized glovebag or waste bag, not larger than 60 inches in length and width in order to access a building component.

P. Encapsulation

1. The reduction of an asbestos hazard through the appropriate use of chemical encapsulants.

Q. Encapsulants

1. Specific materials in various forms used to chemically or physically entrap asbestos fibers in various configurations to prevent these fibers from becoming airborne. There are

four types of encapsulants as follows which must comply with performance requirements as specified herein.

2. Removal Encapsulant (can be used as a wetting agent).

3. Bridging Encapsulant (used to provide a tough, durable surface coating to asbestos containing material).

4. Penetrating Encapsulant (used to penetrate the asbestos containing material encapsulating all asbestos fibers and preventing fiber release due to routine mechanical damage and must penetrate at least 13 mm (1/2 inches).

5. Lock-Down Encapsulant (used to seal off or "lock-down" minute asbestos fibers left on surfaces from which asbestos containing material has been removed).

R. Friable Asbestos Material

1. A term defined in 40 CFR 61-SUBPART M and EPA 340/1-90/018 meaning any material which contains more than 1 percent asbestos, as determined using the method specified in 40 CFR 763, Polarized Light Microscopy (PLM), that when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

S. Glovebag Technique

1. Those asbestos removal and control techniques put forth in 29 CFR 1926.1101.

T. HEPA Filter Equipment

1. High efficiency particulate air (HEPA) filtered vacuum and exhaust ventilation equipment with a filter system capable of collecting and retaining asbestos fibers. Filters must retain 99.97 percent of particles 0.3 microns or larger as indicated in UL 586.

U. Model Accreditation Plan (MAP)

1. USEPA training accreditation requirements for persons who work with asbestos as specified in 40 CFR 763.

V. Negative Pressure Enclosure (NPE)

1. That engineering control technique described as a negative pressure enclosure in 29 CFR 1926.1101.

W. NESHAP

1. National Emission Standards for Hazardous Air Pollutants. The USEPA NESHAP regulation for asbestos is at 40 CFR 61-SUBPART M.

X. Nonfriable Asbestos Material

1. Material that contains asbestos in which the fibers have been immobilized by a bonding agent, coating, binder, or other material so that the asbestos is well bound and will not normally release asbestos fibers during any appropriate use, handling, storage, or transportation. It is understood that asbestos fibers may be released under other conditions such as demolition, removal, or mishap.

Y. Permissible Exposure Limits (PELs)

1. PEL-Time Weighted Average (TWA)

a. Concentration of asbestos not in excess of 0.1 fibers per cubic centimeter of air (f/cc) as an 8-hour time weighted average (TWA).

2. PEL-Excursion Limit

a. An airborne concentration of asbestos not in excess of 1.0 f/cc of air as averaged over a sampling period of 30 minutes.

Z. Personal Sampling

1. Air sampling which is performed to determine asbestos fiber concentrations within the breathing zone of a specific employee, as performed in accordance with 29 CFR 1926.1101.

AA. TEM

1. Refers to Transmission Electron Microscopy.

BB. Time Weighted Average (TWA)

1. The TWA is an 8-hour time weighted average airborne concentration of asbestos fibers.

CC. Transite

1. A generic name for asbestos cement wallboard and pipe.

DD. Wetting Agent

1. A chemical added to water to reduce the water's surface tension thereby increasing the water's ability to soak into the material to which it is applied. An equivalent wetting agent must have a surface tension of at most 0.00042 psi.

EE. Worker

1. Individual (not designated as the Competent Person or a supervisor) who performs asbestos work and has completed asbestos worker training required by 29 CFR 1926.1101, to include EPA Model Accreditation Plan (MAP) "Worker" training and accreditation, if required by the OSHA Class of work to be performed or by the state where the work is to be performed. The worker must be appropriately licensed in the State of Maine.

FF. VA Professional Industrial Hygienist (VPIH/CIH)

1. The Department of Veterans Affairs Professional Industrial Hygienist who may be a Registered Architect, Professional Engineer, Certified Industrial Hygienist, consultant or

other qualified person who has successfully completed training and is therefore accredited under a legitimate State Model Accreditation Plan as described in 40 CFR 763 as a Building Inspector, Asbestos Abatement Worker and Contractor/Supervisor, and Asbestos Project Designer; and has successfully completed the National Institute of Occupational Safety and Health (NIOSH) 582 course "Sampling and Evaluating Airborne Asbestos Dust" or equivalent. The VPIH/CIH must be qualified to perform visual inspections as indicated in ASTM E1368. The VPIH/CIH must be appropriately licensed in the State of Maine. The VPIH/CIH must be independent of the Contractor and must have no employee or employer relationship which could constitute a conflict of interest.

1.5.REQUIREMENTS

A. Description of Work

1. The work covered by this section includes the handling and control of asbestos-containing materials and describes some of the resultant procedures and equipment required to protect workers, the environment and occupants of the building or area, or both, from contact with airborne asbestos fibers. The work also includes the disposal of any asbestos-containing materials generated by the work. More specific operational procedures must be outlined in the Asbestos Hazard Abatement Plan called for elsewhere in this specification. The asbestos work includes the disturbance, demolition, removal, and encapsulation of asbestos-containing materials from the project areas as shown on the hazards abatement drawings which is governed by 40 CFR 763, 40 CFR 61-SUBPART M, 29 CFR 1926.1101, and other state and local standards. Provide negative pressure enclosure techniques as outlined in this specification. The work area

will be evacuated prior to the asbestos abatement work. A competent person must supervise asbestos removal work as specified herein.

2. The estimated quantities of asbestos-containing materials to be removed and/or disturbed are shown on the hazards abatement drawings. Nothing in this section may be interpreted as limiting the extent of work otherwise required by this contract and related documents. Refer to the Hazardous Materials Assessment for detailed information on the asbestos-containing materials known or assumed to be present at this site.

3. The work tasks required by this project are summarized briefly as follows:

   a. Submittal of an Asbestos Abatement Plan, prepared in accordance with the requirements of Maine Department of Environmental Protection (DEP)

   b. Pre-abatement activities including pre-abatement meeting(s), inspection(s), notifications, permits, submittal approvals, regulated area preparations, emergency procedures arrangements, and standard operating procedures for asbestos abatement work.

   c. Abatement activities including removal, encapsulation, and clean-up and disposal of ACM waste, recordkeeping, security, monitoring, and inspections.

   d. Cleaning and decontamination activities including final visual inspection, air monitoring, and certification of decontamination.

B. Variations in Quantity

1. The estimated quantities are to be considered a baseline for bidding purposes only and are based on limited assessments

of materials located within the project work areas which were made accessible to the State-accredited Building Inspector along with additional information made available to the State-accredited Project Designer for use in preparing the hazards abatement drawings and specifications. The Contractor shall satisfy themselves of the actual quantities to be removed and disposed of and to conduct that work in accordance with applicable laws of the authorities having jurisdiction. The Contractor shall document the locations and quantities of asbestos-containing materials removed each day from each work area. Quantities of asbestos-containing materials must match the units used on the hazards abatement drawings. Where, in the opinion of the Contractor, the use of alternative units is necessary, those alternative units may be used with preapproval from the VA and/or the COR. Minor variations (+/- 10 percent) in the quantities of asbestos-containing materials shown on the hazards abatement drawings are considered as having no impact on contract price and time requirements of this contract.

2. Prior to starting work in any area, the Contractor must determine the extents of their work area and the work which will take place within that area so that the VPIH may assess the work area for the potential presence of asbestos-containing materials not shown in the contract documents. The VPIH is responsible for inspecting each work area prior to the start of work, and that assessment must include sampling of materials that will be disturbed, or may be contacted by persons performing work, which have not already been identified as asbestos-containing or been shown to be asbestos-free.

C. Stop Asbestos Removal

1. If the COR; the facility Safety Officer/Manager or their designee, or the VA Professional Industrial Hygienist/Certified Industrial Hygienist (VPIH/CIH) presents a verbal Stop Asbestos Removal Order, the Contractor/Personnel shall immediately stop all asbestos removal and maintain HEPA filtered negative pressure air flow in the containment and adequately wet any exposed ACM. If a verbal Stop Asbestos Removal Order is issued, the VA shall follow-up with a written order to the Contractor as soon as it is practicable. The Contractor shall not resume any asbestos removal activity until authorized to do so in writing by the COR. A stop asbestos removal order may be issued at any time the COR determines abatement conditions/activities are not within VA specification, regulatory requirements or that an imminent hazard exists to human health or the environment. Work stoppage will continue until conditions have been corrected to the satisfaction of the VA. Standby time and costs for corrective actions will be borne by the Contractor, including any applicable time or expense incurred by any of the personnel categories stated in the beginning of this paragraph, as a result of the stop asbestos removal order. The occurrence of any of the following events shall be reported immediately by the Contractor's CP to the COR using the most expeditious means (e.g., verbal or telephonic), followed up with written notification to the COR as soon as practicable. The Contractor shall immediately stop asbestos removal/disturbance activities and initiate fiber reduction activities if:

   a. Airborne PCM analysis results outside of the asbestos regulated work area exceeds 0.01 fibers per cubic centimeter or background whichever is higher.

b. Breach or break in regulated area containment barrier(s.).

c. Less than -0.02 inch WCG pressure in the regulated area.

d. Serious injury/death at the site.

e. Fire/safety emergency at the site.

f. Respiratory protection system failure.

g. Power failure or loss or inadequate use of wetting agent.

h. Any visible emissions observed outside the regulated area.

i. Failure to follow project specification requirements.

D. Medical Requirements

1. Provide medical requirements including but not limited to medical surveillance and medical record keeping as listed in 29 CFR 1926.1101.

E. Medical Examinations

1. Before exposure to airborne asbestos fibers, provide workers with a comprehensive medical examination as required by 29 CFR 1926.1101 or other pertinent state or local directives. This requirement must have been satisfied within the 12 months prior to the start of work on this contract. The same medical examination must be given on an annual basis to employees engaged in an occupation involving asbestos and within 30 calendar days before or after the termination of employment in such occupation. Specifically identify x-ray films of asbestos workers to the consulting radiologist and mark medical record jackets with the word "ASBESTOS."

F. Medical Records

1. Adequate records must show that employees meet the medical surveillance requirements of 29 CFR 1926.33, 29 CFR 1926.1101, and 29 CFR 1926.103. Provide medical surveillance to all personnel exposed to asbestos as indicated in 29 CFR 1926.1101. Maintain complete and accurate medical records of employees for the duration of employment plus 30 years.

G. Employee Training

1. Submit completed Certificate of Worker's Acknowledgment found in Attachment #2 of this section prior to the start of work. Organize certificates by individual worker, not grouped by type of certification. Post appropriate evidence of compliance with the training requirements of 29 CFR 1926.1101, 40 CFR 763, and applicable sections of the Maine Codified Laws. Train personnel involved in the asbestos control work in accordance with United States Environmental Protection Agency (USEPA) Asbestos Hazard Emergency Response Act (AHERA) training criteria or state training criteria whichever is more stringent. Document the training by providing: dates of training, training entity, course outline, names of instructors, and qualifications of instructors upon request by the COR. Fully cover engineering and other hazard control techniques and procedures. Asbestos workers must have a current State of Maine asbestos worker's license.

2. Due to the potential to contact asbestos-containing materials in project areas throughout this site, all personnel performing work at this site are required to have a minimum of "two-hour asbestos awareness training". Only personnel who are trained and State-accredited as an EPA Worker or EPA Contractor/Supervisor are permitted to disturb asbestos-containing materials.

3. Additional training related to health, safety, and environmental issues may be required, and it is the responsibility of the CPIH/CIH to identify those additional issues and to recommend training to the Contractor as necessary to ensure compliance with applicable regulations.

H. Permits and Notifications

1. Prior to the start of work, obtain necessary Permits in conjunction with asbestos removal, encapsulation, hauling, and disposition, and furnish notification of such actions required by federal, state, regional, and local authorities. Notify the Regional Office of the United States Environmental Protection Agency (USEPA) and the COR in writing 10 working days prior to commencement of work in accordance with 40 CFR 61-SUBPART M and applicable sections of the Maine Codified Laws. Note this may include more than one notification and may include trades other than the Asbestos Abatement Contractor. In accordance with the applicable requirements of the State of Maine DEQ, submit any necessary fees or notifications to the state of Maine. It is the contractor’s responsibility to include the cost of any state fees into their bid for the project. Submit copies of all Notifications to the COR. Submit additional required notifications and arrangements made with regulatory agencies having regulatory jurisdiction and the specific contingency/emergency arrangements made with local health, fire, ambulance, hospital authorities and any other notifications/arrangements.

I. Environment, Safety and Health Compliance

1. In addition to detailed requirements of this specification, comply with those applicable laws, ordinances, criteria, rules, and regulations of federal, state, regional, and local authorities having jurisdiction regarding handling,

storing, transporting, and disposing of asbestos waste materials. Comply with the applicable requirements of the current issue of 29 CFR 1926.1101, 40 CFR 61-SUBPART A, 40 CFR 61-SUBPART M, and 40 CFR 763. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting the work. Where the requirements of this specification, applicable laws, rules, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements apply. Maine has generally adopted federal regulations as they pertain to the removal, handling, storing, transporting, and disposing of asbestos, however, there are some differences. It is the contractor's responsibility to familiarize themselves of all applicable laws and to conduct all work in accordance with the applicable portions of those laws whether they are specifically stated or not within this specification.

J. Respiratory Protection Program

1. Establish and implement a respirator program as required by 29 CFR 1926.103, 29 CFR 1926.1101, and 29 CFR 1926.55. Submit respirator program records with a written description of the program to the COR. Submit a written program manual or operating procedure including methods of compliance with regulatory statutes.

K. Asbestos Hazard Control Supervisor (CP)

1. The Contractor must be represented on site at all times asbestos work is being performed by a CP with qualifications meeting the criteria of this specification.

L. Hazard Communication Program

1. Adhere to all parts of 29 CFR 1926.59 and provide the Contracting Officer with a copy of the Safety Data Sheets (SDS) for all materials brought to the site.

M. Asbestos Hazard Abatement Plan

1. The Asbestos Hazard Abatement Plan must not be combined with other hazard abatement plans, and must be prepared, signed, and sealed by a State-accredited EPA Project Designer. Provide a Table of Contents for each abatement submittal, which follows the sequence of requirements in the contract. The plan, at a minimum, shall include the proposed means, methods, materials, equipment, and other procedures to be used by the Contractor which must include, but not be limited to, the following elements:

   a. Notification of other employers and their employees performing work at the site under this contract, building occupants, and other interested parties or as directed by the VA.

   b. A pre-work sampling plan describing the procedures to be used to identify, sample, and quantify any additional asbestos-containing materials found that will require disturbance.

   c. Procedures used to identify, execute, and document potential pre-cleaning activities.

   d. A detailed plan of the safety precautions such as lockout, tagout, tryout, fall protection, and confined space entry procedures and equipment and work procedures to be used during the removal, disturbance, or demolition of materials containing asbestos

   e. Procedures to ensure the protection of existing work to remain.

f. Isolation and protection of life-critical systems and other existing systems.

g. Regulated work area setup for each class of asbestos work to be performed.

h. Personal protective equipment for each class of asbestos work to be performed.

i. Asbestos removal procedure(s) for each material being removed or disturbed.

j. Expendable materials to be used for asbestos work such as encapsulants, surfactants, poly sheeting, etc.

k. Decontamination area setup for each type of regulated work area and/or class of asbestos work to be performed.

l. Procedures to ensure negative air pressure is maintained within Negative Pressure Enclosures and corrective actions to be taken in the event of equipment failure or other events which may lead to inadequate negative pressure.

m. Procedures for supplying, controlling, treating, and discharging water and wastewater.

n. Air monitoring for each type of regulated work area and/or class of asbestos work to be performed.

o. Waste packaging, storage, loadout, decontamination, manifesting, transport and disposal.

p. Procedures to follow in the event additional quantities of known asbestos-containing materials are encountered.

q. Procedures to follow in the event materials are encountered which have not previously been shown to not contain asbestos.

r. Current copies of the Project Designer's accreditation.

2. At a minimum, shop drawings must show the following elements:

a. The locations and extents of each regulated work area.

b. Locations of critical barriers.

c. Locations of life-critical systems within and/or adjacent to the regulated work area boundaries.

d. Location of decontamination area(s).

e. Location(s) of negative pressure exhaust routing.

f. Location of make-up air entrance(s) into each regulated work area.

g. Location(s) of existing equipment to be isolated during the asbestos abatement activities.

h. Locations of water supplies and wastewater treatment and discharge area(s).

i. Locations of air monitoring equipment.

j. Location(s) of first aid materials.

k. Location(s) of fire extinguishers.

l. Emergency egress routes.

m. Waste loadout route(s).

n. Location of temporary storage area(s).

o. The location of copies of all applicable codes, standards, regulations, notices, SDSs, air monitoring results, the Contractor's approved work plan, and other pertinent documents.

N. Testing Laboratory

1. Submit the name, address, and telephone number of each testing laboratory selected for the analysis and reporting of airborne concentrations of asbestos fibers along with evidence that each laboratory is American Industrial Hygiene Association (AIHA) accredited and that persons counting the samples have been judged proficient by current inclusion on the AIHA Asbestos Analysis Registry (AAR) and successful participation of the laboratory in the Proficiency Analytical Testing (PAT) Program. Where analysis to determine asbestos content in bulk materials or transmission electron microscopy is required, submit evidence that the laboratory is accredited by the National Institute of Science and Technology (NIST) under National Voluntary Laboratory Accreditation Program (NVLAP) for asbestos analysis. The testing laboratory firm must be independent of the asbestos contractor and must have no employee or employer relationship which could constitute a conflict of interest.

O. Landfill Approval

1. Submit written evidence that the landfill is approved for asbestos disposal by the U.S. Environmental Protection Agency, Region 8, local regulatory agencies, and that the Contractor has consulted with the proposed landfill to determine any specific requirements which may be more stringent than those found within this specification, including if pre-authorization is required. Within three working days after delivery, submit detailed delivery tickets, prepared, signed, and dated by an agent of the landfill, certifying the quantities of asbestos materials delivered to the landfill. Submit a copy of the waste shipment records within one day of the shipment leaving the project site.

P. Transporter Certification

1. Submit written evidence that the transporter is approved to transport asbestos waste in accordance with the DOT requirements of 49 CFR 171, 49 CFR 172, and 49 CFR 173 as well as registration requirements of 49 CFR 107 and all other state and local regulatory agency requirements.

Q. Medical Certification

1. Provide a written certification for each worker and supervisor, signed by a licensed physician indicating that the worker and supervisor has met or exceeded all of the medical prerequisites listed herein and in 29 CFR 1926.1101 and 29 CFR 1926.103 as prescribed by law. Submit certificates prior to the start of work but after the main abatement submittal.

1.6.EMERGENCY ACTION PLAN AND ARRANGEMENTS

A. An Emergency Action Plan shall be developed prior to commencing abatement activities and shall be agreed to by the Contractor and the VA. The Plan shall meet the requirements of 29 CFR 1926.35 Employee Emergency Action Plans.

B. Emergency procedures shall be in written form and prominently posted in the clean room and equipment room of the decontamination unit. Everyone, prior to entering the regulated area, must read and sign these procedures to acknowledge understanding of the regulated area layout, location of emergency exits and emergency procedures.

C. Emergency planning shall include written notification of police, fire, and emergency medical personnel of planned abatement activities; work schedule; layout of regulated area; and access to the regulated area, particularly barriers that may affect response capabilities.

D. Emergency planning shall include consideration of fire, explosion, hazardous atmospheres, electrical hazards, slips/trips and falls, confined spaces, and heat stress illness. Written procedures for response to emergency situations shall be developed and employee training in procedures shall be provided.

E. Employees shall be trained in regulated area/site evacuation procedures in the event of workplace emergencies. For non-life-threatening situations - employees injured or otherwise incapacitated shall be decontaminated following normal procedures with assistance from fellow workers, if necessary, before exiting the regulated area to obtain proper medical treatment. For life-threatening injury or illness, worker decontamination shall take least priority after measures to stabilize the injured worker, medical personnel shall remove them from the regulated area if back or neck injury is present, and secure proper medical treatment.

F. Telephone numbers of any/all emergency response personnel shall be prominently posted in the clean room, along with the location of the nearest telephone.

G. The Contractor shall provide verification of first aid/CPR training for personnel responsible for providing first aid/CPR. OSHA requires medical assistance within 3-4 minutes of a life-threatening injury/illness. Bloodborne Pathogen training shall also be verified for those personnel required to provide first aid/CPR.

H. The Emergency Action Plan shall provide for a Contingency Plan in the event that an incident occurs that may require the modification of the standard operating procedures during abatement. Such incidents include, but are not limited to, fire; accident; power failure; negative pressure failure; and supplied air system failure. The Contractor shall detail procedures to be followed in the event of an incident assuring that asbestos

abatement work is stopped and wetting is continued until correction of the problem.

1.7. SUBMITTALS

A. Submit the following in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES:

1. Preconstruction Submittals

a. Asbestos Abatement Plan, prepared in accordance with the requirements of Maine Department of Environmental Protection (DEP)

b. Emergency Action Plan and Arrangements

c. Affidavit Of Medical Surveillance, Respiratory Protection, And Training Accreditation

d. Certificate Of Worker's Acknowledgement

e. Contractor/Competent Person(S) Review and Acceptance of The Va's Asbestos Specifications

f. Employee Training

g. Notifications

h. Permits

i. Respiratory Protection Program

j. Respirator Program Records

k. Asbestos Hazard Abatement Plan

l. Testing Laboratory

m. Landfill Approval

n. Medical Certification

o. Contractor's Professional Industrial Hygienist (CPIH/CIH)

p. Designated Competent Person

q. Worker's License

r. Contractor's License

s. Federal, State or Local Citations on Previous Projects

t. Certificate Of Compliance

u. Product Data

i. Amended Water

ii. Safety Data Sheets (SDS) for All Materials

iii. Encapsulants

iv. Respirators

v. Local Exhaust Equipment

vi. Pressure Differential Automatic Recording Instrument

vii. Vacuums

viii. Glovebags

ix. Equipment Used to Contain Airborne Asbestos Fibers

x. Water Filtration Equipment

xi. Ventilation Systems

2. Periodic Submittals

a. Air Sampling Results

b. Pressure Differential Recordings for Local Exhaust System

c. Clearance Sampling

d. Updates to any of the preconstruction submittals

3. Closeout Submittals

a. Asbestos Disposal Quantity Report

b. Delivery Tickets

c. Waste Shipment Records

d. Transporter Certification

e. Certificate Of Completion

f. Rental Equipment

g. In addition to these submittals, the closeout submittals shall include all updates to previously submitted information as necessary to ensure the documentation requirements of this section are fulfilled.

1.8.QUALITY ASSURANCE

A. General

1. Administrative and supervisory personnel shall, at a minimum, consist of the Contractor's approved CP, the accredited Project Designer, and the Contractor's Professional Industrial Hygienist. These employees are the Contractor's representatives responsible for compliance with these specifications and all other applicable requirements. Non-supervisory personnel shall consist of an adequate number of qualified personnel to meet the schedule requirements of the project. Personnel shall meet required qualifications.

2. Comply with laws, ordinances, rules, and regulations of federal, state, and local authorities having jurisdiction regarding removing, handling, storing, transporting, and disposing asbestos-containing waste materials. Comply with applicable requirements of 29 CFR Part 1926.1101, and notify the COR and request resolution of conflicts between regulations and specified requirements before starting work.

3. Submit a completed Certificate of Worker's Acknowledgement found in Attachment #2 of this section, a completed Affidavit of Medical Surveillance, Respiratory Protection, and Training Accreditation found in Attachment #3 of this section, and the Contractor/Competent Person(s) Review and Acceptance of the VA's Asbestos Specifications found in Attachment #4 of this section.

B. Responsibilities

1. VA Responsibilities Prior to Commencement of Work

a. Notify occupants adjacent to regulated areas of project dates and requirements for relocation, if needed. Arrangements must be made prior to starting work for relocation of desks, files, equipment, and personal possessions to avoid unauthorized access into the regulated area. Coordinate utilities use, locations, and other conditions of use with the Contractor.

2. Asbestos Abatement Contractor Responsibility

a. The Asbestos Abatement Contractor (Contractor) shall assume primary responsibility and liability for compliance with all applicable federal, state, and local regulations related to all aspects of the asbestos abatement work. The General Contractor shall assume secondary responsibility and liability for their own and their other sub-contractor's compliance with all applicable federal, state, and local regulations as it relates to potential asbestos disturbance. The Contractor is responsible for providing and maintaining required documentation including but not limited to training, accreditations, medical exams, medical records, personal protective equipment (PPE), respiratory protection, and respirator fit testing, as required by applicable

federal, state, and local regulations. The Contractor shall hold the VA and VPIH/CIH consultants harmless for any Contractor's failure to comply with any applicable work, packaging, transporting, disposal, safety, health, or environmental regulations or contract requirements on the part of themself, their employees, or their subcontractors.

C. Contractors Use of Premises

1. The Contractor and Contractor's personnel shall cooperate fully with the COR to facilitate efficient use of buildings and areas within buildings. The Contractor shall perform the work in accordance with the specifications, drawings, phasing plan and in compliance with any/all applicable federal, state, and local regulations and requirements.

2. The Contractor shall not block or hinder use of buildings by patients, staff, and visitors to the VA in partially occupied buildings by placing materials/equipment in any unauthorized location.

D. Contractor's Professional Industrial Hygienist (CPIH/CIH)

1. Submit the name, address, and telephone number of the Contractor's Professional Industrial Hygienist (CPIH/CIH) selected to direct monitoring and training, and documented evidence that the CPIH/CIH has successfully completed training in and is accredited as a Building Inspector and Contractor/Supervisor Abatement Worker as described by 40 CFR 763 and Article 74:31 and has successfully completed the National Institute of Occupational Safety and Health (NIOSH) 582 course "Sampling and Evaluating Airborne Asbestos Dust" or equivalent. The CPIH/CIH shall have at least five (5) years of monitoring experience and supervision of asbestos abatement projects; has participated as senior IH on five

(5) abatement projects, three (3) of which are similar in size and complexity as this project; has specialized EPA AHERA/OSHA training in asbestos abatement management, respiratory protection, waste disposal and asbestos inspection; and has appropriate medical/respiratory protection records/documentation. The CPIH/CIH and the Contractor and/or their subcontractors must not have an employee/employer relationship or financial relationship which could constitute a conflict of interest. The CPIH/CIH must be a first-tier subcontractor.

E. Designated Competent Person Documentation

1. The Designated Competent Person must be experienced in the administration and supervision of asbestos abatement projects including exposure assessment and monitoring, work practices, abatement methods, protective measures for personnel, setting up and inspecting asbestos abatement work areas, evaluating the integrity of containment barriers, placement and operation of local exhaust systems, ACM generated waste containment and disposal procedures, decontamination units installation and maintenance requirements, site safety and health requirements, notification of other employees onsite, and has at least four (4) years of abatement experience of which two (2) years were as the Competent Person on the project; meets the OSHA definition of a Competent Person; has been the Competent Person on two (2) projects of similar size and complexity as this project within the past three (3) years; has completed EPA AHERA/OSHA/State/Local training requirements/accreditation(s) and refreshers; and has all required OSHA documentation related to medical and respiratory protection. The Designated Competent Person must be on-site at all times when asbestos abatement activities are underway. Submit training certification and a

current State of Maine Asbestos Contractor's and Supervisor's License. The Designated Competent Person must be a first-tier subcontractor.

F. Worker's License

1. Submit documentation that workers meet the requirements of 29 CFR 1926.1101, 40 CFR 61-SUBPART M, have a current State of Maine Asbestos Workers License, and have training on the standard operating procedures of the Contractor. Submit a completed Certificate of Completion found in Attachment #1 of this section prior to the start of work.

2. Submit a list of and verification of training for all personnel who have current first-aid/CPR training. A minimum of one person per shift must have adequate training.

G. Contractor's License

1. Submit a copy of the asbestos contractor's license issued by the State of Maine and a copy of their insurance policy, including exclusions with a letter from agent stating in plain language the coverage provided and the fact that asbestos abatement activities are covered by the policy. Submit a completed Certificate of Worker's Acknowledgement found in Attachment #2 of this section, a completed Affidavit of Medical Surveillance, Respiratory Protection, and Training Accreditation found in Attachment #3 of this section, and the Contractor/Competent Person(s) Review and Acceptance of the VA's Asbestos Specifications. Submit project experience within the past 3 years, listing projects first most similar to this project and include the: Project Name; Type of Abatement; Duration; Cost; Reference Name/Phone Number; Final Clearance; and Completion Date. Submit evidence that the Contractor has adequate and qualified personnel available to complete the work; has

comprehensive standard operating procedures for asbestos work; and has adequate materials, equipment, and supplies to perform the work.

H. Air Sampling Results

1. The Contractor and/or the CPIH/CIH must complete fiber counting and provide results to the VPIH/CIH and the COR for review within 16 hours of the "time off" of the sample pump. Notify the COR immediately of any airborne levels of asbestos fibers in excess of the acceptable limits. Submit sampling results to the VPIH/CIH, the COR, and the affected Contractor employees where required by law within three working days, signed by the CPIH/CIH who performed the air sampling, the employee that analyzed the sample, and the Contractor. Notify the Contractor and the COR immediately of any variance in the pressure differential which could cause asbestos fibers to migrate into adjacent unsealed areas. Under no circumstance may asbestos concentrations outside of the asbestos regulated work area exceed 0.01 fibers per cubic centimeter or background whichever is higher.

I. Pressure Differential Recordings for Local Exhaust System

1. Provide a local exhaust system that creates a negative pressure of at least 0.02 inches of water relative to the pressure external to the enclosure and operate it continuously, 24-hours a day, until the temporary enclosure of the asbestos control area is removed. Submit pressure differential recordings for each workday to the CP and CPIH/CIH for review and to the VPIH/CIH and the COR 24-hours from the end of each workday.

J. Federal, State or Local Citations on Previous Projects

1. Submit a statement, signed by an officer of the company, containing a record of any citations, notices of violations, penalties issued by federal, state or local regulatory agencies relating to asbestos activities within the last 5 years (including projects, dates, and resolutions) and any legal actions taken against the company including the company's officers (including damages paid); a list of penalties incurred through non-compliance with asbestos project specifications, including liquidated damages, overruns in scheduled time limitations and resolutions; and situations in which an asbestos-related contract has been terminated (including projects, dates, and reasons for terminations). If there are none, a negative declaration signed by an officer of the company must be provided.

K. Preconstruction Conference

1. After the pre-construction submittals have been reviewed and approved, a pre-construction meeting shall be held with the following parties in attendance at a minimum: the General Contractor, the Asbestos Abatement Sub-Contractor and their Competent Person(s), other interested sub-contractors, the Contractor's Professional Industrial Hygienist (CPIH/CIH), and the VA Certified Industrial Hygienist (VPIH/CIH), and the COR. The goals of the pre-construction meeting are to discuss the planned scope, phasing, and overall coordination and execution of the asbestos abatement work; to verify that the approved pre-construction submittals are still valid; to identify any potential issues with the project scope, timing, or planning as it relates to the asbestos abatement scope of work, and to ensure agreement among the parties prior to commencing work. The pre-construction meeting minutes and sign in sheet must be submitted to the COR

within 5 days after the completion of the pre-construction meeting.

2. No work shall commence until the pre-construction submittals have been approved, a pre-construction meeting held, and a written authorization to proceed with the work is provided by the VA Professional Industrial Hygienist (VPIH/CIH) and the COR.

1.9.SECURITY

A. Regulated area access is to be restricted only to authorized, trained/accredited and protected personnel. These may include the Contractor's employees, employees of Subcontractors, VA employees and representatives, State and Local inspectors, and any other designated individuals. A list of authorized personnel shall be established prior to commencing the project and be posted in the clean room of the decontamination unit.

B. Entry into the regulated area by unauthorized individuals shall be reported immediately to the Competent Person by anyone observing the entry. The Competent Person shall immediately require any unauthorized person to leave the regulated area and then notify the VA Contracting Officer or COR using the most expeditious means.

C. A log book shall be maintained in the clean room of the decontamination unit. Anyone who enters the regulated area must record their name, affiliation, time in, and time out for each entry.

D. Access to the regulated area shall be through a single decontamination unit. All other access (doors, windows, hallways, etc.) shall be sealed and demarcated as an asbestos regulated work area to prevent entry to or exit from the regulated area unless in the event of an emergency. The only exceptions for this requirement are the waste/equipment load-out

area which shall be sealed except during the removal of containerized asbestos waste from the regulated area, and emergency exits. Emergency exits shall not be locked from the inside; however, they shall be sealed with poly sheeting and taped until needed. In any situation where exposure to high temperatures which may result in a flame hazard, fire-retardant poly sheeting must be used.

E. The Contractor's Competent Person shall control site security during abatement operations in order to isolate work in progress and protect adjacent personnel. A 24-hour security system shall be provided at the entrance to the regulated area to assure that all entrants are logged in/out and that only authorized personnel are allowed entrance.

F. The Contractor will have the VA's assistance in notifying adjacent personnel of the presence, location, and quantity of ACM in the regulated area and enforcement of restricted access by the VA's employees.

G. The regulated area shall be locked during non-working hours and secured by COR or Competent Person. The VA Police shall be informed of asbestos abatement regulated areas to provide security checks during facility rounds and emergency response.

1.10. EQUIPMENT

A. Rental Equipment

1. Provide a copy of the written notification to the rental company concerning the intended use of the equipment and the possibility of asbestos contamination of the equipment.

1.11. WARRANTY

A. Construction Warranty: FAR clause 52.246 21, "Warranty of Construction."

PART 2 – PRODUCTS

2.1.GENERAL

A. Prior to the start of work, the Contractor shall provide and maintain a sufficient quantity of materials and equipment to assure continuous and efficient work throughout the duration of the project including, but not limited to:

1. All materials shall be delivered in their original package, container or bundle bearing the name of the manufacturer and the brand name (where applicable).

2. Store all materials subject to damage off the ground, away from wet or damp surfaces and under cover sufficient enough to prevent damage or contamination. Flammable and combustible materials cannot be stored inside buildings. Replacement materials shall be stored outside of the regulated area until abatement is completed.

3. The Competent Person shall inspect for damaged, deteriorating or previously used materials. Such materials shall not be used and shall be removed from the worksite and disposed of properly.

4. Polyethylene sheeting for walls in the regulated area shall be a minimum of 6-mils. For floors and all other uses, sheeting of at least 6-mil shall be used in widths selected to minimize the frequency of joints. Fire-retardant poly shall be used throughout.

5. The method of attaching polyethylene sheeting shall be agreed upon in advance by the Contractor and the VA and selected to minimize damage to equipment and surfaces. Method of attachment may include any combination of moisture resistant duct tape, poly tape, furring strips, spray glue, staples, nails, screws, lumber, and plywood for enclosures

or approved equivalent procedures capable of sealing polyethylene to dissimilar finished or unfinished surfaces under both wet and dry conditions.

6. Polyethylene sheeting utilized for the PDF shall be opaque white or black in color, 6-mil fire-retardant poly.

7. Installation and plumbing hardware, showers, hoses, drain pans, sump pumps and wastewater filtration system shall be provided by the Contractor.

8. An adequate number of HEPA vacuums, scrapers, sprayers, nylon brushes, brooms, disposable mops, rags, sponges, staple guns, shovels, ladders and scaffolding of suitable height and length as well as meeting OSHA requirements, fall protection devices, water hose to reach all areas in the regulated area, airless spray equipment, and any other tools, materials or equipment required to conduct the abatement project. All electrically operated hand tools, equipment, electric cords shall be connected to GFCI protection.

9. Special protection for objects in the regulated area shall be detailed (e.g., plywood over carpeting or hardwood floors to prevent damage from scaffolds, water and falling material).

10. Disposal bags - 2 layers of 6-mil poly for asbestos waste shall be pre-printed with labels, markings and address as required by OSHA, EPA, and DOT regulations.

11. Chlorinated compounds shall not be used with any spray adhesive, mastic remover or other product. Appropriate encapsulant(s) shall be provided.

12. OSHA DANGER demarcation signs, as many and as required by OSHA 29 CFR 1926.1101(k)(7) shall be provided and placed by

the Competent Person. All other posters and notices required by Federal and State regulations shall be posted in the Clean Room.

13. Adequate and appropriate PPE for the project and number of personnel/shifts shall be provided. All personal protective equipment issued must be based on a written hazard assessment conducted under 29 CFR 1910.132(d).

2.2.ENCAPSULANTS

A. Encapsulants must conform to current USEPA requirements, contain no toxic or hazardous substances as defined in 29 CFR 1926.59, and conform to the following performance requirements. Submit, before the start of work, the manufacturer's technical data for all types of encapsulants and application instructions.

B. Certificate of compliance: The Contractor shall submit to the COR certification from the manufacturer indicating compliance with performance requirements for encapsulants when applied according to manufacturer recommendations.

C. Removal Encapsulants

1. All encapsulants must meet the performance requirements of the University of Pittsburgh Protocol: Combustion Toxicity; zero mortality.

D. Bridging Encapsulant

Requirement	Test Standard
Flame Spread - 25, Smoke Emission - 50	ASTM E84
Life Expectancy - 20 years	ASTM C732 Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E96/E96M

Requirement	Test Standard
Fire Resistance - Negligible effect on fire resistance rating over 3-hour test (Classified by UL for use over fibrous and cementitious sprayed fireproofing)	ASTM E119
Impact Resistance - Minimum 43 in/lb.	ASTM D2794 Gardner Impact Test
Flexibility - no rupture or cracking	ASTM D522/D522M Mandrel Bend Test

E. Penetrating Encapsulant

Requirement	Test Standard
Flame Spread - 25, Smoke Emission - 50	ASTM E84
Life Expectancy - 20 years	ASTM C732 Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E96/E96M
Fire Resistance - Negligible effect on fire resistance rating over 3-hour test (Classified by UL for use over fibrous and cementitious sprayed fireproofing)	ASTM E119
Impact Resistance - Minimum 43 in/lb.	ASTM D2794 Gardner Impact Test
Flexibility - no rupture or cracking	ASTM D522/D522M Mandrel Bend Test

F. Lock-down Encapsulant

Requirement	Test Standard
Flame Spread - 25, Smoke Emission - 50	ASTM E84
Life Expectancy - 20 years	ASTM C732 Accelerated Aging Test
Permeability - Minimum 0.4 perms	ASTM E96/E96M
Cohesion/Adhesion Test - 50 pounds of force/foot	ASTM E119
Fire Resistance - Negligible effect on fire resistance rating over 3-hour test (Classified by UL for use over fibrous and cementitious sprayed fireproofing)	ASTM E119
Impact Resistance - Minimum 43 in/lb.	ASTM D2794 Gardner Impact Test
Flexibility - no rupture or cracking	ASTM D522/D522M Mandrel Bend Test

G. In certain situations, encapsulants may have to be applied to hot pipes/equipment. The encapsulants must be able to withstand high temperatures without cracking or creating any noxious gaseous or vapors during or after application.

2.3.DUCT TAPE

A. Industrial grade duct tape of appropriate widths suitable for bonding sheet plastic and disposal container.

2.4.DISPOSAL CONTAINERS

A. Leak-tight (defined as solids, liquids, or dust that cannot escape or spill out) disposal containers must be provided for

ACM wastes as required by 29 CFR 1926.1101. Disposal containers can be in the form of:

1. Disposal Bags
2. Fiberboard Drums
3. Cardboard Boxes
4. Disposal Bags
5. Fiberboard Drums
6. Cardboard Boxes

2.5.SHEET PLASTIC

A. Sheet plastic must be polyethylene of 6 mil minimum thickness and must be provided in the largest sheet size necessary to minimize seams. Film must be clear, frosted, or black and conform to ASTM D4397, except as specified below.

1. Flame Resistant

   a. Where a potential for fire exists, flame-resistant sheets must be provided. Film must be frosted or black and must conform to the requirements of NFPA 701 and as specified in this section.

2. Reinforced

   a. Reinforced sheets must be provided where high skin strength is required, such as where it constitutes the only barrier between the regulated area and the outdoor environment. The sheet stock must consist of translucent, nylon-reinforced, or woven-polyethylene thread laminated between 2 layers of polyethylene film. Film must meet flame resistant standards of NFPA 701.

2.6. MASTIC REMOVING SOLVENT

A. Mastic removing solvent must be compatible with replacement materials, must be nonflammable, and must not contain methylene chloride, glycol ether, or halogenated hydrocarbons. Solvents used onsite must have a flash point greater than 140 degrees F.

2.7. LEAK-TIGHT WRAPPING

A. Two layers of 6 mil minimum thick polyethylene sheet stock must be used for the containment of removed asbestos-containing components or materials such as large tanks, boilers, insulated pipe segments, and other materials. Upon placement of the ACM component or material, each layer must be individually leak-tight sealed with duct tape.

2.8. VIEWING INSPECTION WINDOW

A. Where feasible, a minimum of one clear, 1/8-inch thick, acrylic sheet, 18 by 24 inches, must be installed as a viewing inspection window at eye level on a wall in each containment enclosure. The windows must be sealed leak-tight with industrial grade duct tape.

2.9. WETTING AGENTS

A. Removal encapsulant (a penetrating encapsulant) must be provided when conducting removal abatement activities that require a longer removal time or are subject to rapid evaporation of amended water. The removal encapsulant must be capable of wetting the ACM and retarding fiber release during disturbance of the ACM greater than or equal to that provided by amended water. Performance requirements for penetrating encapsulants are specified in paragraph ENCAPSULANTS above.

2.10. WATER FILTRATION EQUIPMENT

A. Submit performance data for the Contractor's proposed water filtration equipment meeting the requirements of this section.

2.11. SAFETY DATA SHEETS

A. Submit Safety Data Sheets (SDS) as required for all hazardous chemicals under OSHA 29 CFR 1910.1200 - Hazard Communication in the pre-construction meeting submittals.

PART 3 – EXECUTION

3.1. GENERAL

A. No work shall commence until the pre-construction submittals have been approved, a pre-construction meeting held, the pre-work inspections have been completed, and a written authorization to proceed with the work is provided by the VA Professional Industrial Hygienist (VPIH/CIH).

B. The Contractor must perform the following pre-abatement inspections and preparations prior to the construction of the regulated area:

1. With the assistance of the COR, determine if there are any special or unique conditions within the work area, such as controls or equipment which may require access during the abatement by non-abatement personnel, that may necessitate a modification to work area setups contained in the Contractor's approved Asbestos Hazard Abatement Plan. If modifications are required, provide details of the proposed modification to the COR for review and approval.

2. Conduct a space-by-space inspection with the COR and prepare a written inventory of all existing damage in those spaces where asbestos abatement will occur. Still or video photography may be used to supplement the written damage inventory. Document will be signed and certified as accurate by both parties.

3. Determine the extents of each individual work area and the work to be performed within those areas, and prepare a

sketch or other document which will sufficiently communicate the work area extents and planned work to the VPIH/CIH. Conduct a space-by-space inspection with the VPIH/CIH to verify the extents of the work areas, the planned work, and what materials may be contacted or disturbed by the work so that those materials may be sampled prior to being disturbed.

4. Verify the conditions that are presented in the hazards abatement design drawings and specifications.

3.2.EQUIPMENT

A. Provide the COR and/or the VPIH/CIH with at least two complete sets of personal protective equipment as required for entry to and inspection of the asbestos control area. Provide equivalent training to the COR and/or the VPIH/CIH as provided to Contractor's employees in the use of the required personal protective equipment. Provide manufacturer's certificate of compliance for all equipment used to contain airborne asbestos fibers.

B. Air Monitoring Equipment

1. The CPIH/CIH must provide and approve air monitoring equipment. The equipment must include, but must not be limited to:

a. High-volume sampling pumps that can be calibrated and operated at a constant airflow up to 16 liters per minute.

b. Low-volume, battery powered, body-attachable, portable personal pumps that can be calibrated to a constant airflow up to approximately 3.5 liters per minute, and a self-contained rechargeable power pack capable of sustaining the calibrated flow rate for a minimum of 10

hours. The pumps must also be equipped with an automatic flow control unit which must maintain a constant flow, even as filter resistance increases due to accumulation of fiber and debris on the filter surface.

c. Single use standard 25 mm diameter cassette, open face, 0.8-micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive extension cowl, and shrink bands for personal air sampling.

d. Single use standard 25 mm diameter cassette, open face, 0.45-micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive cowl, and shrink bands when conducting environmental area sampling using NIOSH NMAM Methods 7400 and 7402, (and the transmission electric microscopy method specified at 40 CFR 763 if required).

e. A flow calibrator capable of calibration to within plus or minus 2 percent of reading over a temperature range of minus 4 to plus 140 degrees F and traceable to a NIST primary standard.

C. Respirators

1. Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services.

2. Respirators for Handling Asbestos

a. Provide personnel engaged in pre-cleaning, cleanup, handling, removal, disturbance, or demolition of asbestos materials with respiratory protection as indicated in 29 CFR 1926.1101 and 29 CFR 1926.103. Breathing air must comply with CGA G-7.

D. Exterior Whole-Body Protection

1. Outer Protective Clothing

a. Provide personnel exposed to asbestos with disposable whole body outer protective clothing, head coverings, gloves, and foot coverings. Provide disposable plastic or rubber gloves to protect hands. Cloth gloves may be worn inside the plastic or rubber gloves for comfort but must not be used alone. Make sleeves secure at the wrists, make foot coverings secure at the ankles, and make clothing secure at the neck by the use of tape.

2. Work Clothing

a. Provide cloth work clothes for wear under the outer protective clothing and foot coverings and either dispose of or properly decontaminate them as recommended by the CPIH/CIH after each use.

3. Eye Protection

a. Provide eye protection that complies with ANSI/ISEA Z87.1 when operations present a potential eye injury hazard. Provide goggles to personnel engaged in asbestos abatement operations when the use of a full-face respirator is not required.

E. DECONTAMINATION FACILITIES

1. General

a. Provide each regulated area with separate personnel decontamination facilities (PDF) and waste/equipment decontamination facilities (W/EDF). Ensure that the PDF are the only means of ingress and egress to the regulated area and that all equipment, bagged waste, and other material exit the regulated area only through the W/EDF.

b. All personnel entering or exiting a regulated area must go through the PDF and shall follow the requirements at 29 CFR 1926.1101 and these specifications. All waste, equipment and contaminated materials must exit the regulated area through the W/EDF and be decontaminated in accordance with these specifications. Walls and ceilings of the PDF and W/EDF must be constructed of a minimum of 3 layers of 6-mil opaque fire-retardant polyethylene sheeting and be securely attached to existing building components and/or an adequate temporary framework. A minimum of 3 layers of 6-mil poly shall also be used to cover the floor under the PDF and W/EDF units. Construct doors so that they overlap and secure to adjacent surfaces. Weight inner doorway sheets with layers of duct tape or approved equivalent so that they close quickly after release. Put arrows on sheets so they show direction of travel and overlap. If the building adjacent area is occupied, construct a solid barrier on the occupied side(s) to protect the sheeting and reduce potential for non-authorized personnel entering the regulated area.

c. The Competent Person, with the assistance of the VA who will provide a water source for the Contractor's use, shall provide temporary water service connections to the PDF and W/EDF as coordinated with the COR. Backflow prevention must be provided at the point of connection to the VA system. Water supply must be of adequate pressure and meet the requirements of 29 CFR 1926.1101. The contractor shall provide adequate temporary electric power with ground fault circuit interruption (GFCI) protection. The contractor shall provide a sub-panel equipped with GFCI protection for all temporary power in the clean room. The contractor shall provide adequate

lighting to provide a minimum of 50-foot candles in the PDF and W/EDF. The contractor shall provide temporary heat, if needed, to maintain 70 degrees F throughout the PDF and W/EDF.

2. Personnel Decontamination Facility (PDF)

a. The Competent Person shall provide a PDF consisting of shower room which is contiguous to a clean room and equipment room which is connected to the regulated area. The PDF must be sized to accommodate the number of personnel scheduled for the project. The shower room, located in the center of the PDF, shall be fitted with as many portable showers as necessary to ensure all employees can complete the entire decontamination procedure within 15 minutes. The PDF shall be constructed of opaque poly for privacy. The PDF shall be constructed to eliminate any parallel routes of egress without showering and must conform to the following requirements:

i. Clean Room: The clean room must be physically and visually separated from the rest of the structure to protect the privacy of personnel changing clothes. The clean room shall be constructed of at least 3 layers of 6-mil opaque fire-retardant poly to provide an airtight room. Provide a minimum of 2 - 900 mm (3 foot) wide 6-mil poly opaque fire-retardant doorways. The floor of the clean room shall be maintained in a clean, dry, and sanitary condition. Shower overflow shall not be allowed into the clean room. Provide 1 storage locker per person. A portable fire extinguisher, minimum 10 pounds capacity, Type ABC, shall be provided in accordance with OSHA and NFPA Standard 10. All persons entering the regulated area shall remove all street clothing in the clean room

and dress in disposable protective clothing and respiratory protection. Any person entering the clean room does so either from the outside with street clothing on or is coming from the shower room completely naked and thoroughly washed. Male/Females required to enter the regulated area shall be ensured of their privacy throughout the entry/exit process by posting guards at both entry points to the PDF so no male/female can enter or exit the PDF during his/her stay in the PDF.

ii. Shower Room: The Competent Person shall assure that the shower room is a completely watertight compartment to be used for the movement of all personnel from the clean room to the equipment room and for the showering of all personnel going from the equipment room to the clean room. Each shower shall be constructed so water runs down the walls of the shower and into a drip pan. Install a freely draining smooth floor on top of the shower pan. The shower room shall be separated from the rest of the building and from the clean room and equipment room using airtight walls made from at least 3 layers of 6-mil opaque fire-retardant poly. The shower shall be equipped with a shower head and controls, hot and cold water, drainage, soap dish and continuous supply of soap, and shall be maintained in a sanitary condition throughout its use. The controls shall be arranged so an individual can shower without assistance. Provide a flexible hose shower head, hose bibs and all other items shown on Shower Schematic. Wastewater will be pumped to a drain after being filtered through a minimum of a 100-micron sock in the shower drain; a 20-micron filter; and a final 5-

micron filter. Filters will be changed a minimum of daily or more often as needed. Filter changes must be done in the shower to prevent loss of contaminated water. Hose down all shower surfaces after each shift and clean any debris from the shower pan. Residue is to be disposed of as asbestos waste.

iii. Equipment Room: The Competent Person shall provide an equipment room which shall be an airtight compartment for the storage of work equipment/tools, reusable personal protective equipment, except for a respirator and for use as a gross decontamination area for personnel exiting the regulated area. The Competent Person shall ensure that most gross contamination is removed from the outside of PPE, suits, and respirators in the regulated work area, prior to entering the Equipment Room. The equipment room shall be separated from the regulated area by a minimum 3-foot-wide door made with 2 layers of 6-mil opaque fire-retardant poly. The equipment room shall be separated from the regulated area, the shower room, and the rest of the building by airtight walls and ceiling constructed of a minimum of 3 layers of 6-mil opaque fire-retardant poly. Damp wipe all surfaces of the equipment room after each shift change. Provide an additional loose layer of 6-mil fire-retardant poly per shift change and remove this layer after each shift. If needed, provide a temporary electrical sub-panel equipped with GFCI in the equipment room to accommodate any equipment required in the regulated area.

iv. The PDF shall be as follows: Clean room at the entrance followed by a shower room followed by an equipment room leading to the regulated area. Each

doorway in the PDF shall be a minimum of 2 layers of 6-mil opaque fire-retardant poly.

3. Waste/Equipment Decontamination Facility (W/EDF)

a. The Competent Person shall provide a decontamination facility W/EDF consisting of a washroom, holding room, and clean room for removal of waste, equipment, and contaminated material from the regulated area. Personnel shall not enter or exit the W/EDF except in the event of an emergency. Clean debris and residue in the W/EDF daily. All surfaces in the W/EDF shall be wiped/hosed down after each shift and all debris shall be cleaned from the shower pan. The W/EDF shall consist of the following:

i. Wash Down Station: Provide an enclosed shower unit in the regulated area just outside the washroom as an equipment bag and container cleaning station.

ii. Washroom: Provide a washroom for cleaning of bagged or containerized asbestos containing waste materials passed from the regulated area. Construct the washroom using 50 x 100 mm (2 inches x 4 inches) wood framing or approved equivalent and 3 layers of 6-mil fire-retardant poly. Locate the washroom so that packaged materials, after being wiped clean, can be passed to the Holding Room. Doorways in the washroom shall be constructed of 2 layers of 6-mil fire-retardant poly.

iii. Holding Room: Provide a holding room as a drop location for bagged materials passed from the washroom. Construct the holding room using 50 x 100 mm (2 inches x 4 inches) wood framing or approved equivalent and 3 layers of 6-mil fire-retardant poly.

The holding room shall be located so that bagged material cannot be passed from the washroom to the clean room unless it goes through the holding room. Doorways in the holding room shall be constructed of 2 layers of 6-mil fire-retardant poly.

iv. Clean Room: Provide a clean room to isolate the holding room from the exterior of the regulated area. Construct the clean room using 2 inches x 4 inches wood framing or approved equivalent and 2 layers of 6-mil fire-retardant poly. The clean room shall be located so as to provide access to the holding room from the building exterior. Doorways to the clean room shall be constructed of 2 layers of 6-mil fire-retardant poly. When a negative pressure differential system is used, a rigid enclosure separation between the W/EDF clean room and the adjacent areas shall be provided.

v. The W/EDF shall be as follows: Washroom leading to a Holding Room followed by a Clean Room leading to outside the regulated area.

4. Waste/Equipment Decontamination Procedures

a. At the washdown station in the regulated area, thoroughly wet clean contaminated equipment and/or sealed polyethylene bags and pass into washroom after visual inspection. When passing anything into the washroom, close all doorways of the W/EDF, other than the doorway between the washdown station and the washroom. Keep all outside personnel clear of the W/EDF. Once inside the washroom, wet clean the equipment and/or bags. After cleaning and inspection, pass items into the Holding Room. Close all doorways except the doorway between the Holding Room and the Clean Room. Workers from the Clean

Room/Exterior shall enter the Holding Room and remove the decontaminated/cleaned equipment/bags for removal and disposal. At no time shall personnel from the clean side be allowed to enter the washroom.

F. Regulated Areas

1. All Class I, II, and III asbestos work must be conducted within regulated areas. The regulated area must be demarcated to minimize the number of persons within the area and to protect persons outside the area from exposure to airborne asbestos. Control access to regulated areas, ensure that only authorized personnel enter, and verify that Contractor required medical surveillance, training and respiratory protection program requirements are met prior to allowing entrance.

G. Signage and Power Management

1. Provide warning signs at all approaches to asbestos control areas. Locate signs at such a distance that personnel may read the sign and take the necessary protective steps required before entering the area. Signs must comply with the requirements of 29 CFR 1926.1101. Provide labels and affix to all asbestos materials, scrap, waste, debris, and other products contaminated with asbestos. Containers with preprinted warning labels conforming to the requirements are acceptable.

2. Maintain two (2) copies of all standards, regulations, codes, and other applicable documents, including those publications referenced by this specification. Post one copy of each in the clean room at the regulated area where workers will have daily access to the regulations and keep another hard copy or electronic copy in the Contractor's office.

3. Shut down and lock out/tag out electric power to the regulated area and provide temporary power and lighting in accordance with all applicable electrical code and OSHA requirements for temporary electrical systems. Electricity shall be provided by the VA.

4. Shut down and lock out/tag out heating, cooling, and air conditioning system (HVAC) components that are in, supply or pass through the regulated area. Investigate the regulated area and agree on pre-abatement condition with the VA's representative. Provide an air-tight seal consisting of a minimum of 2 layers of independently installed 6-mil poly at all intake and exhaust vents in the regulated area. Also, seal any seams in system components that pass through the regulated area.

H. Local Exhaust System

1. Provide a local exhaust system in the asbestos control area in accordance with ASSP Z9.2 and 29 CFR 1926.1101 that will provide at least four air changes per hour inside of the negative pressure enclosure. Local exhaust equipment must be operated 24-hours per day, until the asbestos control area is removed and must be leak proof to the filter and equipped with HEPA filters. Maintain a minimum pressure differential in the control area of minus 0.02 inch of water column relative to adjacent, unsealed areas. Provide continuous 24-hour per day monitoring of the pressure differential with a pressure differential automatic recording instrument. The building ventilation system must not be used as the local exhaust system for the asbestos control area. Filters on exhaust equipment must conform to ASSP Z9.2 and UL 586. Terminate the local exhaust system out of doors a minimum of 30 feet from building make-up air,

doors, open windows, patients, visitors, and staff unless the COR allows an alternate arrangement.

I. Tools

1. Vacuums must be leak proof to the filter and equipped with HEPA filters. Filters on vacuums must conform to ASSP Z9.2 and UL 586. Do not use power tools to remove asbestos containing materials unless the tool is equipped with effective, integral HEPA filtered exhaust ventilation systems. Remove all residual asbestos from reusable tools prior to storage or reuse. Reusable tools must be thoroughly decontaminated prior to being removed from the regulated areas.

J. Rental Equipment

1. If rental equipment is to be used, furnish written notification to the rental agency concerning the intended use of the equipment and the possibility of asbestos contamination of the equipment.

K. Glovebags

1. Submit written manufacturers proof that glovebags will not break down under expected temperatures and conditions.

3.3.WORK PROCEDURE

A. Perform asbestos related work in accordance with 29 CFR 1926.1101, 40 CFR 61-SUBPART M, and as specified herein. Use wet removal procedures, appropriate encapsulation procedures as listed in the asbestos hazard abatement plan, and negative pressure enclosure techniques. Wear and utilize protective clothing and equipment as specified herein. No eating, smoking, drinking, chewing gum, tobacco, or applying cosmetics is permitted in the asbestos work or control areas. Personnel of other trades not engaged in the removal, demolition, or

encapsulation of asbestos-containing material must not be exposed at any time to airborne concentrations of asbestos unless all the personnel protection and training provisions of this specification are complied with by the trade personnel. Seal all roof top penetrations, except plumbing vents, prior to asbestos roofing work. Shut down the building heating, ventilating, and air conditioning system, cap the openings to the system, and provide temporary heating, ventilation, and air conditioning prior to the commencement of asbestos work. Power to the regulated area must be locked-out and tagged in accordance with 29 CFR 1910.147. Disconnect electrical service when encapsulation or wet removal is performed and provide temporary electrical service with verifiable ground fault circuit interrupter (GFCI) protection prior to the use of any water or encapsulant. All electrical work must be performed by a licensed electrician.

B. Building Ventilation System and Critical Barriers

1. Building ventilation system ducts in a regulated area must be shut down and isolated by lockable switch or other positive means in accordance with 29 CFR 1910.147. The ducts and any other penetrations located within the work area must be isolated by airtight seals to prevent the spread of contamination throughout the system. The airtight seals must consist of air-tight rigid covers for building ventilation supply and exhaust grills where the ventilation system is required to remain in service during abatement. Edges to wall, ceiling and floor surfaces must be sealed with industrial grade duct tape.

   a. A Competent Person must supervise the work.

   b. For indoor work, critical barriers must be placed over all openings to the regulated area.

c. Impermeable dropcloths must be placed on surfaces beneath all removal activity.

C. Protection of Existing Work to Remain

1. Perform work without damage or contamination of adjacent work. Where such work is damaged or contaminated as verified by the COR using visual inspection or sample analysis, it must be restored to its original condition or decontaminated by the Contractor at no expense to the VA as deemed appropriate by the COR. This includes inadvertent spill of dirt, dust, or debris in which it is reasonable to conclude that asbestos may exist. When these spills occur, stop work immediately. Then clean up the spill. When satisfactory visual inspection and air sampling results are obtained from the CPIH/CIH work may proceed after written authorization from the COR.

D. Furnishings

1. The VA will remove furniture and equipment from the work areas before asbestos work begins.

2. Fixed furniture and equipment will remain in the building. Protect, cover, and seal furnishings with 6-mil plastic sheet prior to the start of work.

E. Pre-cleaning and Pre-work Inspection Activities

1. There is no requirement to remove pre-existing asbestos-containing dusts or debris from the facility unless Contractor determines that to be a more cost-effective means of completing the work.

2. All work areas must be assessed by the VPIH to determine what additional sampling may be required prior to the disturbance of any materials which have not been previously shown to contain asbestos or to not contain asbestos. The

minimum bulk sampling requirements for each homogeneous area of material are:

a. Surfacing materials:

i. At least three (3) bulk samples shall be collected from each homogeneous area that is 1,000 square feet or less.

ii. At least five (5) bulk samples shall be collected from each homogeneous area that is greater than 1,000 square feet but less than or equal to 5,000 square feet.

iii. At least seven (7) bulk samples shall be collected from each homogeneous area that is greater than 5,000 square feet.

iv. At least one (1) additional bulk sample for every additional 1,000 square feet of material.

b. Thermal System Insulation (TSI):

i. At least three (3) bulk samples shall be collected from each homogeneous area of TSI.

ii. At least one (1) bulk sample from each homogeneous area of patched thermal system insulation if the patched section is less than 6 linear or square feet.

iii. In a manner sufficient to determine, which must include at least two (2) bulk samples, from each insulated mechanical system where cement or plaster is used on fittings such as tees, elbows, or valves.

iv. Bulk samples are not required to be collected from any homogeneous area where the accredited inspector has determined that the thermal system insulation is fiberglass, foam glass, rubber, or other non-ACBM.

c. Miscellaneous materials:

i. At least two (2) bulk samples shall be collected from each homogeneous area that is less than 500 square feet.

ii. At least three (3) bulk samples shall be collected from each homogeneous area that is greater than or equal to 500 square feet but less than 1,000 square feet.

iii. At least five (5) bulk samples shall be collected from each homogeneous area that is greater than 1,000 square feet but less than or equal to 5,000 square feet.

iv. At least seven (7) bulk samples shall be collected from each homogeneous area that is greater than 5,000 square feet.

v. At least one (1) additional bulk sample for every additional 1,000 square feet of material.

3. Once the assessment has been completed and the extent of the asbestos abatement work verified, the work may proceed.

4. Pre-cleaning of ACM contaminated items shall be performed after the enclosure has been erected and negative pressure has been established in the work area.

5. Pre-clean all movable objects within the regulated area using a HEPA filtered vacuum and/or wet cleaning methods as appropriate. After cleaning, these objects shall be removed from the regulated area and carefully stored in an uncontaminated location. Drapes, clothing, upholstered furniture, and other fabric items shall be disposed of as asbestos contaminated waste.

6. Pre-clean all fixed objects in the regulated area using HEPA filtered vacuums and/or wet cleaning techniques as appropriate.

7. After pre-cleaning, enclose fixed objects with a minimum of 2 layers of 6-mil poly and seal securely in place with duct tape. Objects (e.g., permanent fixtures, shelves, electronic equipment, laboratory tables, sprinklers, alarm systems, closed circuit TV equipment and computer cables) which must remain in the regulated area and that require special ventilation or enclosure requirements should be designated along with specified means of protection. Contact the manufacturer for special protection requirements.

8. Pre-clean all surfaces in the regulated area using HEPA filtered vacuums and/or wet cleaning methods as appropriate. Do not use any methods that would raise dust such as dry sweeping or vacuuming with equipment not equipped with HEPA filters. Do not disturb asbestos-containing materials during this pre-cleaning phase.

9. All workers performing pre-cleaning activities must don personal protective equipment (PPE) in accordance with 29 CFR 1926.1101 for asbestos, and other pertinent OSHA regulations should additional hazards be identified.

F. Firestopping

1. Identify all fire barrier penetrations due to abatement work and provide firestopping as specified in Section 07 84 00 FIRESTOPPING.

2. Any discovery of penetrations during abatement shall be brought to the attention of the COR immediately. All walls, floors and ceilings are considered fire rated unless otherwise determined by the COR or Fire Marshall.

3. Any visible openings, whether or not caused by a penetration, shall be reported by the Contractor to the COR for a sealant system determination.

G. Asbestos Control Area Requirements

1. Negative Pressure Enclosure

a. Unless pre-authorized by the VA's Representative, all asbestos abatement work shall be conducted within a Negative Pressure Enclosure meeting the specifications of 29 CFR 1926.1101.

b. HEPA equipped negative air machines shall be discharged outside of the building a minimum of 30 feet from building make-up air, doors, open windows, patients, visitors, and staff.

c. Provide standby units in the event of machine failure and/or emergency in an adjacent area.

d. The fully operational negative air system within the regulated area shall continuously maintain a pressure differential at least -0.02-inch WCG inside the regulated work area.

e. The pressure differential shall be continuously monitored and recorded between the regulated area and the area outside the regulated area with a monitoring device that incorporates a strip chart recorder. The strip chart recorder shall become part of the project log and shall indicate at least -0.02-inch WCG pressure differential inside the regulated work area for the duration of the project.

f. If the building is occupied during abatement, provide an auxiliary gasoline/diesel generator located outside the building in an area protected from the weather. In the

event of a power failure of the general power grid and the VAMC emergency power grid, the generator must automatically start and supply power to a minimum of 50 percent of the negative air machines in operation.

g. Provide, as needed for proper air flow in the regulated area, in a location approved by the VA, openings in the plastic sheeting to allow outside air to flow into the regulated area. Auxiliary makeup air inlets must be located as far from the negative air machines as possible, off the floor near the ceiling, and away from the barriers that separate the regulated area from the occupied clean areas. Cover the inlets with weighted flaps which will seal in the event of failure of the negative pressure system.

h. The Negative Pressure Enclosure must be tested before any ACM is disturbed in any way. After the regulated area has been completely prepared, the decontamination units set up, and the negative air machines installed, start the units up one at a time. Demonstrate and document the operation and testing of the negative pressure system to the VA using smoke tubes and a negative pressure gauge. Verification and documentation of adequate negative pressure differential across each barrier must be done at the start of each work shift.

i. The demonstration of the operation of the negative pressure system to the VA shall include, but not be limited to, the following:

   i. Plastic barriers and sheeting move lightly in toward the regulated area.

   ii. Curtains of the decontamination units move in toward regulated area.

iii. There is a noticeable movement of air through the decontamination units. Use the smoke tube to demonstrate air movement from the clean room to the shower room to the equipment room to the regulated area.

iv. Use smoke tubes to demonstrate air is moving across all areas in which work is to be done.

v. Use a differential pressure gauge to indicate a negative pressure of > -0.02-inch WCG across every barrier separating the regulated area from the rest of the building. Modify the system as necessary to meet the above requirements.

j. Use of the Negative Pressure Filtration System During Abatement Operations:

i. Start units before beginning any disturbance of ACM occurs.

ii. The negative air machines shall continue to run for the duration of the work until a final visual clearance and a final air clearance has been successfully completed for that regulated area.

iii. No negative air units shall be shut down at any time unless authorized by the VA Contracting Officer, verbally and in writing.

k. Dismantling The System:

i. After completion of the final visual and final air clearance has been obtained by the VPIH/CIH, the negative air units may be shut down. The exterior surfaces of the negative air units shall have been completely decontaminated; pre-filters are not to be removed and the unit’s inlet/outlet sealed using a

minimum of 2 layers of 6-mil poly immediately after shut down. No filter removal shall occur at the VA site following successful completion of site clearance. OSHA/EPA/DOT asbestos labels shall be attached to the units.

2. Containment Barriers and Coverings in the Regulated Area

   a. Seal off the perimeter of the regulated area to completely isolate the regulated area from adjacent spaces. All surfaces in the regulated area must be covered to prevent contamination and to facilitate clean-up. Should adjacent areas become contaminated as a result of the work, Contractor shall immediately stop work and clean up the contamination at no additional cost to the VA.

   b. Preparation Prior To Sealing:

      i. The Regulated Area: Place all tools, scaffolding, materials, and equipment needed for working in the regulated area prior to erecting any plastic sheeting. All uncontaminated removable furniture, equipment and/or supplies shall be removed by the VA from the regulated area before commencing work. Any objects not scheduled for removal remaining in the regulated area shall be completely covered using a minimum of 2 layers of 6-mil fire-retardant poly sheeting and secured with duct tape.

      ii. If the regulated area is adjacent to, or within view of an occupied area, provide a visual barrier of 6-mil opaque fire-retardant poly to prevent building occupant observation. If the adjacent area is accessible to the public, the barrier must be solid and capable of withstanding the negative pressure.

c. Critical Barriers:

i. Completely separate any operations in the regulated area from adjacent areas using a minimum of 2 layers of 6-mil fire-retardant poly and duct tape. Individually seal all HVAC openings into the regulated area using a minimum of 2 layers of 6-mil poly and duct tape. Individually seal all lighting fixtures, clocks, doors, windows, convectors, speakers, or any other objects/openings in the regulated area.

d. Primary Barriers must include:

i. Cover the regulated area with a minimum of two layers of 6-mil fire-retardant poly on the floors and a minimum of two layers of 4 mil, fire-retardant poly on the walls, unless otherwise directed in writing by the COR. Floor layers must form a right angle with the wall and turn up the wall at least 300 mm (12 inches). Seams must overlap at least 1800 mm (6 feet) and must be spray glued and taped. Install sheeting so that layers can be removed independently from each other. Carpeting shall be covered with a minimum of three layers of 6-mil poly. Corrugated cardboard sheets or other approved material must be placed between the bottom and middle layers of poly. Mechanically support and seal with duct tape and glue all wall layers.

ii. If stairs and ramps are covered with 6-mil plastic, a minimum of two layers must be used. Provide 19 mm (3/4 inch) exterior grade plywood treads held in place with duct tape/glue on the plastic. Do not cover rungs or rails with any isolation materials.

e. Secondary Barrier and Walkways must include:

i. Install as a drop cloth a 6-mil poly sheet at the beginning of each work shift where removal is to be done during that shift. Completely cover floors and any walls within 10 feet (3 meters) of the area where work is to be performed. Secure the secondary barrier with duct tape to prevent it from moving or debris from getting behind it. Remove the secondary barrier at the end of the shift or as work in the area is completed. Keep residue on the secondary barrier wetted. When removing, fold inward to prevent spillage and place in a disposal bag.

ii. Install walkways using 6-mil poly between the regulated area and the decontamination facilities (PDF and W/EDF) to protect the primary layers from contamination and damage. Install the walkways at the beginning of each shift and remove at the end of each shift.

f. Extension of the Regulated Area:

i. If the enclosure of the regulated area is breached in any way that could allow contamination to occur, the affected area shall be included in the regulated area and constructed as per this section. Decontamination measures must be started immediately and continue until air monitoring indicates background levels are met.

3. Glovebag

a. If the construction of a negative pressure enclosure is infeasible, or if the work meets the definition of "Small-Scale Short-Duration" in 40 CFR 763, the use of alternate techniques as indicated in 29 CFR 1926.1101 is

allowed with prior written approval from the COR. Establish designated limits for the asbestos regulated area with the use of rope or other continuous barriers and maintain all other requirements for asbestos control areas. The CPIH/CIH must conduct personal samples of each worker engaged in asbestos handling (removal, disposal, transport, and other associated work) throughout the duration of the project. If the quantity of airborne asbestos fibers monitored at the breathing zone of the workers at any time exceeds background or 0.01 fibers per cubic centimeter whichever is greater, stop work, evacuate personnel in adjacent areas or provide personnel with approved protective equipment at the discretion of the COR. This sampling may be duplicated by the VA at the discretion of the COR. If the air sampling results obtained by the COR differ from those obtained by the Contractor, the COR will determine which results predominate. If adjacent areas are contaminated as determined by the VPIH/CIH or the COR, clean the contaminated areas, monitor, and visually inspect the area as specified herein.

4. Alternative Regulated Area Configuration

a. At the discretion of the VPIH/CIH and the COR, alternative regulated area configurations may be allowed. Under most circumstances, these alternative configurations would include the following minimum requirements: establish designated limits for the asbestos regulated work area with the use of red barrier tape; install critical barriers, splash guards and signs; and maintain all other requirements for asbestos control areas except local exhaust ventilation unless feasible. Place impermeable dropcloths on surfaces beneath removal

activity extending out 3 feet in all directions. A detached decontamination system may be used.

H. Removal Procedures

1. Removal of asbestos-containing materials shall be performed in accordance with 29 CFR 1926.1101, the Contractor's approved Asbestos Hazards Abatement Plan, and this specification.

I. Methods of Compliance

1. Mandated Practices

a. The specific abatement techniques and items identified must be detailed in the Contractor's AHAP. Use the following engineering controls and work practices in all operations, regardless of the levels of exposure:

i. Vacuum cleaners equipped with HEPA filters.

ii. Wet methods or wetting agents except where it can be demonstrated that the use of wet methods is unfeasible due to the creation of electrical hazards, equipment malfunction, and in roofing.

iii. Prompt clean-up and disposal.

iv. Inspection and repair of polyethylene.

v. Cleaning of equipment and surfaces of containers prior to removing them from the equipment room or area.

2. Control Methods

a. Use the following control methods:

i. Local exhaust ventilation equipped with HEPA filter.

ii. Enclosure or isolation of processes producing asbestos dust.

iii. Where the feasible engineering and work practice controls are not sufficient to reduce employee exposure to or below the PELs, use them to reduce employee exposure to the lowest levels attainable and must supplement them by the use of respiratory protection.

3. Unacceptable Practices

a. The following work practices must not be used:

i. High-speed abrasive disc saws that are not equipped with point of cut ventilator or enclosures with HEPA filtered exhaust air.

ii. Compressed air used to remove asbestos containing materials, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air.

iii. Dry sweeping, shoveling, or other dry clean up.

iv. Employee rotation as a means of reducing employee exposure to asbestos.

J. Glovebag/Glovebox Systems

1. Where used, glovebags must be used without modification, smoke-tested for leaks, and completely cover the circumference of pipe or other structures where the work is to be done. Glovebags must be used only once and must not be moved. Glovebags must not be used on surfaces that have temperatures exceeding 150 degrees F. Prior to disposal, glovebags must be collapsed using a HEPA vacuum. Before beginning the operation, loose and friable material adjacent

to the glovebag operation must be wrapped and sealed in 2 layers of plastic or otherwise rendered intact. At least two persons must perform glovebag removal. Asbestos regulated work areas must be established for glovebag abatement. Designated boundary limits for the asbestos work must be established with rope or other continuous barriers and all other requirements for asbestos control areas must be maintained, including area signage and boundary warning tape.

2. Attach HEPA vacuum systems to the bag to prevent collapse during removal of ACM.

3. The negative pressure glovebag/glovebox must be fitted with gloved apertures and a bagging outlet and constructed with rigid sides from metal or other material which can withstand the weight of the ACM and water used during removal. A negative pressure must be created in the system using a HEPA filtration system. The box must be smoke tested for leaks prior to each use.

K. Mini-Enclosure

1. Mini-containment (small walk-in enclosure) to accommodate no more than two persons may be used at the discretion of the VPIH/CIH and the COR if the disturbance or removal can be completely contained by the enclosure. The mini-enclosure must be inspected for leaks and smoke tested before each use. Air movement must be directed away from the employee's breathing zone within the mini-enclosure.

L. Wrap and Cut Operation

1. Prior to cutting pipe, the asbestos-containing insulation must be wrapped with polyethylene and securely sealed with duct tape to prevent asbestos becoming airborne as a result of the cutting process. The following steps must be taken:

install glovebag, strip back sections to be cut 6 inches from point of cut, and cut pipe into manageable sections.

M. Encapsulation Procedures

1. General

a. At the conclusion of ACM removal and before removal of the primary barriers, the contractor shall encapsulate all surfaces with a bridging encapsulant.

2. Delivery and Storage

a. Deliver materials to the job site in original, new, and unopened containers bearing the manufacturer's name and label as well as the following information: name of material, manufacturer's stock number, date of manufacture, thinning instructions, application instructions and the SDS for the material.

3. Worker Protection

a. Before beginning work with any material for which an SDS has been submitted, provide workers with any required personal protective equipment. The required personal protective equipment shall be used whenever exposure to the material might occur. In addition to OSHA/specification requirements for respiratory protection, a paint pre-filter and an organic vapor cartridge, at a minimum, shall be used in addition to the HEPA filter when an organic solvent based encapsulant or other solvent is used. The CPIH/CIH shall be responsible for provision of adequate respiratory protection. Note: Flammable and combustible encapsulants or solvents shall not be used, unless authorized in writing by the VA.

4. Lockdown Encapsulation

a. Lockdown Encapsulation of Abated Surfaces: With the express written permission of the VA's representative, perform lockdown encapsulation of all surfaces from which asbestos was abated in accordance with the procedures in this specification. Negative pressure shall be maintained in the regulated area during the lockdown application.

b. Apply two coats of lockdown encapsulant to scratch coat plaster or piping after all ACM has been removed. Apply the first coat while the scratch coat is still damp from the asbestos removal process, after passing the visual inspection. If the surface has been allowed to dry, wet wipe or HEPA vacuum prior to spraying with encapsulant. Apply a second coat over the first coat in strict conformance with the manufacturer's instructions. Any deviation from the instructions must be approved by the VA's representative in writing prior to commencing the work.

c. Color the lockdown encapsulant and contrast the color in the second coat so that visual confirmation of completeness and uniform coverage of each coat is possible. Adhere to the manufacturer's instructions for coloring. At the completion of the encapsulation, the surface must be a uniform third color produced by the mixture unless the area being encapsulated will not be accessible or visible to building occupants during normal facility operations.

5. Bridging Encapsulant

a. Seal edges of ACM exposed by removal work with two coats of bridging encapsulant. Prior to sealing, permit the exposed edges to dry completely to permit penetration of the bridging encapsulant. Apply as recommended by the manufacturer.

N. Air Sampling

1. The VA will employ an independent industrial hygienist (VPIH/CIH) consultant and/or use its own IH to perform various services on behalf of the VA. The VPIH/CIH will perform the final clearance monitoring and visual inspections and may perform other support services at the discretion of the COR to ensure that VA patients, employees, and visitors will not be adversely affected by the abatement work, and that the abatement work proceeds in accordance with these specifications, that the abated areas or abated buildings have been successfully decontaminated. The work of the VPIH/CIH consultant in no way relieves the Contractor from their responsibility to perform the work in accordance with contract/specification requirements, to perform continuous inspection, monitoring and testing as specified, and to perform other such services as specified. The cost of the VPIH/CIH and their services will be borne by the VA except for any repeat of final visual inspections and/or clearance monitoring that may be required due to unsatisfactory initial results. Any repeated final visual inspections and/or clearance monitoring, if required, shall be borne by the Contractor.

2. If laboratory analysis of samples collected during abatement work, either inside or outside the regulated area, utilizing the NIOSH 7400 air monitoring method, exceed 0.01 f/cc above background levels, the Contractor shall stop work. The Contractor may request confirmation of the results by analysis of the samples using NIOSH TEM Method 7402. Request must be in writing and submitted to the VA's representative. Cost for the confirmation of results shall be borne by the Contractor for both the collection and analysis of samples and for any associated time delay that may occur as a result.

3. Monitoring, Inspection, and Testing by Contractor CPIH/CIH: The Contractor's CPIH/CIH is responsible for managing all monitoring, inspections, and testing required by these specifications, as well as any and all regulatory requirements adopted by these specifications. The CPIH/CIH is responsible for the continuous monitoring of all subsystems and procedures which could affect the health and safety of the Contractor's personnel. Safety and health conditions and the provision of those conditions inside the regulated area for all persons entering the regulated area is the exclusive responsibility of the Contractor/Competent Person.

4. The person performing the personnel and area air monitoring inside and outside the regulated area shall be the CPIH/CIH and/or an IH Technician who is under the direct supervision of the CPIH/CIH. The IH Technician shall meet the minimum qualifications of the CPIH/IH, however, the IH Technician need not meet the minimum experience requirements of the CPIH/CIH.

5. Provide area air sampling and establish the baseline one day prior to the masking and sealing operations for each asbestos removal, demolition, or encapsulation site. Establish the background by performing area sampling in similar but uncontaminated sites in the building.

6. The analytical laboratory used by the Contractor to analyze the samples shall be approved by the VA prior to start of the project. A daily log shall be maintained by the CPIH/CIH or IH Technician. This log shall be made available to the COR and/or the VPIH/CIH upon request. The log will contain, at a minimum, information on personnel or area samples, other persons represented by the sample, the date of sample collection, start and stop times for sampling, sample

volume, flow rate, and fibers/cc. The CPIH/CIH shall collect and analyze samples for each representative job task in accordance with 29 CFR 1926.1101. Air monitoring shall be conducted for the duration of the project while asbestos abatement work is being performed in accordance with the following minimum requirements:

a. No fewer than two (2) personal air samples or 25 percent of representative workforce per shift shall be collected, whichever is greater, in each regulated area.

b. A minimum of three (3) air samples from within the regulated area boundaries.

c. A minimum of three (3) area air samples at locations inside the building but immediately outside the regulated work area.

d. One (1) area air sample shall be collected daily in the Clean Room of the PDF.

e. One (1) area air sample shall be collected daily at the approximate location of HEPA exhaust discharge.

f. One (1) sample taken in the waste loadout area during waste loadout operations.

7. These quantities are to be considered minimum requirements, and the CPIH/CIH must ensure an adequate quantity of samples are collected for each unique regulated area or activity in a way which is representative of the conditions. A reduction of monitoring may be permitted at the discretion of the COR upon written request from the CPIH/CIH. Modifications to any air monitoring procedure shall not be implemented until a written authorization from the COR has been received.

8. In addition to the continuous monitoring required, the CPIH/CIH will perform inspection and testing at the final

stages of abatement for each regulated area to ensure the area is ready for inspection by the VPIH/CIH. Additionally, the CPIH/CIH will monitor and record pressure readings within the containment daily with a minimum of two readings at the beginning and at the end of a shift and submit the data in the daily report.

9. Clearance Sampling

a. Final visual inspection and clearance air monitoring shall be performed by the VPIH/CIH upon request by the CPIH/CIH. A minimum of 24 hours advance written notice shall be provided to the VPIH/CIH to ensure adequate time is afforded to schedule the final visual inspection and clearance air monitoring. The final visual inspection and clearance air monitoring shall be conducted by the VPIH/CIH no later than 48 hours after receipt of the written request by the CPIH/CIH.

b. A final visual inspection shall be conducted for all interior and exterior asbestos removal in accordance with ASTM E1368 regardless of the quantity of material removed or how the materials were removed. If any debris, residue, dust, or any other suspect material is detected, the final cleaning shall be repeated at no additional cost to the VA. When the regulated area is visually clean the final air clearance testing can be done.

c. After an acceptable final visual inspection by the VPIH/CIH, the VPIH/CIH will perform the final clearance air monitoring. Samples will be collected and analyzed using methodologies specified in 40 CFR 763. If the work involves the removal of less than 260 linear feet, 160 square feet, or 35 cubic feet, PCM sampling may be conducted. If the work involves the removal of more than 260 linear feet, 160 square feet, or 35 cubic feet, TEM

sampling shall be conducted. All clearance sampling must be conducted using aggressive means.

d. Clearance air monitoring using PCM may be used when the work involves less than 260 linear feet, 160 square feet, or 35 cubic feet of asbestos removal and when no aggressive means were used to remove asbestos-containing materials. A minimum of five (5) samples collected from within the regulated area boundaries by aggressive means shall be used for PCM clearance air monitoring, and the analysis shall be performed in accordance with the latest published version of NIOSH NMAM Method 7400. The asbestos removal work for each regulated area may be considered complete if all five sample results are less than or equal to 0.01 f/cc. Samples exceeding the specified criteria may be reanalyzed, at no additional cost to the VA, using NIOSH NMAM TEM Method 7402. If the analysis shows the concentration of asbestos fibers to be less than or equal to 0.01 asbestos fibers/cc, then those samples are considered to have passed the clearance criteria.

e. Clearance air monitoring using TEM is required when the work involves greater than or equal to 260 linear feet, 160 square feet, or 35 cubic feet. A minimum of five (5) samples collected from within the regulated area boundaries by aggressive means shall be used for TEM clearance air monitoring. TEM sampling and analysis must be done in accordance with the EPA Method specified in 40 CFR 763. The asbestos removal work for each regulated area may be considered complete if all five sample results are less than or equal to 70 s/mm2. Averaging of the sample results to achieve clearance criteria is explicitly prohibited for this project.

f. Work in a regulated area is complete when the regulated area has successfully passed a final visual inspection and the laboratory results of the clearance air samples are below the clearance criteria for the type of analysis used.

g. If the clearance criteria are not met, the Contractor shall repeat the final cleaning and continue decontamination procedures until clearance is achieved. All Additional inspection and testing costs will be borne by the Contractor.

h. If clearance criteria are met, proceed to perform the abatement closeout and to issue the Certificate of Completion found in Attachment #1 of this section.

O. Site Inspection

1. While performing asbestos engineering control work, the Contractor must be subject to on-site inspection by the VPIH/CIH and/or the COR. If the work is found to be in violation of this specification, the COR will issue a stop work order to be in effect immediately and until the violation is resolved. All related costs including standby time required to resolve the violation must be at the Contractor's expense.

3.4.CLEAN-UP AND DISPOSAL

A. Housekeeping

1. Essential parts of asbestos dust control are housekeeping and clean-up procedures. Maintain surfaces of the asbestos control area free of accumulations of asbestos fibers. Give meticulous attention to restricting the spread of dust and debris; keep waste from being distributed over the general area. Use HEPA filtered vacuum cleaners. DO NOT BLOW DOWN

THE SPACE WITH COMPRESSED AIR. When asbestos removal is complete, all asbestos waste is removed from the worksite, and final clean-up is completed, the VPIH/CIH and the COR will attest that the area is safe before the signs can be removed. After final clean-up and acceptable airborne concentrations are attained but before the HEPA unit is turned off and the enclosure removed, remove all pre-filters on the building HVAC system and provide new pre-filters. Dispose of filters as asbestos contaminated materials. Reestablish HVAC mechanical, and electrical systems in proper working order. The VPIH/CIH and/or the COR will visually inspect all surfaces within the enclosure for residual material or accumulated dust or debris. The Contractor must re-clean all areas showing dust or residual materials. If re-cleaning is required, air sample and establish an acceptable asbestos airborne concentration after re-cleaning. The VPIH/CIH and the COR must agree that the area is safe in writing before unrestricted entry will be permitted.

B. Title to Materials

1. All waste materials, except as specified otherwise, become the property of the Contractor and must be disposed of as specified in applicable local, state, and federal regulations and herein.

C. Disposal of Asbestos

1. Procedure for Disposal

a. Coordinate all Waste Shipment Records with the VPIH/CIH and the COR. The VA must be notified at least 24 hours in advance of any waste removed from the containment. Asbestos waste shall be packaged and moved through the

W/EDF into a covered transport container in accordance with procedures is this specification.

b. Collect asbestos waste, contaminated wastewater filters, asbestos contaminated water, scrap, debris, bags, containers, equipment, and asbestos contaminated clothing which may produce airborne concentrations of asbestos fibers and place in sealed fiber-proof, waterproof, non-returnable containers (e.g., double plastic bags 6 mils thick, cartons, drums, or cans), and ensure any additional requirements of the landfill operator are met. Wastes within the containers must be wetted with amended water prior to disposal in accordance with 40 CFR 61-SUBPART M. Wetted waste can be very heavy. Bags shall not be overfilled. Bags shall be evacuated with HEPA vacuum and securely sealed to prevent accidental opening and/or leakage. The top shall be tightly twisted and goose necked prior to tightly sealing with at least three wraps of duct tape.

c. Asbestos waste with sharp edged components, i.e., nails, screws, lath, strapping, tin sheeting, jacketing, metal mesh, etc., which might tear poly bags shall be wrapped securely in burlap before packaging and, if needed, use a poly lined fiber drum as the second container, prior to disposal.

d. Affix a warning and Department of Transportation (DOT) label to each container including the bags or use at least 6-mil thick bags with the approved warnings and DOT labeling preprinted on the bag. Clearly indicate on the outside of each container the name of the waste generator and the location at which the waste was generated.

e. Waste load out shall be done in accordance with the procedures in W/EDF Decontamination Procedures. Sealed

waste bags shall be decontaminated on exterior surfaces by wet cleaning and HEPA vacuuming before being placed in the second waste bag and sealed, which then must also be wet wiped and HEPA vacuumed. Ensure that unauthorized persons do not have access to the waste material once it is outside the regulated area.

f. All transport containers must be covered at all times when not in use. NESHAP signs must be on containers during loading and unloading. Material shall not be transported in open vehicles. If drums are used for packaging, the drums shall be labeled properly and shall not be re-used.

g. Prevent contamination of the transport vehicle (especially if the transport vehicle is a rented truck likely to be used in the future for non-asbestos purposes). These precautions include lining the vehicle cargo area with plastic sheeting (similar to work area enclosure) and thorough cleaning of the cargo area after transport and unloading of asbestos debris is complete. Dispose of waste asbestos material at an Environmental Protection Agency (EPA) or state-approved asbestos landfill off VA property. For temporary storage, store sealed impermeable bags in asbestos waste drums or skids. An area for interim storage of asbestos waste-containing drums or skids will be assigned by the VPIH/CIH and/or the COR. Comply with 40 CFR 61-SUBPART M, state, regional, and local standards for hauling and disposal. If allowed by the landfill, sealed plastic bags may be dumped from drums into the burial site unless the bags have been broken or damaged. Damaged bags must remain in the drum and the entire contaminated drum must be buried. Uncontaminated drums may be recycled. Workers unloading the sealed drums must wear appropriate respirators and

personal protective equipment when handling asbestos materials at the disposal site.

2. Asbestos Disposal Quantity Report

   a. Direct the CP to record and report, to the COR, the amount of asbestos-containing material removed and released for disposal. Deliver the report for the previous day at the beginning of each day shift with amounts of material removed during the previous day reported in the units used for quantities shown on the hazards abatement drawings.

   b. Allow the VPIH/CIH and/or the COR to inspect, record, and report the amount of asbestos containing material removed and released for disposal on a daily basis at their discretion.

3. Abatement Closeout and Certificate of Compliance

   a. After successful achievement of clearance criteria:

      i. Remove all equipment and materials from the project area.

      ii. Dispose of all packaged ACM waste as required.

      iii. Repair or replace all interior finishes damaged during the abatement work, as required.

      iv. Fulfill other project closeout requirements as required in this specification.

   b. At the completion of the abatement and decontamination of the regulated area, the CPIH/CIH shall complete and sign the Certificate of Completion found in Attachment #1.

ATTACHMENT #1

CERTIFICATE OF COMPLETION

DATE: _____ VA Project#: 402-22-700

PROJECT NAME: Electronic Health Records Modernization (EHRM) Infrastructure Upgrades

Abatement Contractor: _____

VAMC/ADDRESS: Togus, ME

1. I certify that I have personally inspected, monitored, and supervised the abatement work of (specify regulated area or Building) which took place from / / to / / .

2. That throughout the work all applicable requirements/regulations and the VA's specifications were met.

3. That any person who entered the regulated area was protected with the appropriate personal protective equipment and respirator and that they followed the proper entry and exit procedures and the proper operating procedures for the duration of the work.

4. That all employees of the Abatement Contractor engaged in this work were trained in respiratory protection, were experienced with abatement work, had proper medical surveillance documentation, were fit-tested for their respirator, and were not exposed at any time during the work to asbestos without the benefit of appropriate respiratory protection.

5. That I performed and supervised all inspection and testing specified and required by applicable regulations and VA specifications.

6. That the conditions inside the regulated area were always maintained in a safe and healthy condition and the maximum

fiber count never exceeded 0.5 f/cc, except as described below.

7. That all abatement work was done in accordance with OSHA requirements and the manufacturer's recommendations.

CPIH/CIH Signature/Date: _____

CPIH/CIH Print Name: _____

Abatement Contractor Signature/Date: _____

Abatement Contractor Print Name: _____

ATTACHMENT #2

CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

DATE: _____ VA Project#: 402-22-700

PROJECT NAME: Electronic Health Records Modernization (EHRM) Infrastructure Upgrades

Abatement Contractor: _____

VAMC/ADDRESS: Togus, ME

WORKING WITH ASBESTOS CAN BE HAZARDOUS TO YOUR HEALTH. INHALING ASBESTOS HAS BEEN LINKED WITH VARIOUS TYPES OF CANCERS. IF YOU SMOKE AND INHALE ASBESTOS FIBERS, YOUR CHANCES OF DEVELOPING LUNG CANCER IS GREATER THAN THAT OF THE NON-SMOKING PUBLIC.

Your employer's contract with the owner for the above project requires that: You must be supplied with the proper personal protective equipment including an adequate respirator and be trained in its use. You must be trained in safe and healthy work practices and in the use of the equipment found at an asbestos abatement project. You must receive/have a current medical examination for working with asbestos. These things shall be provided at no cost to you. By signing this certificate of worker’s acknowledgement, you are indicating to the owner that your employer has met these obligations.

RESPIRATORY PROTECTION: I have been trained in the proper use of respirators and have been informed of the type of respirator to be used on the above indicated project. I have a copy of the written Respiratory Protection Program issued by my employer. I have been provided for my exclusive use, at no cost, with a respirator to be used on the above indicated project.

TRAINING COURSE: I have been trained by a third party, State/EPA accredited trainer in the requirements for an AHERA/OSHA Asbestos Abatement Worker training course, 32-hours minimum duration. I

currently have a valid State accreditation certificate. The topics covered in the course include, as a minimum, the following:

1. Physical Characteristics and Background Information on Asbestos
2. Potential Health Effects Related to Exposure to Asbestos
3. Employee Personal Protective Equipment
4. Establishment of a Respiratory Protection Program
5. State of the Art Work Practices
6. Personal Hygiene
7. Additional Safety Hazards
8. Medical Monitoring
9. Air Monitoring
10. Relevant Federal, State and Local Regulatory Requirements, Procedures, and Standards
11. Asbestos Waste Disposal

MEDICAL EXAMINATION: I have had a medical examination within the past 12 months which was paid for by my employer. This examination included: health history, occupational history, pulmonary function test, and may have included a chest x-ray evaluation. The physician issued a positive written opinion after the examination.

Signature: _____

Printed Name: _____

Social Security Number: _____

Witness: _____

ATTACHMENT #3

AFFIDAVIT OF MEDICAL SURVEILLANCE, RESPIRATORY PROTECTION AND TRAINING/ACCREDITATION

DATE: _____ VA Project#: 402-22-700

PROJECT NAME: Electronic Health Records Modernization (EHRM) Infrastructure Upgrades

Abatement Contractor: _____

VAMC/ADDRESS: Togus, ME

1. I verify that the following individual

Name:

Social Security Number:

who is proposed to be employed in asbestos abatement work associated with the above project by the named Abatement Contractor, is included in a medical surveillance program in accordance with 29 CFR 1926.1101(m), and that complete records of the medical surveillance program as required by 29 CFR 1926.1101(m)(n) and 29 CFR 1910.20 are kept at the offices of the Abatement Contractor at the following address:

Address:

2. I verify that this individual has been trained, fit-tested and instructed in the use of all appropriate respiratory protection systems and that the person is capable of working in safe and healthy manner as expected and required in the expected work environment of this project.

3. I verify that this individual has been trained as required by 29 CFR 1926.1101(k). This individual has also obtained a valid State accreditation certificate. Documentation will be kept on-site.

4. I verify that I meet the minimum qualifications criteria of the VA specifications for a CPIH.

Signature of CPIH/CIH: _____

Date: _____

Printed Name of CPIH/CIH: _____

Signature of Contractor: _____

Date: _____

Printed Name of Contractor: _____

ATTACHMENT #4

ABATEMENT CONTRACTOR/COMPETENT PERSON(S) REVIEW AND ACCEPTANCE OF THE VA'S ASBESTOS SPECIFICATIONS

DATE: _____ VA Project#: 402-22-700

PROJECT NAME: Electronic Health Records Modernization (EHRM) Infrastructure Upgrades

Abatement Contractor: _____

VAMC/ADDRESS: Togus, ME

1. This form shall be signed by the Asbestos Abatement Contractor Owner and the Asbestos Abatement Contractor's Competent Person(s) prior to any start of work at the VA related to this Specification. If the Asbestos Abatement Contractor's/Competent Person(s) has not signed this form, they shall not be allowed to work on-site.

2. I, the undersigned, have read VA's Asbestos Specification regarding the asbestos abatement requirements. I understand the requirements of the VA's Asbestos Specification and agree to follow these requirements as well as all required rules and regulations of OSHA/EPA/DOT and State/Local requirements. I have been given ample opportunity to read the VA's Asbestos Specification and have been given an opportunity to ask any questions regarding the content and have received a response related to those questions. I do not have any further questions regarding the content, intent, and requirements of the VA's Asbestos Specification.

3. At the conclusion of the asbestos abatement, I will certify that all asbestos abatement work was done in accordance with the VA's Asbestos Specification and all ACM was removed properly and no fibrous residue remains on any abated surfaces.

Abatement Contractor Owner's Signature: _____

Date: _____

- - - END - - -

SECTION 02 83 00

LEAD REMEDIATION

PART 1 – GENERAL

1.1.CONTRACT DOCUMENTS AND RELATED REQUIREMENTS:

A. Drawings, general provisions of the contract, including general and supplementary conditions and other Division 01 specifications, shall apply to the work of this section. The contract documents show or describe the work to be done under the contract and related requirements and conditions impacting the project. Related requirements and conditions include applicable codes and regulations, notices and permits, existing site conditions and restrictions on use of the site, requirements for partial owner occupancy during the work, coordination with other work and the phasing of the work. In the event the Contractor/Sub-Contractor discovers a conflict in the contract documents and/or requirements or codes, the conflict must be brought to the immediate attention of the COR for resolution. Whenever there is a conflict or overlap in the requirements, the most stringent shall apply. Any actions taken by the Contractor/Sub-Contractor without obtaining guidance from the COR shall become the sole risk and responsibility of the Contractor/Sub-Contractor. All costs incurred due to such action are also the responsibility of the Contractor/Sub-Contractor.

1.2.RELATED WORK

A. 01 35 26 SAFETY REQUIREMENTS

B. 02 41 00 SELECTIVE DEMOLITION

C. 02 81 00 TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS

D. 02 82 00 ASBESTOS REMEDIATION

E. 07 84 00 FIRESTOPPING

F. Division 09 FINISHES

1.3.REFERENCES

A. 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.

B. All work under this contract shall be done in strict accordance with all applicable federal, state, and local regulations, standards and codes governing lead-containing materials work, and any other trade work done in conjunction with the project. All applicable codes, regulations and standards are adopted into this specification and will have the same force and effect as this specification.

C. The most recent edition of any relevant regulation, standard, document, or code shall be in effect. Where conflict among the requirements or with these specifications exists, the most stringent requirement(s) shall be utilized.

D. All related regulations, statutes, public laws, registers, and regulatory guidance are incorporated by reference.

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP Z9.2	(2018) Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 701	(2019) Standard Methods of Fire Tests for Flame Propagation of Textiles and Films

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)

HUD 6780	(1995; Errata Aug 1996; Rev Ch. 7 - 1997) Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1926.21	Safety Training and Education
29 CFR 1926.33	Access to Employee Exposure and Medical Records
29 CFR 1926.55	Gases, Vapors, Fumes, Dusts, and Mists
29 CFR 1926.59	Hazard Communication
29 CFR 1926.62	Lead
29 CFR 1926.65	Hazardous Waste Operations and Emergency Response
29 CFR 1926.103	Respiratory Protection
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
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 268	Land Disposal Restrictions
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 178	Specifications for Packagings

UNDERWRITERS LABORATORIES (UL)

UL 586 (2009; Reprint Dec 2017) UL Standard for Safety High-Efficiency Particulate, Air Filter Units

1.4.DEFINITIONS

A. General

1. Definitions can be found in the applicable publications referenced by this specification.

B. Action Level

1. Employee exposure, without regard to use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air averaged over an 8-hour period.

C. Area Sampling

1. Sampling of lead concentrations within the lead control area and inside the physical boundaries which is representative of the airborne lead concentrations but is not collected in the breathing zone of personnel (approximately 5 to 6 feet above the floor).

D. Contractor's Professional Industrial Hygienist (CPIH/CIH)

1. The Contractor's industrial hygienist who is trained in the recognition and control of lead hazards in accordance with current federal, State, and local regulations. The CPIH/CIH must be independent of the Contractor and must have no employee or employer relationship which could constitute a conflict of interest.

E. Competent Person (CP)

1. As used in this section, refers to a person employed by the Contractor who is trained in the recognition and control of lead hazards in accordance with current federal, State, and local regulations and has the authority to take prompt corrective actions to control the lead hazard. The

Contractor may provide more than one CP as required to supervise and monitor the work.

F. Contracting Officer Representative (COR)

1. The VA official responsible for monitoring on-going project work.

G. Contaminated Room

1. Refers to a room for removal of contaminated personal protective equipment (PPE).

H. Decontamination Shower Facility

1. That facility that encompasses a clean clothing storage room, and a contaminated clothing storage and disposal rooms, with a shower facility in between.

I. Deleading

1. Activities conducted by a person who offers to remove hazards from lead-containing materials or to plan such activities in commercial buildings, bridges, or other structures.

J. Eight-Hour Time Weighted Average (TWA)

1. Airborne concentration of lead to which an employee is exposed, averaged over an 8-hour workday as indicated in 29 CFR 1926.62.

K. High Efficiency Particulate Air (HEPA) Filter Equipment

1. HEPA filtered vacuuming equipment with a UL 586 filter system capable of collecting and retaining lead contaminated particulate. A high efficiency particulate filter demonstrates at least 99.97 percent efficiency against 0.3 micron or larger size particles.

L. Lead

1. Metallic lead, inorganic lead compounds, and organic lead soaps. Excludes other forms of organic lead compounds.

M. Lead-Based Paint (LBP)

1. Paint or other surface coating that contains lead in excess of 1.0 milligrams per centimeter squared or 0.5 percent by weight.

N. Lead Control Area

1. A system of control methods to prevent the spread of lead dust, paint chips or debris to adjacent areas that may include temporary containment, floor or ground cover protection, physical boundaries, and warning signs to prevent unauthorized entry of personnel. HEPA filtered local exhaust equipment may be used as engineering controls to further reduce personnel exposures or building/outdoor environmental contamination.

O. Lead Permissible Exposure Limit (PEL)

1. Fifty micrograms per cubic meter of air as an 8-hour time weighted average as determined by 29 CFR 1926.62. If an employee is exposed for more than 8-hours in a workday, determine the PEL by the following formula:

   a. PEL (micrograms/cubic meter of air) = 400/No. hrs. worked per day

P. Material Containing Lead/Paint with Lead (MCL/PWL)

1. Any material, including paint, which contains lead as determined by the testing laboratory using a valid test method. The requirements of this section do not apply if no detectable levels of lead are found using a quantitative method for analyzing paint or MCL using laboratory instruments with specified limits of detection of no greater than 60 parts per million. An X-Ray Fluorescence (XRF)

instrument may not be used for the purposes of determining if no lead is present.

Q. Personal Sampling

1. Sampling of airborne lead concentrations within the breathing zone of an employee to determine the 8-hour time weighted average concentration in accordance with 29 CFR 1926.62. Samples must be representative of the employees' work tasks. Breathing zone must be considered an area within a hemisphere, forward of the shoulders, with a radius of 6 to 9 inches and centered at the nose or mouth of an employee.

R. Physical Boundary

1. Area physically roped or partitioned off around lead control area to limit unauthorized entry of personnel.

S. VA Professional Industrial Hygienist (VPIH/CIH)

1. The Department of Veterans Affairs Professional Industrial Hygienist who is trained in the recognition and control of lead hazards in accordance with current federal, State, and local regulations. The VPIH/CIH must be independent of the Contractor and must have no employee or employer relationship which could constitute a conflict of interest.

1.5.DESCRIPTION

A. Construction activities impacting PWL or materials containing lead which are covered by this specification include the demolition or removal of material containing lead in good to poor condition, located throughout the buildings and as indicated in the Hazardous Materials Assessment. The work covered by this section includes work tasks and the precautions specified in this section for the protection of building

occupants and the environment during and after the performance of activities which disturb lead-containing materials.

B. The work includes the disturbance, demolition, removal, and disposal of various lead-containing materials in project areas throughout the buildings only as necessary to accommodate the work of this project. The work may include, but is not limited to, disturbance of the following lead-containing materials in conditions ranging from good to poor condition:

1. Paints, coatings, and coverings.

2. Metallic lead.

3. Dusts with measurable concentrations of lead.

4. Plastic, vinyl, and rubber components.

5. Glazings of ceramics.

C. Except for waste testing, transportation, and disposal of lead-containing wastes, this specification applies only to work regulated by 29 CFR 1926.62 which applies to all personnel from all trades performing work under this contract. The work of this project is not classified as a "Lead Abatement" project as defined by 40 CFR 745 and is not regulated by 40 CFR 745, however, this section may include similar requirements. The disturbance of lead-containing materials is subject to regulation by 29 CFR 1926.62, 40 CFR Parts 260-273, and other closely related regulations.

D. Protection of Existing Areas to Remain

1. Project work including, but not limited to, removal or disturbance of lead-containing materials, storage, transportation, and disposal must be performed without damaging or contaminating adjacent work and areas. Where such work or areas are damaged or contaminated, restore work

and areas to the original condition at no additional cost to the VA.

E. Coordination with Other Work

1. Coordinate with work being performed in adjacent areas to ensure there are no exposure issues. Explain coordination procedures in the Lead Compliance Plan and describe how the Contractor will prevent lead exposure to other contractors performing work unrelated to lead activities, VA personnel, or building occupants.

1.6. SUBMITTALS

A. Submit the following in accordance with SECTION 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES:

1. Preconstruction Submittals

a. Lead Abatement Plan, prepared in accordance with the requirements of Maine Department of Environmental Protection (DEP)

b. Competent Person Qualifications

c. Training Certification

d. Occupational and Environmental Assessment Data Report

e. Medical Examinations

f. Lead Waste Management Plan

g. Licenses, Permits and Notifications

h. Occupant Protection Plan

i. Lead Compliance Plan

j. Contractor Experience and Qualifications

k. Affidavit of Medical Surveillance, Respiratory Protection, and Training Accreditation

l. Contractor/Competent Person(s) Review and Acceptance of the VA's Lead Specifications

m. Written Evidence of TSD Approval

n. Testing Laboratory

o. Contractor's Professional Industrial Hygienist (CPIH/CIH) Qualifications

p. Certificate Of Worker's Acknowledgement

q. Product Data

i. Respirators

ii. Vacuum Filters

iii. Negative Air Pressure System

iv. Materials and Equipment

v. Expendable Supplies

vi. Local Exhaust Equipment

vii. Pressure Differential Automatic Recording Instrument

viii. Safety Data Sheets (SDS) For All Materials

2. Periodic Submittals

a. Initial Sample Results

b. Pressure Differential Log

c. Occupational and Environmental Assessment Data Report

d. Sampling Results

e. Pressure Differential Recordings for Local Exhaust System

f. Clearance Certification

g. Certificate Of Completion

3. Closeout Submittals

a. Hazardous Waste Manifest

b. In addition to these submittals, the closeout submittals shall include all updates to previously submitted information as necessary to ensure the documentation requirements of this section are fulfilled.

1.7.QUALITY ASSURANCE

A. General

1. Comply with laws, ordinances, rules, and regulations of federal, state, and local authorities having jurisdiction regarding removing, handling, storing, transporting, and disposing lead waste materials. Comply with applicable requirements of 29 CFR 1926.62, applicable rules and regulations of state and local authorities having jurisdiction, and notify the COR and request resolution of conflicts between regulations and specified requirements before starting work.

2. Submit a completed Certificate of Worker's Acknowledgement found in Attachment #2 of this section, a completed Affidavit of Medical Surveillance, Respiratory Protection, and Training Accreditation found in Attachment #3 of this section, and the Contractor/Competent Person(s) Review and Acceptance of the VA's Lead Specifications found in Attachment #4 of this section.

B. Responsibilities

1. VA Responsibilities Prior to Commencement of Work

a. Notify occupants adjacent to regulated areas of project dates and requirements for relocation, if needed. Arrangements must be made prior to starting work for relocation of desks, files, equipment, and personal possessions to avoid unauthorized access into the regulated area. Coordinate utilities use, locations, and other conditions of use with the Contractor.

2. Contractor Responsibility

a. The "Lead-Removal" Contractor (Contractor) shall assume primary responsibility and liability for compliance with all applicable Federal, State and Local regulations related to all aspects of the lead-related work. The General Contractor shall assume secondary responsibility and liability for their own and their other sub-contractor's compliance with all applicable federal, state, and local regulations as it relates to potential lead disturbance. The Contractor is responsible for providing and maintaining required documentation including but not limited to training, accreditations, medical exams, medical records, personal protective equipment (PPE), respiratory protection, and respirator fit testing, as required by applicable federal, state, and local regulations. The Contractor shall hold the VA and VPIH/CIH consultants harmless for any Contractor or Sub-Contractor failure to comply with any applicable work, packaging, transporting, disposal, safety, health, or environmental regulations or contract requirements on the part of themself, their employees, or their sub-contractors.

C. Contractors Use of Premises

1. The Contractor and Contractor's personnel shall cooperate fully with the COR to facilitate efficient use of buildings

and areas within buildings. The Contractor shall perform the work in accordance with the VA specifications, drawings, phasing plan and in compliance with any/all applicable federal, state, and local regulations and requirements.

2. The Contractor shall not block or hinder use of buildings by patients, staff, and visitors to the VA in partially occupied buildings by placing materials/equipment in any unauthorized location.

D. Qualifications

1. Contractor Experience and Qualifications

a. Submit project experience within the past 3 years, listing projects first most similar to this project:

i. Project Name; Type of Work; Duration; Cost; Reference Name/Phone Number; Final Clearance; and Completion Date

b. List of project(s) halted by owner, A/E, CPIH/CIH, regulatory agency in the last 3 years.

i. Project Name; Reason; Date; Reference Name/Number; and Resolution.

c. List lead-related regulatory citations (e.g., OSHA), notices of violations (e.g., Federal and state EPA), penalties, and legal actions taken against the company including the company's officers (including damages paid) in the last 5 years. Provide copies and all information needed for verification.

d. Evidence the Contractor has adequate liability/occurrence insurance which must including exclusions with a letter from agent stating in plain language the coverage provided and the fact that lead-related activities are covered by the policy for lead work as required by the

state; is licensed to perform lead-related work in Maine; has adequate and qualified personnel available to complete the work; has comprehensive standard operating procedures for lead-related work; has adequate materials, equipment and supplies to perform the work.

2. Competent Person (CP)

   a. Submit name, address, and telephone number of the CP selected to perform responsibilities specified in paragraph COMPETENT PERSON (CP) RESPONSIBILITIES. Provide documented construction project-related experience with implementation of OSHA's Lead in Construction standard (29 CFR 1926.62) which shows ability to assess occupational and environmental exposure to lead; experience with the use of respirators, personal protective equipment, and other exposure reduction methods to protect employee health. Demonstrate a minimum of 4 years' experience, of which 2 years were as the CP on the project, implementing OSHA's Lead in Construction standard (29 CFR 1926.62). Submit evidence that the proposed CP has been the CP on 2 projects of similar size and complexity as this project within the past 3 years. Submit proper documentation that the CP is trained, licensed, and certified in accordance with federal, state, and local laws.

3. Training Certification

   a. Submit a certificate for each worker and supervisor, signed and dated by the accredited training provider, showing evidence that the employee has received the required lead training specified in 29 CFR 1926.62, has received training on the standard operating procedures of the Contractor, and has applicable medical and respiratory protection documentation. Submit a list of

and verification of training for all personnel who have current first-aid/CPR training. A minimum of one person per shift must have adequate training.

4. Testing Laboratory

a. Submit the name, address, and telephone number of the testing laboratory selected to perform the air, soil, and wipe analysis, testing, and reporting of airborne concentrations of lead. Use a laboratory participating in the EPA National Lead Laboratory Accreditation Program (NLLAP) by being accredited by either the American Association for Laboratory Accreditation (A2LA) or the American Industrial Hygiene Association (AIHA) and that is successfully participating in the Environmental Lead Proficiency Analytical Testing (ELPAT) program to perform sample analysis. Laboratories selected to perform blood lead analysis must be OSHA approved.

5. Contractor's Professional Industrial Hygienist (CPIH/CIH) Qualifications

a. Submit the name, address, telephone number, and documentation of past experience of the Contractor's Professional Industrial Hygienist (CPIH/CIH) selected to perform the lead sampling. The CPIH/CIH shall have at least 5 years of monitoring experience and supervision of lead-related; has participated as senior CPIH on 5 abatement projects, 3 of which are similar in size and complexity as this project; has specialized OSHA training in lead-related work, respiratory protection, waste disposal and lead inspection; and has appropriate medical/respiratory protection records/documentation.

E. Requirements

1. Competent Person (CP) Responsibilities

a. Verify training meets all federal, State, and local requirements.

b. Review and approve Lead Compliance Plan for conformance to the applicable referenced standards.

c. Continuously inspect LBP/PWL or MCL work for conformance with the approved plan.

d. Recommend upgrades or downgrades (whichever is appropriate based on exposure) on the use of PPE (respirators included) and engineering controls.

e. Ensure work is performed in strict accordance with specifications at all times.

f. Control work to prevent hazardous exposure to human beings and to the environment at all times.

g. Supervise final cleaning of the lead control area.

h. Certify the conditions of the work as called for elsewhere in this specification.

2. Lead Compliance Plan

a. Submit a detailed job-specific plan of the work procedures to be used in the disturbance of lead, LBP/PWL, or MCL. Include in the plan a sketch showing the location, size, and details of lead control areas, critical barriers, physical boundaries, location, and details of decontamination facilities, viewing ports, and mechanical ventilation system. Include a description of equipment and materials, work practices, controls, and job responsibilities for each activity from which lead is emitted. Include in the plan, eating, drinking, smoking, hygiene facilities and sanitary procedures, interface of trades, sequencing of lead-related work, collected wastewater and dust containing lead, air sampling,

respirators, personal protective equipment, and a detailed description of the method of containment of the operation to ensure that lead is not released outside of the lead control area. Include site preparation, cleanup, and clearance procedures. Include occupational and environmental sampling, training and strategy, sampling and analysis strategy and methodology, frequency of sampling, duration of sampling, and qualifications of sampling personnel in the air sampling portion of the plan. Include a description of arrangements made among contractors on multi-contractor worksites to inform affected employees and to clarify responsibilities to control exposures.

3. Occupational and Environmental Assessment Data Report

a. If initial monitoring is necessary, submit occupational and environmental sampling results to the Contracting Officer within three working days of collection, signed by the testing laboratory employee performing the analysis, the employee that performed the sampling, and the CP.

b. In order to reduce the full implementation of 29 CFR 1926.62 the Contractor must provide documentation. Submit a report that supports the determination to reduce full implementation of the requirements of 29 CFR 1926.62 and supporting Lead Compliance Plan.

i. The initial monitoring must represent each job classification, or if working conditions are similar to previous jobs by the same employer, provide previously collected exposure data that can be used to estimate worker exposures per 29 CFR 1926.62. The data must represent the worker's regular daily exposure to lead for stated work.

ii. Submit worker exposure data gathered during the task-based trigger operations of 29 CFR 1926.62 with a complete process description. This may include manual demolition, manual scraping, manual sanding, heat gun, power tool cleaning, rivet busting, cleanup of dry expendable abrasives, abrasive blast enclosure removal, abrasive blasting, welding, cutting, and torch burning where lead-containing coatings are present.

iii. The initial assessment must determine the requirement for further monitoring and the need to fully implement the control and protective requirements including the lead compliance plan per 29 CFR 1926.62.

4. Medical Examinations

a. Submit pre-work blood lead levels and post-work blood lead levels for all workers performing lead activities during the execution of the work. Initial medical surveillance as required by 29 CFR 1926.62 must be made available to all employees exposed to lead at any time (one day) above the action level. Full medical surveillance must be made available to all employees on an annual basis who are or may be exposed to lead in excess of the action level for more than 30 days a year or as required by 29 CFR 1926.62. Adequate records must show that employees meet the medical surveillance requirements of 29 CFR 1926.33, 29 CFR 1926.62, and 29 CFR 1926.103. Provide medical surveillance to all personnel exposed to lead as indicated in 29 CFR 1926.62. Maintain complete and accurate medical records of employees for the duration of employment plus 30 years.

5. Training

a. Train each employee performing work that disturbs lead, who performs LBP/MCL/PWL disposal, and air sampling operations prior to the time of initial job assignment and annually thereafter, in accordance with 29 CFR 1926.21 and 29 CFR 1926.62.

b. Additional training related to health, safety, and environmental issues may be required, and it is the responsibility of the CPIH/CIH to identify those additional issues and to recommend training to the Contractor as necessary to ensure compliance with applicable regulations.

6. Respiratory Protection Program

a. Establish and implement a respirator program as required by 29 CFR 1926.103, 29 CFR 1926.62, and 29 CFR 1926.55. Submit a written description of the program to the COR. Submit a written program manual or operating procedure including methods of compliance with regulatory statutes.

7. Hazard Communication Program

a. Adhere to all parts of 29 CFR 1926.59 and provide the Contracting Officer with a copy of the Safety Data Sheets (SDS) for all materials brought to the site.

8. Lead Waste Management Plan

a. The Lead Waste Management Plan must comply with applicable requirements of federal, state, and local hazardous waste regulations and address:

i. Identification and classification of wastes associated with the work.

ii. Estimated quantities of wastes to be generated and disposed of.

iii. Names and qualifications of each contractor that will be transporting, storing, treating, and disposing of the wastes. Include the facility location and operator and a 24-hour point of contact. Furnish two copies of USEPA hazardous waste manifests and USEPA Identification numbers if they are required due to generation of hazardous wastes.

iv. Names and qualifications (experience and training) of personnel who will be working on-site with hazardous wastes.

v. List of waste handling equipment to be used in performing the work, to include cleaning, volume reduction, and transport equipment.

vi. Spill prevention, containment, and cleanup contingency measures including a health and safety plan to be implemented in accordance with 29 CFR 1926.65.

vii. Work plan and schedule for waste containment, removal, and disposal. Proper containment of the waste includes using acceptable waste containers (e.g., 55-gallon drums) as well as proper marking/labeling of the containers. Clean up and containerize wastes daily.

viii. Include any process that may alter or treat waste rendering a hazardous waste non-hazardous. Treatment of wastes must be performed at a facility permitted to treat hazardous wastes. Treatment of wastes at the project site is prohibited.

ix. Unit cost for hazardous waste disposal according to this plan.

9. Environmental, Safety and Health Compliance

   a. In addition to the detailed requirements of this specification, comply with laws, ordinances, rules, and regulations of federal, state, and local authorities regarding lead. Comply with the applicable requirements of the current issue of 29 CFR 1926.62. Submit matters regarding interpretation of standards to the COR for resolution before starting work. Where specification requirements and the referenced documents vary, the most stringent requirements apply.

F. Pressure Differential Recordings for Local Exhaust System

1. Provide a local exhaust system that creates a negative pressure of at least 0.02 inches of water relative to the pressure external to the enclosure and operate it continuously, 24-hours a day, until the temporary enclosure of the lead control area is removed. Submit pressure differential recordings for each workday to the CPIH/CIH for review and to the VPIH/CIH and COR within 24-hours from the end of each workday.

G. Licenses, Permits and Notifications

1. Certify and submit in writing to the COR at least 3 days prior to the commencement of work that licenses, permits, and notifications have been obtained. All associated fees or costs incurred in obtaining the licenses, permits and notifications shall be borne by the Contractor.

H. Occupant Protection Plan

1. The Contractor must develop and implement an Occupant Protection Plan describing the measures and management procedures to be taken during lead hazard abatement activities to protect the building occupants/building

facilities and the outside environment from exposure to any lead contamination while lead activities are performed.

I. Pre-Construction Conference

1. After the pre-construction submittals have been reviewed and approved, a pre-construction meeting shall be held with the following parties in attendance at a minimum: the General Contractor, any Sub-Contractor(s) and their Competent Person(s) who will disturb lead-containing materials during the work, other interested Sub-Contractors, the Contractor's Professional Industrial Hygienist (CPIH/CIH), the Industrial Hygiene Technician, the VA Certified Industrial Hygienist (VPIH/CIH), and the COR. The goals of the pre-construction meeting are to discuss the planned scope, phasing, and overall coordination and execution of the lead-related work; to verify that the approved pre-construction submittals are still valid; to identify any potential issues with the project scope, timing, or planning as it relates to the lead-related scope of work, and to ensure agreement among the parties prior to commencing work. The pre-construction meeting minutes and sign in sheet must be submitted to the COR within 5 days after the completion of the pre-construction meeting.

2. No work shall commence until the pre-construction submittals have been approved, a pre-construction meeting held, and a written authorization to proceed with the work is provided by the VA Professional Industrial Hygienist (VPIH/CIH) and the COR.

1.8.EQUIPMENT

A. Respirators

1. Furnish appropriate respirators approved by the National Institute for Occupational Safety and Health (NIOSH),

Department of Health and Human Services, for use in atmospheres containing lead dust, fume, and mist. Respirators must comply with the requirements of 29 CFR 1926.62.

B. Special Protective Clothing

1. Personnel exposed to lead contaminated dust must wear proper disposable protective whole-body clothing, head covering, gloves, eye, and foot coverings as required by 29 CFR 1926.62. Furnish proper disposable plastic or rubber gloves to protect hands. Reduce the level of personnel protection only after obtaining written approval from the CPIH/CIH and the CP.

C. Rental Equipment Notification

1. If rental equipment is to be used during PWL or MCL handling and disposal, notify the rental agency in writing concerning the intended use of the equipment.

D. Vacuum Filters

1. UL 586 labeled HEPA filters.

E. Equipment for VA Personnel

1. Furnish the COR with 2 complete sets of personal protective equipment (PPE) daily, as required herein, for entry into and inspection of the lead removal work within the lead control area. Personal protective equipment must include disposable whole body covering, including appropriate foot, head, eye, and hand protection. PPE remains the property of the Contractor. The VA will provide respiratory protection for the COR.

F. Abrasive Removal Equipment

1. The use of powered machines for vibrating, sanding, grinding, or abrasive blasting is prohibited unless equipped with local exhaust ventilation systems equipped with high efficiency particulate air (HEPA) filters.

G. Negative Air Pressure System

1. Minimum Requirements

a. Do not proceed with work in the area until containment is set up and HEPA filtration systems are in place. The negative air pressure system must meet the requirements of ASSP Z9.2 including approved HEPA filters in accordance with UL 586. Negative air pressure equipment must be equipped with new HEPA filters and be sufficient to maintain a minimum pressure differential of minus 0.02 inch of water column relative to adjacent, unsealed areas. Negative air pressure system minimum requirements are listed as follows:

i. The unit must be capable of delivering its rated volume of air with a clean first stage filter, an intermediate filter, and a primary HEPA filter in place.

ii. The HEPA filter must be certified as being capable of trapping and retaining mono-disperse particles as small as 0.3 micrometers at a minimum efficiency of 99.97 percent.

iii. The unit must be capable of continuing to deliver no less than 70 percent of rated capacity when the HEPA filter is 70 percent full or measures 2.5 inches of water static pressure differential on a magnehelic gauge.

iv. Equip the unit with a manometer-type negative pressure differential monitor with minor scale division of 0.02 inch of water and accuracy within plus or minus 1.0 percent. The manometer must be calibrated daily as recommended by the manufacturer.

v. Equip the unit with a means for the operator to easily interpret the readings in terms of the volumetric flow rate of air per minute moving through the machine at any given moment.

vi. Equip the unit with an electronic mechanism that automatically shuts the machine off in the event of a filter breach or absence of a filter.

vii. Equip the unit with an audible horn that sounds an alarm when the machine has shut itself off.

viii. Equip the unit with an automatic safety mechanism that prevents a worker from improperly inserting the main HEPA filter.

2. Auxiliary Generator

a. Provide an auxiliary generator with capacity to power a minimum of 50 percent of the negative air machines at any time during the work. When power fails, the generator controls must automatically start the generator and switch the negative air pressure system machines to generator power. The generator must not present a carbon monoxide hazard to workers or building occupants.

H. Vacuum Systems

1. Vacuum systems must be suitably sized for the project, and filters must be capable of trapping and retaining all mono-disperse particles as small as 0.3 micrometers (mean aerodynamic diameter) at a minimum efficiency of 99.97

percent. Properly dispose of used filters that are being replaced.

I. Heat Blower Guns

1. Heat blower guns must be flameless, electrical, paint-softener type with controls to limit temperature to 1,100 degrees F. Heat blower must be (grounded) 120 volts ac, and must be equipped with cone, fan, glass protector and spoon reflector nozzles.

1.9. PROJECT/SITE CONDITIONS

A. Protection of Existing Work to Remain

1. Perform work without damage or contamination of adjacent areas. Where existing work is damaged or contaminated, restore work to its original condition at no additional cost to the VA.

1.10. WARRANTY

A. Construction Warranty: FAR clause 52.246 21, "Warranty of Construction".

PART 2 – PRODUCTS

2.1. MATERIALS AND EQUIPMENT

A. Keep materials and equipment needed to complete the project available and on the site. Submit a description of the materials and equipment required; including Safety Data Sheets (SDSs) and manufacturer's instructions for use for materials brought onsite to perform the work.

B. Expendable Supplies

1. Submit a description of the expendable supplies required.

2. Polyethylene Bags

a. Disposable bags must be polyethylene plastic and be a minimum of 6-mils thick (4 mils thick if double bags are used) or any other thick plastic material shown to demonstrate at least equivalent performance; and capable of being made leak-tight. Leak-tight means that solids, liquids, or dust cannot escape or spill out.

3. Polyethylene Leak-tight Wrapping

a. Wrapping used to wrap lead contaminated debris must be polyethylene plastic that is a minimum of 6-mils thick or any other thick plastic material shown to demonstrate at least equivalent performance.

4. Polyethylene Sheeting

a. Sheeting must be polyethylene plastic with a minimum thickness of 6-mil, or any other thick plastic material shown to demonstrate at least equivalent performance; and be provided in the largest sheet size reasonably accommodated by the project to minimize the number of seams. Where the project location constitutes an out of the ordinary potential for fire, or where unusual fire hazards cannot be eliminated, provide flame-resistant polyethylene sheets which conform to the requirements of NFPA 701.

5. Tape and Adhesive Spray

a. Tape and adhesive must be capable of sealing joints between polyethylene sheets and for attachment of polyethylene sheets to adjacent surfaces. After dry application, tape or adhesive must retain adhesion when exposed to wet conditions, including amended water. Tape must be minimum 2 inches wide, industrial strength.

6. Containers

a. When used, containers must be leak-tight and be labeled in accordance with EPA, DOT, and OSHA standards.

7. Chemical Paint Strippers

a. Chemical paint strippers must be bio-degradable, capable of removing existing paint layers in one application, be formulated to prevent stain, discoloration, or raising of the substrate materials, and must be acceptable to the COR.

8. Chemical Paint Stripper Neutralizer

a. Neutralizers for paint strippers must be compatible with the substrate and suitable for use with the chemical stripper that has been applied to the surface.

9. Detergents and Cleaners

a. Detergents or cleaning agents must not contain trisodium phosphate and have demonstrated effectiveness in lead control work using cleaning techniques specified by HUD 6780 guidelines.

PART 3 – EXECUTION

3.1. PREPARATION

A. Protection

1. Notification

a. Notify the COR a minimum of 3 days prior to the start of any lead work.

2. Lead Control Area

a. Physical Boundary - Provide physical boundaries around the lead control area by providing curtains, portable partitions, or other enclosures to ensure that lead will

not escape outside of the lead control area. Prohibit the general public from accessing the lead control areas.

b. Warning Signs - Provide warning signs at approaches to lead control areas. Locate signs at such a distance that personnel may read the sign and take the necessary precautions before entering the area. Signs must comply with the requirements of 29 CFR 1926.62.

3. Furnishings

a. The VA will remove moveable furniture and equipment from the work areas before lead work begins.

b. Fixed furniture and equipment will remain in the lead control area. Protect and cover furnishings that remain in the lead control area.

4. Heating, Ventilating and Air Conditioning (HVAC) Systems

a. Shut down, lock out, and isolate HVAC systems that supply, exhaust, or pass through the lead control areas. Seal intake and exhaust vents in the lead control area with 6-mil plastic sheet and tape. Seal seams in HVAC components that pass through the lead control area. Provide temporary HVAC system for areas in which HVAC has been shut down outside the lead control area.

5. Local Exhaust System

a. Provide a local exhaust system in the lead control area in accordance with ASSP Z9.2 and 29 CFR 1926.62 that will provide at least 4 air changes per hour inside of the negative pressure enclosure. Local exhaust equipment must be operated 24-hours per day, until the lead control area is removed and must be leak proof to the filter and equipped with HEPA filters. Maintain a minimum pressure differential in the lead control area of minus 0.02 inch

of water column relative to adjacent, unsealed areas. Provide continuous 24-hour per day monitoring of the pressure differential with a pressure differential automatic recording instrument. The building ventilation system must not be used as the local exhaust system for the lead control area. Filters on exhaust equipment must conform to ASSP Z9.2 and UL 586. Terminate the local exhaust system out of doors a minimum of 30 feet from building make-up air, doors, open windows, patients, visitors, and staff unless the COR allows an alternate arrangement.

6. Negative Air Pressure System Containment

a. Operate the negative air pressure systems to provide at least 4 air changes per hour inside the containment. Operate the local exhaust unit equipment continuously until the containment is removed. Smoke test the negative air pressure system for leaks at the beginning of each shift. The certified supervisor is responsible to continuously monitor and keep a pressure differential log with an automatic manometric recording instrument. Notify the COR immediately if the pressure differential falls below the prescribed minimum. Submit the continuously monitored pressure differential log, as specified. Do not use the building ventilation system as the local exhaust system. Terminate the local exhaust system out of doors a minimum of 30 feet from building make-up air, doors, open windows, patients, visitors, and staff unless the COR allows an alternate arrangement. All filters must be new at the beginning of the project and be periodically changed as necessary to maintain specified pressure differential and disposed of as lead contaminated waste.

b. Discontinuing Negative Air Pressure System. Operate the negative air pressure system continuously during lead activities unless otherwise authorized by the COR. At the completion of the project, units must be run until full cleanup has been completed and final clearance testing requirements have been met. Dismantling of the negative air pressure systems must be as presented in the Lead Compliance Plan. Seal the HEPA filter machine intakes with polyethylene to prevent environmental contamination.

7. Decontamination Shower Facility

a. Provide clean and contaminated change rooms and shower facilities in accordance with this specification and 29 CFR 1926.62.

8. Eye Wash Station

a. Provide suitable facilities within the work area for quick drenching or flushing of the eyes where eyes may be exposed to injurious corrosive materials.

9. Mechanical Ventilation System

a. Use adequate ventilation to control personnel exposure to lead in accordance with 29 CFR 1926.62. To the extent feasible, use local exhaust ventilation or other collection systems, approved by the CPIH/CIH and CP. Evaluate and maintain local exhaust ventilation systems in accordance with 29 CFR 1926.62.

b. Local exhaust must be equipped with HEPA filtration and must discharge out of doors a minimum of 30 feet from building make-up air, doors, open windows, patients, visitors, and staff unless the COR allows an alternate arrangement.

c. Use locally exhausted, power actuated tools or manual hand tools equipped with HEPA-filtered dust collection systems.

10. Personnel Protection

a. Personnel must wear and use protective clothing and equipment as specified herein. Eating, smoking, or drinking or application of cosmetics is not permitted in the lead control area. No one will be permitted in the lead control area unless they have been appropriately trained and provided with protective equipment.

3.2.ERECTION

A. Lead Control Area Requirements

1. Full containment - Contain removal operations using a negative pressure enclosure system with decontamination facilities and with HEPA filtered exhaust. For containment areas larger than 1,000 square feet install a minimum of two 18-inch square viewing ports. Locate ports to provide a view of the required work from the exterior of the enclosed contaminated area. Glaze ports with laminated safety glass.

2. If the regulated area is adjacent to, or within view of an occupied area, provide a visual barrier of 6-mil opaque fire-retardant poly to prevent building occupant observation. If the adjacent area is accessible to the public, the barrier must be solid and capable of withstanding the negative pressure.

3.3.APPLICATION

A. Lead Work

1. Perform lead work in accordance with approved Lead Compliance Plan. Use procedures and equipment required to limit occupational exposure and environmental contamination

with lead when the work is performed in accordance with 29 CFR 1926.62 and as specified herein. Dispose of all PWL or MCL and associated waste in compliance with federal, state, and local requirements.

B. Paint with Lead or Material Containing Lead Removal

1. Manual or power sanding or grinding of lead surfaces or materials is not permitted unless tools are equipped with HEPA attachments or wet methods. The dry sanding or grinding of surfaces that contain lead is prohibited. Provide methodology for removing lead in the Lead Compliance Plan. Select lead removal processes to minimize the potential of contamination of work areas outside the control area with lead contaminated dust or other lead contaminated debris or waste and to ensure that unprotected personnel are not exposed to hazardous concentrations of lead. Describe this removal process in the Lead Compliance Plan.

2. Avoid flash rusting and/or other deterioration of the substrate. Provide surface preparations for painting in accordance with SECTION 09 91 00 - PAINTING.

3. Paint with Lead or Material Containing Lead - Indoor Removal

   a. Perform manual or mechanical removal and thermal cutting in the lead control areas using enclosures, barriers or containments and powered locally exhausted tools equipped with HEPA filters. Collect residue and debris for disposal in accordance with federal, state, and local requirements.

4. Paint with Lead or Material Containing Lead - Outdoor Removal

   a. Perform outdoor removal as indicated in federal, state, and local regulations and in the Lead Compliance Plan.

The worksite preparation (barriers or containments) must be job dependent and presented in the Lead Compliance Plan.

C. Personnel Exiting Procedures

1. Whenever personnel exit the lead control area, they must perform the following procedures and must not leave the workplace wearing any clothing or equipment worn in the control area:

a. Vacuum all clothing before entering the contaminated change room.

b. Remove protective clothing in the contaminated change room and place them in an approved impermeable disposal bag.

c. Shower.

d. Change to clean clothes prior to leaving the clean clothes storage area.

3.4. FIELD QUALITY CONTROL

A. Tests

1. Air and Wipe Sampling

a. Conduct sampling for lead in accordance with 29 CFR 1926.62 and as specified herein. Air and wipe sampling must be performed by the CPIH/CIH and/or the VPIH/CIH.

i. The CP must be on the job site to observe the air and wipe sampling and inspect the PWL or MCL removal work to ensure that the requirements of the contract have been satisfied during the entire PWL or MCL operation.

ii. Collect personal air samples on employees who are anticipated to have the greatest risk of exposure as determined by the CPIH/CIH and CP. In addition, collect air samples on at least twenty-five percent of the work crew or a minimum of two employees, whichever is greater, during each work shift.

iii. Submit results of air samples, signed by the CPIH/CIH and CP, within 72-hours after the air samples are taken.

iv. Conduct area air sampling daily on each shift in which lead removal operations are performed at the following rates: a minimum of 2 inside the lead control area; a minimum of 2 outside the lead control area; or in a manner sufficient to ensure personnel are not exposed at or above 30 micrograms of lead per cubic meter of air. At no point shall lead in air concentrations exceed background levels outside of the lead control area. If 30 micrograms of lead per cubic meter of air is reached or exceeded within the lead control area or exceeds background levels outside of the lead control area, stop work and correct the conditions(s) causing the increased levels. Notify the COR immediately. Determine if condition(s) require any further change in work methods. Resume removal work only after the CP and the COR give approval.

v. Before any work begins, collect and analyze baseline wipe and soil samples in accordance with methods defined by federal, state, and local standards inside and outside of the physical boundary to assess the degree of dust contamination in the facility prior to

lead disturbance or removal. Provide Initial Sample Results to the COR before work begins.

vi. Surface Wipe Samples - Collect surface wipe samples on floors at a location no greater than 10 feet outside the lead control area at a frequency of once per day while lead removal work is conducted in occupied buildings. Surface wipe samples or Micro Vacuum surface sample results must meet criteria in paragraph CLEARANCE CERTIFICATION.

2. Sampling After Removal

a. The VPIH/CIH must conduct a final visual inspection after the lead work is completed and collect wipe and soil samples according to the HUD protocol contained in HUD 6780 to determine the lead content of settled dust in micrograms per square meter foot of surface area and parts per million (ppm) for soil.

3. Testing of Material Containing Lead Residue

a. Test all lead-containing waste stream(s) in accordance with 40 CFR 261 to determine if the waste stream(s) are classified as a hazardous waste.

3.5.CLEANING AND DISPOSAL

A. Cleanup

1. Maintain surfaces of the lead control area free of accumulations of dust and debris. Restrict the spread of dust and debris; keep waste from being distributed over the work area. Do not dry sweep or use pressurized air to clean up the area. At the end of each shift and when the lead operation has been completed, clean the controlled area of all visible contamination by vacuuming with a HEPA filtered vacuum cleaner, wet mopping the area and wet wiping the area

as indicated by the Lead Compliance Plan. Reclean areas showing dust or debris. After visible dust and debris is removed, wet wipe and HEPA vacuum all surfaces in the controlled area. If adjacent areas become contaminated at any time during the work, clean, visually inspect, and then wipe sample all contaminated areas. The CPIH/CIH and the CP must then certify in writing that the area has been cleaned of lead contamination before clearance testing.

2. Clearance Certification

a. The CPIH/CIH and the CP must certify in writing that air samples collected outside the lead control area during lead removal operations remained less than background levels; the respiratory protection used for the employees was adequate; the work procedures were performed in accordance with 29 CFR 1926.62; and that there were no visible accumulations of material and dust containing lead left in the lead control areas in addition to the Certificate of Completion found in Attachment #1 of this section. Do not remove the lead control area or physical boundary and warning signs prior to receiving written authorization from the COR.

b. The VPIH/CIH must certify surface wipe sample results collected inside the lead control area are less than 10 micrograms of lead per square foot.

c. The VPIH/CIH must certify surface wipe samples collected outside of the lead control area are not significantly greater than the initial surface loading determined prior to work.

d. For exterior work, soil samples taken at the exterior of the work site must be used to determine if soil lead levels have increased at a statistically significant

level (significant at the 95 percent confidence limit) from the soil lead levels prior to the operation. If soil lead levels either show a statistically significant increase above soil lead levels prior to work or soil lead levels above any applicable federal or state standard for lead, the soil must be remediated.

B. Disposal

1. Dispose of material, whether hazardous or non-hazardous in accordance with all laws and provisions and all federal, state, or local regulations. Ensure all waste is properly characterized. The result of each waste characterization (TCLP for RCRA materials) will dictate disposal requirements.

2. Contractor is responsible for segregation of waste. Collect lead contaminated waste, scrap, debris, bags, containers, equipment, and lead contaminated clothing that may produce airborne concentrations of lead particles. Label the containers in accordance with 29 CFR 1926.62, 40 CFR 261, and 40 CFR 262 and corresponding state regulations.

3. Dispose of lead contaminated material classified as hazardous waste at an EPA approved hazardous waste treatment, storage, or disposal facility off VA property. Lead-containing wastes which are not classified as hazardous wastes may be disposed of in accordance with SECTION 02 41 00 - SELECTIVE DEMOLITION.

4. Accumulate waste materials in U.S. Department of Transportation (49 CFR 178) approved 55-gallon drums or appropriately sized container for smaller volumes. Properly label each drum to identify the type of hazardous material (49 CFR 172). For hazardous waste, the collection container requires marking/labeling in accordance with 40 CFR 262 and

corresponding state regulations during the accumulation/collection timeframe. The COR will assign an area for accumulation of waste containers. Coordinate authorized accumulation volumes and time limits with the COR.

5. Handle, store, transport, and dispose lead or lead-contaminated waste in accordance with 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, and 40 CFR 265. Comply with land disposal restriction notification requirements as required by 40 CFR 268.

6. All lead waste generation, management, and disposal will be coordinated with the COR.

7. Disposal Documentation

   a. Coordinate all disposal or off-site shipments of lead waste with the COR. Submit written evidence of TSD approval to demonstrate the hazardous waste treatment, storage, or disposal facility (TSD) is approved for lead disposal by the EPA, state, or local regulatory agencies. Submit one copy of the completed hazardous waste manifest, signed, and dated by the initial transporter in accordance with 40 CFR 262. Provide a certificate that the waste was accepted by the disposal facility.

8. Payment for Hazardous Waste

   a. Payment for disposal of hazardous and non-hazardous waste will not be made until a signed copy of the manifest from the treatment or disposal facility is received and approved by the COR. The manifest must detail and certify the quantity of lead-containing materials or non-hazardous waste delivered to the treatment or disposal facility.

ATTACHMENT #1

CERTIFICATE OF COMPLETION

DATE: _____ VA Project#: 402-22-700

PROJECT NAME: Electronic Health Records Modernization (EHRM) Infrastructure Upgrades

CONTRACTOR/SUB-CONTRACTOR: _____

VAMC/ADDRESS: Togus, ME

1. I certify that I have personally inspected, monitored and supervised the lead-related work of (specify regulated area or Building) which took place from / / to / / .
2. That throughout the work all applicable requirements/regulations and the VA's specifications were met.
3. That any person who entered the control area was protected with the appropriate personal protective equipment and respirator and that they followed the proper entry and exit procedures and the proper operating procedures for the duration of the work.
4. That all employees of the Contractor/Sub-Contractor engaged in this work were trained in respiratory protection, were experienced with lead-related work, had proper medical surveillance documentation, were fit-tested for their respirator, and were not exposed at any time during the work to lead without the benefit of appropriate respiratory protection.
5. That I performed and supervised all inspection and testing specified and required by applicable regulations and VA specifications.
6. That the conditions inside the control area were always maintained in a safe and healthy condition and the maximum

airborne concentrations of lead never exceeded 50 µg/m3, except as described below.

7. That all lead-related work was done in accordance with OSHA requirements and the manufacturer's recommendations.

CPIH/CIH Signature/Date: _____

CPIH/CIH Print Name: _____

Contractor/Sub-Contractor Signature/Date: _____

Contractor/Sub-Contractor Print Name: _____

ATTACHMENT #2

CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

DATE: _____ VA Project#: 402-22-700

PROJECT NAME: Electronic Health Records Modernization (EHRM) Infrastructure Upgrades

CONTRACTOR/SUB-CONTRACTOR: _____

VAMC/ADDRESS: Togus, Maine

WORKING WITH LEAD CAN BE HAZARDOUS TO YOUR HEALTH. INHALING LEAD HAS BEEN LINKED TO VARIOUS ADVERSE HEALTH CONDITIONS.

Your employer's contract with the owner for the above project requires that: You must be supplied with the proper personal protective equipment including an adequate respirator and be trained in its use. You must be trained in safe and healthy work practices and in the use of typical equipment used for lead-related work. You must receive/have a current medical examination for working with lead. These things shall be provided at no cost to you. By signing this certificate of worker’s acknowledgement, you are indicating to the owner that your employer has met these obligations.

RESPIRATORY PROTECTION: I have been trained in the proper use of respirators and have been informed of the type of respirator to be used on the above indicated project. I have a copy of the written Respiratory Protection Program issued by my employer. I have been provided for my exclusive use, at no cost, with a respirator to be used on the above indicated project.

TRAINING COURSE: I have been trained by my employer or a third-party training provider on the requirements contained in 29 CFR 1926.62 and was issued a certificate of training completion. The topics covered in the course include, as a minimum, the following:

1. The content of 29 CFR 1926.62 and its appendices;

2. The specific nature of the operations which could result in exposure to lead above the action level;

3. The purpose, proper selection, fitting, use, and limitations of respirators;

4. The purpose and a description of the medical surveillance program, and the medical removal protection program including information concerning the adverse health effects associated with excessive exposure to lead (with particular attention to the adverse reproductive effects on both males and females and hazards to the fetus and additional precautions for employees who are pregnant);

5. The engineering controls and work practices associated with the employee's job assignment including training of employees to follow relevant good work practices described in Appendix B of 29 CFR 1926.62;

6. The contents of any compliance plan in effect;

7. Instructions to employees that chelating agents should not routinely be used to remove lead from their bodies and should not be used at all except under the direction of a licensed physician; and

8. The employee's right of access to records under 29 CFR 1910.20

MEDICAL EXAMINATION: I have had a medical examination within the past 12 months which was paid for by my employer. The physician issued a positive written opinion after the examination.

Signature: _____

Printed Name: _____

Social Security Number: _____

Witness: _____

ATTACHMENT #3

AFFIDAVIT OF MEDICAL SURVEILLANCE, RESPIRATORY PROTECTION AND TRAINING/ACCREDITATION

DATE: _____ VA Project#: 402-22-700

PROJECT NAME: Electronic Health Records Modernization (EHRM) Infrastructure Upgrades

CONTRACTOR/SUB-CONTRACTOR: _____

VAMC/ADDRESS: Togus, ME

1. I verify that the following individual

Name:

Social Security Number:

who is proposed to be employed in lead-related work associated with the above project by the named Contractor/Sub-Contractor, is included in a medical surveillance program in accordance with 29 CFR 1926.62(j), and that complete records of the medical surveillance program as required by 29 CFR 1926.62(n) and 29 CFR 1910.20 are kept at the offices of the Contractor/Sub-Contractor at the following address:

Address:

2. I verify that this individual has been trained, fit-tested and instructed in the use of all appropriate respiratory protection systems and that the person is capable of working in safe and healthy manner as expected and required in the expected work environment of this project.

3. I verify that this individual has been trained as required by 29 CFR 1926.26(l). This individual has also obtained a valid certificate of training. Documentation will be kept on-site.

4. I verify that I meet the minimum qualifications criteria of the VA specifications for a CPIH.

Signature of CPIH/CIH: _____

Date: _____

Printed Name of CPIH/CIH: _____

Signature of Contractor/Sub-Contractor: _____

Date: _____

Printed Name of Contractor/Sub-Contractor: _____

ATTACHMENT #4

CONTRACTOR/COMPETENT PERSON(S) REVIEW AND ACCEPTANCE OF THE VA'S LEAD SPECIFICATIONS

DATE: _____ VA Project#: 402-22-700

PROJECT NAME: Electronic Health Records Modernization (EHRM) Infrastructure Upgrades

CONTRACTOR/SUB-CONTRACTOR: _____

VAMC/ADDRESS: Togus, Maine.

1. This form shall be signed by the Contractor/Sub-Contractor, VA and the Contractor/Sub-Contractor Competent Person(s) prior to any start of work at the VA related to this Specification. If the Contractor/Sub-Contractor's Competent Person(s) has not signed this form, they shall not be allowed to work on-site.

2. 2 I, the undersigned, have read VA's Lead Specification regarding the lead-related work requirements. I understand the requirements of the VA's Lead Specification and agree to follow these requirements as well as all required rules and regulations of OSHA/EPA/DOT and State/Local requirements. I have been given ample opportunity to read the VA's Lead Specification and have been given an opportunity to ask any questions regarding the content and have received a response related to those questions. I do not have any further questions regarding the content, intent and requirements of the VA's Lead Specification.

3. 3. At the conclusion of the lead-related work, I will certify that all lead-related work was done in accordance with the VA's Lead Specification and all lead was removed properly.

Contractor/Sub-Contractor Signature: _____

Date: _____

- - - END - - -

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies cast-in-place structural concrete and materials and mixes for other concrete.

1.2 RELATED WORK

A. Section 01 45 29, TESTING LABORATORY SERVICES: Materials testing and inspection during construction.

1.3 TESTING AGENCY FOR CONCRETE MIX DESIGN

A. Testing agency for the trial concrete mix design retained and reimbursed by the Contractor and approved by COR. For all other testing, refer to Section 01 45 29 Testing Laboratory Services.

B. Testing agency maintaining active participation in Program of Cement and Concrete Reference Laboratory (CCRL) of National Institute of Standards and Technology. Accompany request for approval of testing agency with a copy of Report of Latest Inspection of Laboratory Facilities by CCRL.

C. Testing agency shall furnish equipment and qualified technicians to establish proportions of ingredients for concrete mixes.

1.4 TOLERANCES

A. Formwork: ACI 117, except the elevation tolerance of formed surfaces before removal of shores is +0 mm (+0 inch) and -20 mm (-3/4 inch).

B. Reinforcement Fabricating and Placing: ACI 117, except that fabrication tolerance for bar sizes Nos. 10, 13, and 16 (Nos. 3, 4, and 5) (Tolerance Symbol 1 in Fig. 2.1(a), ACI, 117) used as column ties or stirrups is +0 mm (+0 inch) and -13 mm (-1/2 inch) where gross bar length is less than 3600 mm (12 feet), or +0 mm (+0 inch) and -20 mm (-3/4 inch) where gross bar length is 3600 mm (12 feet) or more.

C. Cross-Sectional Dimension: ACI 117, except tolerance for thickness of slabs 12 inches or less is +20 mm (+3/4 inch) and - 6 mm (-1/4 inch). Tolerance of thickness of beams more than 300 mm (12 inch) but less than 900 mm (3 feet) is +20 mm (+3/4 inch) and -10 mm (-3/8 inch).

D. Slab Finishes: ACI 117, Section 4.5.6, F-number method in accordance with ASTM E1155, except as follows:

1. Test entire slab surface, including those areas within 600 mm (2 feet) of construction joints and vertical elements that project through slab surface.
2. Maximum elevation change which may occur within 600 mm (2 feet) of any column or wall element is 6 mm (0.25 inches).
3. Allow sample measurement lines that are perpendicular to construction joints to extend past joint into previous placement no further than 1500 mm (5 feet).

1.5 REGULATORY REQUIREMENTS

A. ACI SP-66 – ACI Detailing Manual.

B. ACI 318 - Building Code Requirements for Reinforced Concrete.

C. ACI 301 – Standard Specifications for Structural Concrete.

1.6 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES. All items indicated below are required submittals requiring Contracting Officer’s Representative (COR) review and approval.

B. Shop Drawings: Reinforcing steel: Complete shop drawings

C. Mill Test Reports:
   1. Reinforcing Steel.
   2. Cement.

D. Manufacturer's Certificates:
   1. Abrasive aggregate.
   2. Lightweight aggregate for structural concrete.
   3. Air-entraining admixture.
   4. Chemical admixtures, including chloride ion content.
   5. Waterproof paper for curing concrete.
   6. Liquid membrane-forming compounds for curing concrete.
   7. Non-shrinking grout.
   8. Liquid hardener.
   9. Waterstops.
   10. Expansion joint filler.
   11. Adhesive binder.

E. Testing Agency for Concrete Mix Design: Approval request including qualifications of principals and technicians and evidence of active participation in program of Cement and Concrete Reference Laboratory (CCRL) of National Institute of Standards and Technology and copy of report of latest CCRL, Inspection of Laboratory.

F. Test Report for Concrete Mix Designs: Trial mixes including water-cement, concrete mix ingredients, and admixtures.

G. Shoring and Reshoring Sequence: Submit for approval a shoring and reshoring sequence for flat slab/flat plate portions, prepared by a registered Professional Engineer. As a minimum, include timing of form stripping, reshoring, number of floors to be re-shored and timing of re-shore removal to serve as an initial outline of procedures subject to modification as construction progresses. Submit revisions to sequence, whether initiated by COR (see FORMWORK) or Contractor.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Conform to ACI 304. Store aggregate separately for each kind or grade, to prevent segregation of sizes and avoid inclusion of dirt and other materials.

B. Deliver cement in original sealed containers bearing name of brand and manufacturer, and marked with net weight of contents. Store in suitable watertight building in which floor is raised at least 300 mm (1 foot) above ground. Store bulk cement in separate suitable bins.

C. Deliver other packaged materials for use in concrete in original sealed containers, plainly marked with manufacturer's name and brand, and protect from damage until used.

1.8 PRE-CONCRETE CONFERENCE

A. General: At least 15 days prior to submittal of design mixes, conduct a meeting to review proposed methods of concrete construction to achieve the required results.

B. Agenda: Includes but is not limited to:

1. Submittals.
2. Coordination of work.
3. Availability of material.
4. Concrete mix design including admixtures.
5. Methods of placing, finishing, and curing.
6. Finish criteria required to obtain required flatness and levelness.
7. Timing of floor finish measurements.
8. Material inspection and testing.

C. Attendees: Include but not limited to representatives of Contractor; subcontractors involved in supplying, conveying, placing, finishing, and curing concrete; lightweight aggregate manufacturer; admixture manufacturers; COR; Consulting Engineer; Department of Veterans Affairs

retained testing laboratories for concrete testing and finish (F-number) verification.

D. Minutes of the meeting: Contractor shall take minutes and type and distribute the minutes to attendees within five days of the meeting.

1.9 MOCK-UP

A. In addition to the other specified samples and tests, construct a mock-up using the materials, reinforcing, forming system and construction methods proposed for use in exposed architectural concrete.

B. Construct the mock-up with at least a 2.5 m by 2.5 m (8 feet by 8 feet) exposed surface and suitable foundations. Include the following where applicable: Control joints, reglets, recesses or other typical architectural details.

C. Before casting the mock-up, submit full detailed Shop Drawings of the mock-up formwork for review by the Architect. Perform all necessary preliminary tests to ensure that concrete used for the mock-up will exactly match the approved sample in color and texture.

D. Perform the surface treatment proposed for use on one or more areas not less than 300 mm by 300 mm (1 foot by 1 foot) on the back side of the mock-up to establish the texture of finish required by the Architect. Repeat as required until a sample satisfactory to the Architect has been obtained.

E. Treat the finished front surface of the mock-up to produce a uniform appearance similar in every respect to the approved sample area.

F. The completed mock-up shall be inspected by the Architect. Failure of the mock-up to match the approved sample will require the construction of further mock-ups until approval is obtained. Remove rejected mock-ups immediately.

G. Maintain the approved mock-ups in good condition at the job site until all architectural concrete surfaces have been completed and approved by the Architect. Remove the mock-up from the site after completion of the above.

1.10 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.

B. American Concrete Institute (ACI):

117-10.....Specifications for Tolerances for Concrete Construction and Materials and Commentary

211.1-91(R2009).....Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete

211.2-98(R2004).....Standard Practice for Selecting Proportions for Structural Lightweight Concrete

214R-11(R2019).....Guide to Evaluation of Strength Test Results of Concrete

301-16.....Specifications for Structural Concrete

304R-00(R2009).....Guide for Measuring, Mixing, Transporting, and Placing Concrete

305.1-14.....Specification for Hot Weather Concreting

306.1-90(R2002).....Standard Specification for Cold Weather Concreting

308.1-11.....Specification for Curing Concrete

309R-05.....Guide for Consolidation of Concrete

318/318-19.....Building Code Requirements for Structural Concrete and Commentary

347R-14.....Guide to Formwork for Concrete

SP-66-04.....ACI Detailing Manual

C. American National Standards Institute and American Hardboard Association (ANSI/AHA):

A135.4-2012.....Basic Hardboard

D. ASTM International (ASTM):

A615/A615M-20.....Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement

A653/A653M-20.....Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process

A706/A706M-16.....Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement

A767/A767M-19.....Standard Specification for Zinc Coated (Galvanized) Steel Bars for Concrete Reinforcement

A775/A775M-19.....Standard Specification for Epoxy Coated Steel Reinforcing Bars

A820/820M-16.....Standard Specification for Steel Fibers for Fiber Reinforced Concrete

A996/A996M-16.....Standard Specification for Rail Steel and Axle Steel Deformed Bars for Concrete Reinforcement

A1064/A1064M-18a.....Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

C31/C31M-19a.....Standard Practice for Making and Curing Concrete Test Specimens in the field

C33/C33M-18.....Standard Specification for Concrete Aggregates

C39/C39M-20.....Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

C94/C94M-19a.....Standard Specification for Ready Mixed Concrete

C143/C143M-20.....Standard Test Method for Slump of Hydraulic Cement Concrete

C150C150M-20.....Standard Specification for Portland Cement

C171-16.....Standard Specification for Sheet Materials for Curing Concrete

C172C172M-17.....Standard Practice for Sampling Freshly Mixed Concrete

C173/C173M-16.....Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method

C192/C192M-19.....Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory

C231/C231M-17a.....Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

C260/C260M-10a(2016)....Standard Specification for Air Entraining Admixtures for Concrete

C309-19.....Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete

C330/C330M-17a.....Standard Specification for Lightweight Aggregates for Structural Concrete

C494/C494M-19.....Standard Specification for Chemical Admixtures for Concrete

C618-19.....Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

C666/C666M-15.....Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing

C881/C881M-20.....Standard Specification for Epoxy Resin Base Bonding Systems for Concrete

C1107/1107M-20.....Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)

C1315-19.....Standard Specification for Liquid Membrane Forming Compounds Having Special Properties for Curing and Sealing Concrete

D6/D6M-95(2018).....Standard Test Method for Loss on Heating of Oil and Asphaltic Compounds

D297-15(2019).....Standard Test Methods for Rubber Products Chemical Analysis

D412—16.....Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension

D1751-18.....Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)

D4263-83(2018).....Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.

E1155-20.....Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers

F1249-20.....Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor

F1869-16a.....Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

E. American Welding Society (AWS):

D1.4/D1.4M-18.....Structural Welding Code – Steel Reinforcing Bars

F. Concrete Reinforcing Steel Institute (CRSI):

Handbook 2008

G. National Cooperative Highway Research Program (NCHRP):

Report On.....Concrete Sealers for the Protection of Bridge Structures

H. U. S. Department of Commerce Product Standard (PS):

PS 1-07.....Structural Plywood

PS 20-20.....American Softwood Lumber Standard

I. U. S. Army Corps of Engineers Handbook for Concrete and Cement:

CRD C513.....Rubber Waterstops

CRD C572.....Polyvinyl Chloride Waterstops

PART 2 - PRODUCTS

2.1 FORMS

A. Wood: PS 20 free from loose knots and suitable to facilitate finishing concrete surface specified; tongue and grooved.

B. Plywood: PS-1 Exterior Grade B-B (concrete-form) 16 mm (5/8 inch), or 20 mm (3/4 inch) thick for unlined contact form. B-B High Density Concrete Form Overlay optional.

C. Metal for Concrete Rib-Type Construction: Steel (removal type) of suitable weight and form to provide required rigidity.

D. Permanent Steel Form for Concrete Slabs: Corrugated, ASTM A653, Grade E, and Galvanized, ASTM A653, G90. Provide venting where insulating concrete fill is used.

E. Corrugated Fiberboard Void Boxes: Double faced, completely impregnated with paraffin and laminated with moisture resistant adhesive, size as shown. Design forms to support not less than 48 KPa (1000 psf) and not lose more than 15 percent of their original strength after being completely submerged in water for 24 hours and then air dried.

F. Form Lining:

1. 1. Hardboard: ANSI/AHA A135.4, Class 2 with one (S1S) smooth side)
2. 2. Plywood: Grade B-B Exterior (concrete-form) not less than 6 mm (1/4 inch) thick.
3. 3. Plastic, fiberglass, or elastomeric capable of reproducing the desired pattern or texture.

G. Concrete products shall comply with following standards for biobased materials:

Material Type	Percent by Weight
Concrete Penetrating Liquid	79 percent biobased material
Concrete form Release Agent	87 percent biobased material
Concrete Sealer	11 percent biobased material

The minimum-content standards are based on the weight (not the volume) of the material.

H. Form Ties: Develop a minimum working strength of 13.35 kN (3000 pounds) when fully assembled. Ties shall be adjustable in length to permit tightening of forms and not have any lugs, cones, washers to act as spreader within form, nor leave a hole larger than 20 mm (3/4 inch) diameter, or a depression in exposed concrete surface, or leave metal closer than 40 mm (1 1/2 inches) to concrete surface. Wire ties not permitted. Cutting ties back from concrete face not permitted.

2.2 MATERIALS

A. Portland Cement: ASTM C150 Type I or II.

B. Fly Ash: ASTM C618, Class C or F including supplementary optional requirements relating to reactive aggregates and alkalies, and loss on ignition (LOI) not to exceed 5 percent. Do not exceed more than 25 percent total cementitious content by weight.

C. Coarse Aggregate: ASTM C33.

1. Size 67 or Size 467 may be used for footings and walls over 300 mm (12 inches) thick.
2. Coarse aggregate for interior slabs on grade shall conform to the following:
   a. Dense or well graded aggregate.
      1) Percent retained on each sieve below the top size and above the No. 100 sieve:
         a) 8 to 18 percent for 1-1/2 inches (38 mm)top size.
         b) 8 to 22 percent for 3/4 or 1 inch (19 or 25 mm) top size.
      2) The above requirements may be deviated from based on locally available material.
         a) One or two non-adjacent sieves sizes may fall outside of the limits set above.
         b) Percent retained on two adjacent sieves sizes shall not be less than 5 percent of the above required.
         c) Percent retained on three adjacent sieve sizes shall not be less than 8 percent of the above required.
         d) When the percent retained on each of two adjacent sieve sizes is less than 8 percent the total percent retained on either of these sieves and the adjacent outside sieve should be at least 13 percent (for example, if both the No. 4 and No. 8 (4.75 and 2.36 mm)sieves have 6 percent retained on each item then: 1. the total retained on the 3/8 inch and No. 4 (9.5 and 4.75 mm) sieves should be at

least 13 percent, and 2. the total retained on the No. 8 and No. 16 (2.36 and 1.18 mm) sieves should be at least 13 percent.

3. Coarse aggregate for applied topping, encasement of steel columns, and metal pan stair fill shall be Size 7.
4. Maximum size of coarse aggregates not more than one-fifth of narrowest dimension between sides of forms, one-third of depth of slabs, nor three-fourth of minimum clear spacing between reinforcing bars.

D. Lightweight Aggregates for Structural Concrete: ASTM C330, Table 1. Maximum size of aggregate not larger than one-fifth of narrowest dimension between forms, nor three-fourth of minimum clear distance between reinforcing bars. Contractor to furnish certified report to verify that aggregate is sound and durable, and has a durability factor of not less than 80 based on 300 cycles of freezing and thawing when tested in accordance with ASTM C666.

E. Fine Aggregate: ASTM C33. Fine aggregate for applied concrete floor topping shall pass a 4.75 mm (No. 4) sieve, 10 percent maximum shall pass a 150 µm (No. 100) sieve.

F. Mixing Water: Fresh, clean, and potable.

G. Admixtures:

1. Water Reducing Admixture: ASTM C494, Type A and not contain more chloride ions than are present in municipal drinking water.
2. Water Reducing, Retarding Admixture: ASTM C494, Type D and not contain more chloride ions than are present in municipal drinking water.
3. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C494, Type F or G, and not contain more chloride ions than are present in municipal drinking water. Use of superplasticizer requires COR approval.
4. Non-Corrosive, Non-Chloride Accelerator: ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. Admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory of at least one year duration using an acceptable accelerated corrosion test method such as that using electrical potential measures.
5. Air Entraining Admixture: ASTM C260.

6. Microsilica: Use only with prior review and acceptance of the COR. Use only in conjunction with high range water reducer.
7. Calcium Nitrite corrosion inhibitor: ASTM C494 Type C.
8. Prohibited Admixtures: Calcium chloride, thiocyanate or admixtures containing more than 0.05 percent chloride ions are not permitted.
9. Certification: Written conformance to the requirements above and the chloride ion content of the admixture prior to mix design review.

H. Vapor Barrier: ASTM F1249, 0.38 mm (15 mil) WVT 0.007 foot/hour.
I. Reinforcing Steel: ASTM A615, or ASTM A996, deformed, grade as shown.
J. Welded Wire Fabric: ASTM A185.

K. Reinforcing Bars to be Welded: ASTM A706.
L. Galvanized Reinforcing Bars: ASTM A767.
M. Epoxy Coated Reinforcing Bars: ASTM A775.

N. Cold Drawn Steel Wire: ASTM A1064.
O. Reinforcement for Metal Pan Stair Fill: 50 mm (2 inch) wire mesh, either hexagonal mesh at .8Kg/m^2 (1.5 pounds per square yard), or square mesh at .6Kg/m^2 (1.17 pounds per square yard).
P. Supports, Spacers, and Chairs: Types which will hold reinforcement in position shown in accordance with requirements of ACI 318 except as specified.
Q. Expansion Joint Filler: ASTM D1751.
R. Sheet Materials for Curing Concrete: ASTM C171.
S. Liquid Membrane-forming Compounds for Curing Concrete: ASTM C309, Type I, with fugitive dye, and shall meet the requirements of ASTM C1315.Compound shall be compatible with scheduled surface treatment, such as paint and resilient tile, and shall not discolor concrete surface.
T. Abrasive Aggregate: Aluminum oxide grains or emery grits.
U. Moisture Vapor Emissions & Alkalinity Control Sealer: 100 percent active colorless aqueous siliconate solution concrete surface.
   1. ASTM C1315 Type 1 Class A, and ASTM C309 Type 1 Class A, penetrating product to have no less than 34 percent solid content, leaving no sheen, volatile organic compound (VOC) content rating as required to suite regulatory requirements. The product shall have at least a five (5) year documented history in controlling moisture vapor

emission from damaging floor covering, compatible with all finish materials.

2. MVE 15-Year Warranty:
   a. When a floor covering is installed on a below grade, on grade, or above grade concrete slab treated with Moisture Vapor Emissions & Alkalinity Control Sealer according to manufacturer's instruction, sealer manufacturer shall warrant the floor covering system against failure due to moisture vapor migration or moisture-born contaminates for a period of fifteen (15) years from the date of original installation. The warranty shall cover all labor and materials needed to replace all floor covering that fails due to moisture vapor emission & moisture born contaminates.

V. Penetrating Sealer: For use on parking garage ramps and decks. High penetration silane sealer providing minimum 95 percent screening per National Cooperative Highway Research Program (NCHRP) No. 244 standards for chloride ion penetration resistance. Requires moist (non-membrane) curing of slab.

W. Non-Shrink Grout:
   1. ASTM C1107, pre-mixed, produce a compressive strength of at least 18 MPa at three days and 35 MPa (5000 psi) at 28 days. Furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95 percent bearing under a 1200 mm x 1200 mm (4 foot by 4 foot) base plate.
   2. Where high fluidity or increased placing time is required, furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95 percent under an 450 mm x 900 mm (18 inch by 36 inch) base plate.

X. Adhesive Binder: ASTM C881.

Y. Waterstops:
   1. Polyvinyl Chloride Waterstop: CRD C572.
   2. Rubber Waterstops: CRD C513.
   3. Bentonite Waterstop: Flexible strip of bentonite 25 mm x 20 mm (1 inch by 3/4 inch), weighing 8.7 kg/m (5.85 pounds per foot) composed of Butyl Rubber Hydrocarbon (ASTM D297), Bentonite (SS-S-210-A) and Volatile Matter (ASTM D6).
   4. Non-Metallic Hydrophilic: Swellable strip type compound of polymer modified chloroprene rubber that swells upon contact with water

shall conform to ASTM D412 as follows: Tensile strength 420 psi minimum; ultimate elongation 600 percent minimum. Hardness shall be 50 minimum on the type A durameter and the volumetric expansion ratio in in 70 deg water shall be 3 to 1 minimum.

Z. Porous Backfill: Crushed stone or gravel graded from 25 mm to 20 mm (1 inch to 3/4 inch).

AA. Fibers:

1. Synthetic Fibers: Monofilament or fibrillated polypropylene fibers for secondary reinforcing of concrete members. Use appropriate length and 0.9 kg/m^3 (1.5 lb. per cubic yard). Product shall have a UL rating.
2. Steel Fibers: ASTM A820, Type I cold drawn, high tensile steel wire for use as primary reinforcing in slab-on-grade. Minimum dosage rate 18 kg/m^3 (30 lb. per cubic yard).

BB. Epoxy Joint Filler: Two component, 100 percent solids compound, with a minimum shore D hardness of 50.

CC. Bonding Admixture: Non-rewettable, polymer modified, bonding compound.

DD. Architectural Concrete: For areas designated as architectural concrete on the Contract Documents, use colored cements and specially selected aggregates as necessary to produce a concrete of a color and finish which exactly matches the designated sample panel.

2.3 CONCRETE MIXES

A. Mix Designs: Proportioned in accordance with Section 5.3, "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318.

1. If trial mixes are used, make a set of at least 6 cylinders in accordance with ASTM C192 for test purposes from each trial mix; test three for compressive strength at 7 days and three at 28 days.
2. Submit a report of results of each test series, include a detailed listing of the proportions of trial mix or mixes, including cement, admixtures, weight of fine and coarse aggregate per m^3 (cubic yard) measured dry rodded and damp loose, specific gravity, fineness modulus, percentage of moisture, air content, water-cement ratio, and consistency of each cylinder in terms of slump.
3. Prepare a curve showing relationship between water-cement ratio at 7-day and 28-day compressive strengths. Plot each curve using at least three specimens.

4. If the field experience method is used, submit complete standard deviation analysis.

B. Fly Ash Testing: Submit certificate verifying conformance with ASTM 618 initially with mix design and for each truck load of fly ash delivered from source. Submit test results performed within 6 months of submittal date. Notify the COR immediately when change in source is anticipated.

1. Testing Laboratory used for fly ash certification/testing shall participate in the Cement and Concrete Reference Laboratory (CCRL) program. Submit most recent CCRL inspection report.

C. After approval of mixes no substitution in material or change in proportions of approval mixes may be made without additional tests and approval of the COR or as specified. Making and testing of preliminary test cylinders may be carried on pending approval of cement, providing Contractor and manufacturer certify that ingredients used in making test cylinders are the same. The COR may allow Contractor to proceed with depositing concrete for certain portions of work, pending final approval of cement and approval of design mix.

D. Cement Factor: Maintain minimum cement factors in Table I regardless of compressive strength developed above minimums. Use Fly Ash as an admixture with maximum of 25 percent replacement by weight in all structural work. Increase this replacement to 40 percent for mass concrete, and reduce it to 10 percent for drilled piers and caissons.

TABLE I - CEMENT AND WATER FACTORS FOR CONCRETE

Concrete Strength		Non-Air-Entrained	Air-Entrained	
Min. 28 Day Comp. Str. MPa (psi)	Min. Cement kg/m3 (lbs/c. yd)	Max. Water Cement Ratio	Min. Cement kg/m3 (lbs/c. yd)	Max. Water Cement Ratio
35 (5000)1,3	375 (630)	0.45	385 (650)	0.40
30 (4000)1,3	325 (550)	0.55	340 (570)	0.50
25 (3000)1,3	280 (470)	0.65	290 (490)	0.55
25 (3000)1,2	300 (500)	See 4 below	310 (520)	See 4 below

1. If trial mixes are used, the proposed mix design shall achieve a compressive strength 8.3 MPa (1200 psi) in excess of f'c. For concrete strengths above 35 Mpa (5000 psi), the proposed mix design shall achieve a compressive strength 9.7 MPa (1400 psi) in excess of f’c.

2. Lightweight Structural Concrete. Pump mixes may require higher cement values.
3. For concrete exposed to high sulfate content soils maximum water cement ratio is 0.44.
4. Determined by Laboratory in accordance with ACI 211.1 for normal concrete or ACI 211.2 for lightweight structural concrete.

E. Maximum Slump: Maximum slump, as determined by ASTM C143 with tolerances as established by ASTM C94, for concrete to be vibrated shall be as shown in Table II.

TABLE II - MAXIMUM SLUMP, MM (INCHES)

Type of Construction	Normal Weight Concrete	Lightweight Structural Concrete
Reinforced Footings and Substructure Walls	75mm (3 inches)	75 mm (3 inches)
Slabs, Beams, Reinforced Walls, and Building Columns	100 mm (4 inches)	100 mm (4 inches)

F. Slump may be increased by the use of the approved high-range water-reducing admixture (superplasticizer). Tolerances as established by ASTM C94. Concrete containing the high-range-water-reducing admixture may have a maximum slump of 225 mm (9 inches). The concrete shall arrive at the job site at a slump of 50 mm to 75 mm (2 inches to 3 inches), and 75 mm to 100 mm (3 inches to 4 inches) for lightweight concrete. This should be verified, and then the high-range-water-reducing admixture added to increase the slump to the approved level.

G. Air-Entrainment: Air-entrainment of normal weight concrete shall conform with Table III. Air-entrainment of lightweight structural concrete shall conform with Table IV. Determine air content by either ASTM C173 or ASTM C231.

TABLE III - TOTAL AIR CONTENT
FOR VARIOUS SIZES OF COARSE AGGREGATES (NORMAL CONCRETE)

Nominal Maximum Size of Total Air Content	Coarse Aggregate, mm (Inches) Percentage by Volume
10 mm (3/8 in).6 to 10	13 mm (1/2 in).5 to 9
20 mm (3/4 in).4 to 8	25 mm (1 in).3-1/2 to 6-1/2
40 mm (1 1/2 in).3 to 6	

TABLE IV
AIR CONTENT OF LIGHTWEIGHT STRUCTURAL CONCRETE

Nominal Maximum size of Total Air Content	Coarse Aggregate, mm's (Inches) Percentage by Volume
Greater than 10 mm (3/8 in) 4 to 8	10 mm (3/8 in) or less 5 to 9

H. High early strength concrete, made with Type III cement or Type I cement plus non-corrosive accelerator, shall have a 7-day compressive strength equal to specified minimum 28-day compressive strength for concrete type specified made with standard Portland cement.

I. Lightweight structural concrete shall not weigh more than air-dry unit weight shown. Air-dry unit weight determined on 150 mm by 300 mm (6 inch by 12 inch) test cylinders after seven days standard moist curing followed by 21 days drying at 23 degrees C ± 1.7 degrees C (73.4 ± 3 degrees Fahrenheit), and 50 (plus or minus 7) percent relative humidity. Use wet unit weight of fresh concrete as basis of control in field.

J. Concrete slabs placed at air temperatures below 10 degrees C (50 degrees Fahrenheit) use non-corrosive, non-chloride accelerator. Concrete required to be air entrained use approved air entraining admixture. Pumped concrete, synthetic fiber concrete, architectural concrete, concrete required to be watertight, and concrete with a water/cement ratio below 0.50 use high-range water-reducing admixture (superplasticizer).

K. Durability: Use air entrainment for exterior exposed concrete subjected to freezing and thawing and other concrete shown or specified. For air content requirements see Table III or Table IV.

L. Enforcing Strength Requirements: Test as specified in Section 01 45 29, TESTING LABORATORY SERVICES, during the progress of the work. Seven-day tests may be used as indicators of 28-day strength. Average of any three 28-day consecutive strength tests of laboratory-cured specimens representing each type of concrete shall be equal to or greater than specified strength. No single test shall be more than 3.5 MPa (500 psi) below specified strength. Interpret field test results in accordance with ACI 214. Should strengths shown by test specimens fall below required values, the COR may require any one or any combination of the following corrective actions, at no additional cost to the Government:

1. Require changes in mix proportions by selecting one of the other appropriate trial mixes or changing proportions, including cement content, of approved trial mix.
2. Require additional curing and protection.
3. If five consecutive tests fall below 95 percent of minimum values given in Table I or if test results are so low as to raise a question as to the safety of the structure, the COR may direct Contractor to take cores from portions of the structure. Use results from cores tested by the Contractor retained testing agency to analyze structure.
4. If strength of core drilled specimens falls below 85 percent of minimum value given in Table I, the COR may order load tests, made by Contractor retained testing agency, on portions of building so affected. Load tests in accordance with ACI 318 and criteria of acceptability of concrete under test as given therein.
5. Concrete work, judged inadequate by structural analysis, by results of load test, or for any reason, shall be reinforced with additional construction or replaced, if directed by the COR.

2.4 BATCHING AND MIXING

A. General: Concrete shall be "Ready-Mixed" and comply with ACI 318 and ASTM C94, except as specified. Batch mixing at the site is permitted. Mixing process and equipment must be approved by the COR. With each batch of concrete, furnish certified delivery tickets listing information in Paragraph 16.1 and 16.2 of ASTM C94. Maximum delivery temperature of concrete is 38 degrees C (100 degrees Fahrenheit). Minimum delivery temperature as follows:

Atmospheric Temperature	Minimum Concrete Temperature
-1. degrees to 4.4 degrees C (30 degrees to 40 degrees F)	15.6 degrees C (60 degrees F.)
-17 degrees C to -1.1 degrees C (0 degrees to 30 degrees F.)	21 degrees C (70 degrees F.)

1. Services of aggregate manufacturer's representative shall be furnished during the design of trial mixes and as requested by the COR for consultation during batching, mixing, and placing operations of lightweight structural concrete. Services will be required until field controls indicate that concrete of required quality is being furnished. Representative shall be thoroughly familiar with the

structural lightweight aggregate, adjustment and control of mixes to produce concrete of required quality. Representative shall assist and advise the COR.

PART 3 – EXECUTION

3.1 FORMWORK

A. General: Design in accordance with ACI 347 is the responsibility of the Contractor. The Contractor shall retain a registered Professional Engineer to design the formwork, shores, and reshores.
   1. Form boards and plywood forms may be reused for contact surfaces of exposed concrete only if thoroughly cleaned, patched, and repaired and the COR approves their reuse.
   2. Provide forms for concrete footings unless the COR determines forms are not necessary.
   3. Corrugated fiberboard forms: Place forms on a smooth firm bed, set tight, with no buckled cartons to prevent horizontal displacement, and in a dry condition when concrete is placed.

B. Treating and Wetting: Treat or wet contact forms as follows:
   1. Coat plywood and board forms with non-staining form sealer. In hot weather, cool forms by wetting with cool water just before concrete is placed.
   2. Clean and coat removable metal forms with light form oil before reinforcement is placed. In hot weather, cool metal forms by thoroughly wetting with water just before placing concrete.
   3. Use sealer on reused plywood forms as specified for new material.

C. Size and Spacing of Studs: Size and space studs, wales and other framing members for wall forms so as not to exceed safe working stress of kind of lumber used nor to develop deflection greater than 1/270 of free span of member.

D. Unlined Forms: Use plywood forms to obtain a smooth finish for concrete surfaces. Tightly butt edges of sheets to prevent leakage. Back up all vertical joints solidly and nail edges of adjacent sheets to same stud with 6d box nails spaced not over 150 mm (6 inches) apart.

E. Lined Forms: May be used in lieu of unlined plywood forms. Back up form lining solidly with square edge board lumber securely nailed to studs with all edges in close contact to prevent bulging of lining. No joints in lining and backing may coincide. Nail abutted edges of sheets to same backing board. Nail lining at not over 200 mm (8 inches) on center along edges and with at least one nail to each square foot of surface

area; nails to be 3d blued shingle or similar nails with thin flatheads.

F. Architectural Liner: Attach liner as recommended by the manufacturer with tight joints to prevent leakage.

G. Wall Form Ties: Locate wall form ties in symmetrically level horizontal rows at each line of wales and in plumb vertical tiers. Space ties to maintain true, plumb surfaces. Provide one row of ties within 150 mm (6 inches) above each construction joint. Space through-ties adjacent to horizontal and vertical construction joints not over 450 mm (18 inches) on center.

1. Tighten row of ties at bottom of form just before placing concrete and, if necessary, during placing of concrete to prevent seepage of concrete and to obtain a clean line. Ties to be entirely removed shall be loosened 24 hours after concrete is placed and shall be pulled from least important face when removed.
2. Coat surfaces of all metal that is to be removed with paraffin, cup grease or a suitable compound to facilitate removal.

H. Inserts, Sleeves, and Similar Items: Flashing reglets, steel strips, masonry ties, anchors, wood blocks, nailing strips, grounds, inserts, wire hangers, sleeves, drains, guard angles, forms for floor hinge boxes, inserts or bond blocks for elevator guide rails and supports, and other items specified as furnished under this and other sections of specifications and required to be in their final position at time concrete is placed shall be properly located, accurately positioned, and built into construction, and maintained securely in place.

1. Locate inserts or hanger wires for furred and suspended ceilings only in bottom of concrete joists, or similar concrete member of overhead concrete joist construction.
2. Install sleeves, inserts and similar items for mechanical services in accordance with drawings prepared specially for mechanical services. Contractor is responsible for accuracy and completeness of drawings and shall coordinate requirements for mechanical services and equipment.
3. Do not install sleeves in beams, joists or columns except where shown or permitted by the COR. Install sleeves in beams, joists, or columns that are not shown, but are permitted by the COR, and require no structural changes, at no additional cost to the Government.

4. Minimum clear distance of embedded items such as conduit and pipe is at least three times diameter of conduit or pipe, except at stub-ups and other similar locations.
5. Provide recesses and blockouts in floor slabs for door closers and other hardware as necessary in accordance with manufacturer's instructions.

I. Construction Tolerances:

1. Set and maintain concrete formwork to assure erection of completed work within tolerances specified and to accommodate installation of other rough and finish materials. Accomplish remedial work necessary for correcting excessive tolerances. Erected work that exceeds specified tolerance limits shall be remedied or removed and replaced, at no additional cost to the Government.
2. Permissible surface irregularities for various classes of materials are defined as "finishes" in specification sections covering individual materials. They are to be distinguished from tolerances specified which are applicable to surface irregularities of structural elements.

3.2 PLACING REINFORCEMENT

A. General: Details of concrete reinforcement in accordance with ACI 318 unless otherwise shown.

B. Placing: Place reinforcement conforming to CRSI DA4, unless otherwise shown.

1. Place reinforcing bars accurately and tie securely at intersections and splices with 1.6 mm (16 gauge) black annealed wire. Secure reinforcing bars against displacement during the placing of concrete by spacers, chairs, or other similar supports. Portions of supports, spacers, and chairs in contact with formwork shall be made of plastic in areas that will be exposed when building is occupied. Type, number, and spacing of supports conform to ACI 318. Where concrete slabs are placed on ground, use concrete blocks or other non-corrodible material of proper height, for support of reinforcement. Use of brick or stone supports will not be permitted.
2. Lap welded wire fabric at least 1 1/2 mesh panels plus end extension of wires not less than 300 mm (12 inches) in structural slabs. Lap welded wire fabric at least 1/2 mesh panels plus end extension of wires not less than 150 mm (6 inches) in slabs on grade.

3. Splice column steel at no points other than at footings and floor levels unless otherwise shown.

C. Spacing: Minimum clear distances between parallel bars, except in columns and multiple layers of bars in beams shall be equal to nominal diameter of bars. Minimum clear spacing is 25 mm (1 inch) or 1-1/3 times maximum size of coarse aggregate.

D. Splicing: Splices of reinforcement made only as required or shown or specified. Accomplish splicing as follows:

1. Lap splices: Do not use lap splices for bars larger than Number 36 (Number 11). Minimum lengths of lap as shown.
2. Welded splices: Splicing by butt-welding of reinforcement permitted providing the weld develops in tension at least 125 percent of the yield strength (fy) for the bars. Welding conform to the requirements of AWS D1.4. Welded reinforcing steel conform to the chemical analysis requirements of AWS D1.4.
   a. Submit test reports indicating the chemical analysis to establish weldability of reinforcing steel.
   b. Submit a field quality control procedure to insure proper inspection, materials and welding procedure for welded splices.
   c. Department of Veterans Affairs retained testing agency shall test a minimum of three splices, for compliance, locations selected by the COR.
3. Mechanical Splices: Develop in tension and compression at least 125 percent of the yield strength (fy) of the bars. Stresses of transition splices between two reinforcing bar sizes based on area of smaller bar. Provide mechanical splices at locations indicated. Use approved exothermic, tapered threaded coupling, or swaged and threaded sleeve. Exposed threads and swaging in the field not permitted.
   a. Initial qualification: In the presence of the COR, make three test mechanical splices of each bar size proposed to be spliced. Department of Veterans Affairs retained testing laboratory will perform load test.
   b. During installation: Furnish, at no additional cost to the Government, one companion (sister) splice for every 50 splices for load testing. Department of Veterans Affairs retained testing laboratory will perform the load test.

E. Bending: Bend bars cold, unless otherwise approved. Do not field bend bars partially embedded in concrete, except when approved by the COR.

F. Cleaning: Metal reinforcement, at time concrete is placed, shall be free from loose flaky rust, mud, oil, or similar coatings that will reduce bond.

G. Future Bonding: Protect exposed reinforcement bars intended for bonding with future work by wrapping with felt and coating felt with a bituminous compound unless otherwise shown.

3.3 VAPOR BARRIER

A. Except where membrane waterproofing is required, interior concrete slab on grade shall be placed on a continuous vapor barrier.

1. Place 100 mm (4 inches) of fine granular fill over the vapor barrier to act as a blotter for concrete slab.
2. Vapor barrier joints lapped 150 mm (6 inches) and sealed with compatible waterproof pressure-sensitive tape.
3. Patch punctures and tears.

3.4 SLABS RECEIVING RESILIENT COVERING

A. Slab shall be allowed to cure for 6 weeks minimum prior to placing resilient covering. After curing, slab shall be tested by the Contractor for moisture in accordance with ASTM D4263 or ASTM F1869. Moisture content shall be less than 3 pounds per 1000 sf prior to placing covering.

B. In lieu of curing for 6 weeks, Contractor has the option, at his own cost, to utilize the Moisture Vapor Emissions & Alkalinity Control Sealer as follows:

1. Sealer is applied on the day of the concrete pour or as soon as harsh weather permits, prior to any other chemical treatments for concrete slabs either on grade, below grade or above grade receiving resilient flooring, such as, sheet vinyl, vinyl composition tile, rubber, wood flooring, epoxy coatings and overlays.
2. Manufacturer’s representative will be on the site the day of concrete pour to install or train its application and document. He shall return on every application thereafter to verify that proper procedures are followed.
   a. Apply Sealer to concrete slabs as soon as final finishing operations are complete and the concrete has hardened sufficiently to sustain floor traffic without damage.

b. Spray apply Sealer at the rate of 20 m^2 (200 square feet) per gallon. Lightly broom product evenly over the substrate and product has completely penetrated the surface.

c. If within two (2) hours after initial application areas are subjected to heavy rainfall and puddling occurs, reapply Sealer product to these areas as soon as weather condition permits.

3.5 CONSTRUCTION JOINTS

A. Unless otherwise shown, location of construction joints to limit individual placement shall not exceed 24,000 mm (80 feet) in any horizontal direction, except slabs on grade which shall have construction joints shown. Allow 48 hours to elapse between pouring adjacent sections unless this requirement is waived by the COR.

B. Locate construction joints in suspended floors near the quarter-point of spans for slabs, beams or girders, unless a beam intersects a girder at center, in which case joint in girder shall be offset a distance equal to twice width of beam. Provide keys and inclined dowels as shown. Provide longitudinal keys as shown.

C. Place concrete for columns slowly and in one operation between joints. Install joints in concrete columns at underside of deepest beam or girder framing into column.

D. Allow 2 hours to elapse after column is cast before concrete of supported beam, girder or slab is placed. Place girders, beams, grade beams, column capitals, brackets, and haunches at the same time as slab unless otherwise shown.

E. Install polyvinyl chloride or rubber water seals, as shown in accordance with manufacturer's instructions, to form continuous watertight seal.

3.6 EXPANSION JOINTS AND CONTRACTION JOINTS

A. Clean expansion joint surfaces before installing premolded filler and placing adjacent concrete.

B. Install polyvinyl chloride or rubber water seals, as shown in accordance with manufacturer's instructions, to form continuous watertight seal.

C. Provide contraction (control) joints in floor slabs as indicated on the contract drawings. Joints shall be either formed or saw cut, to the indicated depth after the surface has been finished. Complete saw joints within 4 to 12 hours after concrete placement. Protect joints from intrusion of foreign matter.

3.7 PLACING CONCRETE

A. Preparation:
   1. Remove hardened concrete, wood chips, shavings and other debris from forms.
   2. Remove hardened concrete and foreign materials from interior surfaces of mixing and conveying equipment.
   3. Have forms and reinforcement inspected and approved by the COR before depositing concrete.
   4. Provide runways for wheeling equipment to convey concrete to point of deposit. Keep equipment on runways which are not supported by or bear on reinforcement. Provide similar runways for protection of vapor barrier on coarse fill.

B. Bonding: Before depositing new concrete on or against concrete which has been set, thoroughly roughen and clean existing surfaces of laitance, foreign matter, and loose particles.
   1. Preparing surface for applied topping:
      a. Remove laitance, mortar, oil, grease, paint, or other foreign material by sand blasting. Clean with vacuum type equipment to remove sand and other loose material.
      b. Broom clean and keep base slab wet for at least four hours before topping is applied.
      c. Use a thin coat of one part Portland cement, 1.5 parts fine sand, bonding admixture; and water at a 50: 50 ratio and mix to achieve the consistency of thick paint. Apply to a damp base slab by scrubbing with a stiff fiber brush. New concrete shall be placed while the bonding grout is still tacky.

C. Conveying Concrete: Convey concrete from mixer to final place of deposit by a method which will prevent segregation. Method of conveying concrete is subject to approval of the COR.

D. Placing: For special requirements see Paragraphs, HOT WEATHER and COLD WEATHER.
   1. Do not place concrete when weather conditions prevent proper placement and consolidation, or when concrete has attained its initial set, or has contained its water or cement content more than 1 1/2 hours.
   2. Deposit concrete in forms as near as practicable in its final position. Prevent splashing of forms or reinforcement with concrete in advance of placing concrete.

3. Do not drop concrete freely more than 3000 mm (10 feet) for concrete containing the high-range water-reducing admixture (superplasticizer) or 1500 mm (5 feet) for conventional concrete. Where greater drops are required, use a tremie or flexible spout (canvas elephant trunk), attached to a suitable hopper.
4. Discharge contents of tremies or flexible spouts in horizontal layers not exceeding 500 mm (20 inches) in thickness, and space tremies such as to provide a minimum of lateral movement of concrete.
5. Continuously place concrete until an entire unit between construction joints is placed. Rate and method of placing concrete shall be such that no concrete between construction joints will be deposited upon or against partly set concrete, after its initial set has taken place, or after 45 minutes of elapsed time during concrete placement.
6. On bottom of members with severe congestion of reinforcement, deposit 25 mm (1 inch) layer of flowing concrete containing the specified high-range water-reducing admixture (superplasticizer). Successive concrete lifts may be a continuation of this concrete or concrete with a conventional slump.
7. Concrete on metal deck:
   a. Concrete on metal deck shall be minimum thickness shown. Allow for deflection of steel beams and metal deck under the weight of wet concrete in calculating concrete quantities for slab.
      1) The Contractor shall become familiar with deflection characteristics of structural frame to include proper amount of additional concrete due to beam/deck deflection.

E. Consolidation: Conform to ACI 309. Immediately after depositing, spade concrete next to forms, work around reinforcement and into angles of forms, tamp lightly by hand, and compact with mechanical vibrator applied directly into concrete at approximately 450 mm (18 inch) intervals. Mechanical vibrator shall be power driven, hand operated type with minimum frequency of 5000 cycles per minute having an intensity sufficient to cause flow or settlement of concrete into place. Vibrate concrete to produce thorough compaction, complete embedment of reinforcement and concrete of uniform and maximum density without segregation of mix. Do not transport concrete in forms by vibration.

1. Use of form vibration shall be approved only when concrete sections are too thin or too inaccessible for use of internal vibration.
2. Carry on vibration continuously with placing of concrete. Do not insert vibrator into concrete that has begun to set.

3.8 HOT WEATHER

A. Follow the recommendations of ACI 305 or as specified to prevent problems in the manufacturing, placing, and curing of concrete that can adversely affect the properties and serviceability of the hardened concrete. Methods proposed for cooling materials and arrangements for protecting concrete shall be made in advance of concrete placement and approved by the COR.

3.9 COLD WEATHER

A. Follow the recommendations of ACI 306 or as specified to prevent freezing of concrete and to permit concrete to gain strength properly. Use only the specified non-corrosive, non-chloride accelerator. Do not use calcium chloride, thiocyantes or admixtures containing more than 0.05 percent chloride ions. Methods proposed for heating materials and arrangements for protecting concrete shall be made in advance of concrete placement and approved by the COR.

3.10 PROTECTION AND CURING

A. Conform to ACI 308: Initial curing shall immediately follow the finishing operation. Protect exposed surfaces of concrete from premature drying, wash by rain and running water, wind, mechanical injury, and excessively hot or cold temperatures. Keep concrete not covered with membrane or other curing material continuously wet for at least 7 days after placing, except wet curing period for high-early-strength concrete shall be not less than 3 days. Keep wood forms continuously wet to prevent moisture loss until forms are removed. Cure exposed concrete surfaces as described below. Other curing methods may be used if approved by the COR.
   1. Liquid curing and sealing compounds: Apply by power-driven spray or roller in accordance with the manufacturer’s instructions. Apply immediately after finishing. Maximum coverage $10m^2/L$ (400 square feet per gallon) on steel troweled surfaces and $7.5m^2/L$ (300 square feet per gallon) on floated or broomed surfaces for the curing/sealing compound.
   2. Plastic sheets: Apply as soon as concrete has hardened sufficiently to prevent surface damage. Utilize widest practical width sheet and

overlap adjacent sheets 50 mm (2 inches). Tightly seal joints with tape.

3. Paper: Utilize widest practical width paper and overlap adjacent sheets 50 mm (2 inches). Tightly seal joints with sand, wood planks, pressure-sensitive tape, mastic or glue.

3.11 REMOVAL OF FORMS

A. Remove in a manner to assure complete safety of structure after the following conditions have been met.

1. Where structure as a whole is supported on shores, forms for beams and girder sides, columns, and similar vertical structural members may be removed after 24 hours, provided concrete has hardened sufficiently to prevent surface damage and curing is continued without any lapse in time as specified for exposed surfaces.
2. Take particular care in removing forms of architectural exposed concrete to insure surfaces are not marred or gouged, and that corners and arises are true, sharp and unbroken.

B. Control Test: Use to determine if the concrete has attained sufficient strength and curing to permit removal of supporting forms. Cylinders required for control tests taken in accordance with ASTM C172, molded in accordance with ASTM C31, and tested in accordance with ASTM C39. Control cylinders cured and protected in the same manner as the structure they represent. Supporting forms or shoring not removed until strength of control test cylinders have attained at least 70 percent of minimum 28-day compressive strength specified. Exercise care to assure that newly unsupported portions of structure are not subjected to heavy construction or material loading.

C. Reshoring: Reshoring is required if superimposed load plus dead load of the floor exceeds the capacity of the floor at the time of loading. Reshoring accomplished in accordance with ACI 347 at no additional cost to the Government.

3.12 CONCRETE SURFACE PREPARATION

A. Metal Removal: Unnecessary metal items cut back flush with face of concrete members.

B. Patching: Maintain curing and start patching as soon as forms are removed. Do not apply curing compounds to concrete surfaces requiring patching until patching is completed. Use cement mortar for patching of same composition as that used in concrete. Use white or gray Portland cement as necessary to obtain finish color matching surrounding

concrete. Thoroughly clean areas to be patched. Cut out honeycombed or otherwise defective areas to solid concrete to a depth of not less than 25 mm (1 inch). Cut edge perpendicular to surface of concrete. Saturate with water area to be patched, and at least 150 mm (6 inches) surrounding before placing patching mortar. Give area to be patched a brush coat of cement grout followed immediately by patching mortar. Cement grout composed of one part Portland cement, 1.5 parts fine sand, bonding admixture, and water at a 50:50 ratio, mix to achieve consistency of thick paint. Mix patching mortar approximately 1 hour before placing and remix occasionally during this period without addition of water. Compact mortar into place and screed slightly higher than surrounding surface. After initial shrinkage has occurred, finish to match color and texture of adjoining surfaces. Cure patches as specified for other concrete. Fill form tie holes which extend entirely through walls from unexposed face by means of a pressure gun or other suitable device to force mortar through wall. Wipe excess mortar off exposed face with a cloth.

C. Upon removal of forms, clean vertical concrete surface that is to receive bonded applied cementitious application with wire brushes or by sand blasting to remove unset material, laitance, and loose particles to expose aggregates to provide a clean, firm, granular surface for bond of applied finish.

3.13 CONCRETE FINISHES

A. Vertical and Overhead Surface Finishes:

1. Unfinished areas: Vertical and overhead concrete surfaces exposed in pipe basements, elevator and dumbwaiter shafts, pipe spaces, pipe trenches, above suspended ceilings, manholes, and other unfinished areas will not require additional finishing.
2. Interior and exterior exposed areas to be painted: Remove fins, burrs and similar projections on surfaces flush, and smooth by mechanical means approved by the COR, and by rubbing lightly with a fine abrasive stone or hone. Use ample water during rubbing without working up a lather of mortar or changing texture of concrete.

3. Interior and exterior exposed areas finished: Give a grout finish of uniform color and smooth finish treated as follows:
   a. After concrete has hardened and laitance, fins and burrs removed, scrub concrete with wire brushes. Clean stained concrete surfaces by use of a hone stone.
   b. Apply grout composed of one part of Portland cement, one part fine sand, smaller than a 600 µm (No. 30) sieve. Work grout into surface of concrete with cork floats or fiber brushes until all pits, and honeycombs are filled.
   c. After grout has hardened slightly, but while still plastic, scrape grout off with a sponge rubber float and, about 1 hour later, rub concrete vigorously with burlap to remove any excess grout remaining on surfaces.
   d. In hot, dry weather use a fog spray to keep grout wet during setting period. Complete finish of area in same day. Make limits of finished areas at natural breaks in wall surface. Leave no grout on concrete surface overnight.
4. Textured: Finish as specified. Maximum quantity of patched area 0.2 m^2 (2 square feet) in each 93 m^2 (1000 square feet) of textured surface.

B. Slab Finishes:
1. Monitoring and Adjustment: Provide continuous cycle of placement, measurement, evaluation and adjustment of procedures to produce slabs within specified tolerances. Monitor elevations of structural steel in key locations before and after concrete placement to establish typical deflection patterns for the structural steel. Determine elevations of cast-in-place slab soffits prior to removal of shores. Provide information to the COR and floor consultant for evaluation and recommendations for subsequent placements.
2. Set perimeter forms to serve as screed using either optical or laser instruments. For slabs on grade, wet screeds may be used to establish initial grade during strike-off, unless the COR determines that the method is proving insufficient to meet required finish tolerances and directs use of rigid screed guides. Where wet screeds are allowed, they shall be placed using grade stakes set by optical or laser instruments. Use rigid screed guides, as opposed to wet screeds, to control strike-off elevation for all types of elevated

(non slab-on-grade) slabs. Divide bays into halves or thirds by hard screeds. Adjust as necessary where monitoring of previous placements indicates unshored structural steel deflections to other than a level profile.

3. Place slabs monolithically. Once slab placement commences, complete finishing operations within same day. Slope finished slab to floor drains where they occur, whether shown or not.
4. Use straightedges specifically made for screeding, such as hollow magnesium straightedges or power strike-offs. Do not use pieces of dimensioned lumber. Strike off and screed slab to a true surface at required elevations. Use optical or laser instruments to check concrete finished surface grade after strike-off. Repeat strike-off as necessary. Complete screeding before any excess moisture or bleeding water is present on surface. Do not sprinkle dry cement on the surface.
5. Immediately following screeding, and before any bleed water appears, use a 3000 mm (10 foot) wide highway straightedge in a cutting and filling operation to achieve surface flatness. Do not use bull floats or darbys, except that darbying may be allowed for narrow slabs and restricted spaces.
6. Wait until water sheen disappears and surface stiffens before proceeding further. Do not perform subsequent operations until concrete will sustain foot pressure with maximum of 6 mm (1/4 inch) indentation.
7. Scratch Finish: Finish base slab to receive a bonded applied cementitious application as indicated above, except that bull floats and darbys may be used. Thoroughly coarse wire broom within two hours after placing to roughen slab surface to insure a permanent bond between base slab and applied materials.
8. Float Finish: Slabs to receive unbonded toppings, steel trowel finish, fill, mortar setting beds, or a built-up roof, and ramps, stair treads, platforms (interior and exterior), and equipment pads shall be floated to a smooth, dense uniform, sandy textured finish. During floating, while surface is still soft, check surface for flatness using a 3000 mm (10 foot) highway straightedge. Correct high spots by cutting down and correct low spots by filling in with material of same composition as floor finish. Remove any surface projections and re-float to a uniform texture.

9. Steel Trowel Finish: Concrete surfaces to receive resilient floor covering or carpet, monolithic floor slabs to be exposed to view in finished work, future floor roof slabs, applied toppings, and other interior surfaces for which no other finish is indicated. Steel trowel immediately following floating. During final troweling, tilt steel trowel at a slight angle and exert heavy pressure to compact cement paste and form a dense, smooth surface. Finished surface shall be smooth, free of trowel marks, and uniform in texture and appearance.
10. Broom Finish: Finish exterior slabs, ramps, and stair treads with a bristle brush moistened with clear water after surfaces have been floated. Brush in a direction transverse to main traffic. Match texture approved by the COR from sample panel.
11. Finished slab flatness (FF) and levelness (FL) values comply with the following minimum requirements:
    a. Areas covered with carpeting, or not specified otherwise in b. below:
        1) Slab on Grade:
            a) Specified overall value F_F 25/F_L 20
            b) Minimum local value F_F 17/F_L 15
        2) Level suspended slabs (shored until after testing) and topping slabs:
            a) Specified overall value FF 25/FL 20
            b) Minimum local value FF 17/FL 15
        3) Unshored suspended slabs:
            a) Specified overall value FF 25
            b) Minimum local value FF 17
        4) Level tolerance such that 80 percent of all points fall within a 20 mm (3/4 inch) envelope +10 mm, -10 mm (+3/8 inch, -3/8 inch) from the design elevation.
    b. Areas that will be exposed, receive thin-set tile or resilient flooring, or roof areas designed as future floors:
        1) Slab on grade:
            a) Specified overall value FF 36/FL 20
            b) Minimum local value FF 24/FL 15
        2) Level suspended slabs (shored until after testing) and topping slabs
            a) Specified overall value FF 30/FL 20

b) Minimum local value FF 24/FL 15

3) Unshored suspended slabs:

a) Specified overall value FF 30

b) Minimum local value FF 24

4) Level tolerance such that 80 percent of all points fall within a 20 mm (3/4 inch) envelope +10 mm, -10 mm (+3/8 inch, -3/8 inch) from the design elevation.

c. "Specified overall value" is based on the composite of all measured values in a placement derived in accordance with ASTM E1155.

d. "Minimum local value" (MLV) describes the flatness or levelness below which repair or replacement is required. MLV is based on the results of an individual placement and applies to a minimum local area. Minimum local area boundaries may not cross a construction joint or expansion joint. A minimum local area will be bounded by construction and/or control joints, or by column lines and/or half-column lines, whichever is smaller.

12. Measurements

a. Department of Veterans Affairs retained testing laboratory will take measurements as directed by the COR, to verify compliance with FF, FL, and other finish requirements. Measurements will occur within 72 hours after completion of concrete placement (weekends and holidays excluded). Make measurements before shores or forms are removed to insure the "as-built" levelness is accurately assessed. Profile data for above characteristics may be collected using a laser level or any Type II apparatus (ASTM E1155, "profileograph" or "dipstick"). Contractor's surveyor shall establish reference elevations to be used by Department of Veterans Affairs retained testing laboratory.

b. Contractor not experienced in using FF and FL criteria is encouraged to retain the services of a floor consultant to assist with recommendations concerning adjustments to slab thicknesses, finishing techniques, and procedures on measurements of the finish as it progresses in order to achieve the specific flatness and levelness numbers.

13. Acceptance/ Rejection:

a. If individual slab section measures less than either of specified minimum local F_F/F_L numbers, that section shall be rejected and

remedial measures shall be required. Sectional boundaries may be set at construction and contraction (control) joints, and not smaller than one-half bay.

b. If composite value of entire slab installation, combination of all local results, measures less than either of specified overall F_F/F_L numbers, then whole slab shall be rejected and remedial measures shall be required.

14. Remedial Measures for Rejected Slabs: Correct rejected slab areas by grinding, planing, surface repair with underlayment compound or repair topping, retopping, or removal and replacement of entire rejected slab areas, as directed by the COR, until a slab finish constructed within specified tolerances is accepted.

3.14 SURFACE TREATMENTS:

A. Use on exposed concrete floors and concrete floors to receive carpeting except those specified to receive non-slip finish.

B. Liquid Densifier/Sealer: Apply in accordance with manufacturer's directions just prior to completion of construction.

C. Non-Slip Finish: Except where safety nosing and tread coverings are shown, apply non-slip abrasive aggregate to treads and platforms of concrete steps and stairs, and to surfaces of exterior concrete ramps and platforms. Broadcast aggregate uniformly over concrete surface at rate of application of 8 percent per 1/10th m^2 (7.5 percent per square foot) of area. Trowel concrete surface to smooth dense finish. After curing, rub treated surface with abrasive brick and water to slightly expose abrasive aggregate.

3.15 APPLIED TOPPING

A. Separate concrete topping on floor base slab of thickness and strength shown. Topping mix shall have a maximum slump of 200 mm (8 inches) for concrete containing a high-range water-reducing admixture (superplasticizer) and 100 mm (4 inches) for conventional mix. Neatly bevel or slope at door openings and at slabs adjoining spaces not receiving an applied finish.

B. Placing: Place continuously until entire section is complete, struck off with straightedge, leveled with a highway straightedge or highway bull float, floated and troweled by machine to a hard dense finish. Slope to floor drains as required. Do not start floating until free water has disappeared and no water sheen is visible. Allow drying of

surface moisture naturally. Do not hasten by "dusting" with cement or sand.

3.16 RESURFACING FLOORS

A. Remove existing flooring areas to receive resurfacing to expose existing structural slab and extend not less than 25 mm (1 inch) below new finished floor level. Prepare exposed structural slab surface by roughening, broom cleaning, and dampening. Apply specified bonding grout. Place topping while the bonding grout is still tacky.

3.17 RETAINING WALLS

A. Use air-entrained concrete.

B. Expansion and contraction joints, waterstops, weep holes, reinforcement and railing sleeves installed and constructed as shown.

C. Exposed surfaces finished to match adjacent concrete surfaces, new or existing.

D. Place porous backfill as shown.

3.18 PRECAST CONCRETE ITEMS

A. Precast concrete items, not specified elsewhere. Cast using 25 MPa (3000 psi) air-entrained concrete to shapes and dimensions shown. Finish to match corresponding adjacent concrete surfaces. Reinforce with steel for safe handling and erection.

SECTION 04 20 00
UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Concrete masonry unit (CMU) assemblies for:
   1. Exterior walls.

1.2 RELATED REQUIREMENTS

A. Sealants and Sealant Installation: Section 07 92 00, JOINT SEALANTS.
B. Color and Texture of Masonry Units: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.
B. American Concrete Institute (ACI):
   1. 315-99 - Details and Detailing of Concrete Reinforcement.
   2. 530.1/ASCE 6/TMS 602-13 - Specification for Masonry Structures.
C. ASTM International (ASTM):
   1. A615/A615M-15ae1 - Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
   2. A951/A951M-14 - Steel Wire for Masonry Joint Reinforcement.
   3. A1064/A1064M-15 - Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
   4. C55-14a - Concrete Building Brick.
   5. C612-14 - Mineral Fiber Block and Board Thermal Insulation.
   6. C744-14 - Prefaced Concrete and Calcium Silicate Masonry Units.
   7. D1056-14 - Flexible Cellular Materials - Sponge or Expanded Rubber.
   8. D2240-05(2010) - Rubber Property-Durometer Hardness.
   9. F1667-15 - Driven Fasteners: Nails, Spikes, and Staples.
D. American Welding Society (AWS):
   1. D1.4/D1.4M-11 - Structural Welding Code - Reinforcing Steel.
E. Brick Industry Association (BIA):
   1. TN 11B-88 - Guide Specifications for Brick Masonry, Part 3.
F. Federal Specifications (Fed. Spec.):
   1. FF-S-107C(2) - Screws, Tapping and Drive.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Submittal Drawings:

1. Fabrication, bending, and placement of reinforcing bars. Comply with ACI 315. Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies.
2. Special masonry shapes, profiles, and placement.
3. Masonry units for typical window and door openings, and, for special conditions as affected by structural conditions.

C. Manufacturer's Literature and Data:
1. Description of each product.
2. Installation instructions.

D. Samples:
1. Concrete masonry units, when exposed in finish work.
2. Anchors and Ties: Each type.
3. Joint Reinforcing: 1200 mm (48 inches) long each type.
4. Glazed Structural Facing Tile: Clipped panels (triplicate) of four wall units with base units, showing color range, each color and texture.

E. Sustainable Construction Submittals:
1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

F. Certificates: Certify products comply with specifications.
1. Solid and load-bearing concrete masonry units, including fire-resistant rated units.

G. Delegated Design Drawings and Calculations: Signed and sealed by responsible design professional.

1.5 QUALITY ASSURANCE

A. Welders and Welding Procedures Qualifications: AWS D1.4/D1.4M.

B. Mockups:
1. Before starting masonry, build a mockup panel minimum 1800 mm by 1800 mm (6 feet by 6 feet) with 600 mm (24 inch) 90 degree return for outside corner.
   a. Use masonry units from random cubes of units delivered on site.
   b. Include structural backup, reinforcing, ties, and anchors.
2. Mockup panel approved by Contracting Officer's Representative set workmanship and aesthetic quality for masonry work.
3. Clean sample panel to test cleaning methods.
4. Remove mockup panel when directed by Contracting Officer's Representative.

1.6 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

A. Store products above grade, protected from contamination.

B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

A. Hot and Cold Weather Requirements: Comply with ACI 530.1/ASCE 6/TMS 602.

1.9 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Delegated Design: Prepare submittal documents including design calculations and drawings signed and sealed by registered design professional, licensed in state where work is located.

2.2 PRODUCTS - GENERAL

A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.

B. Provide each product from one manufacturer.

2.3 UNIT MASONRY PRODUCTS

A. Concrete Masonry Units (CMU):

1. Hollow and Solid Load-Bearing Concrete Masonry Units: ASTM C90.
   a. Unit Weight: Normal weight.
   b. Fire rated units for fire rated partitions.
2. Sizes: Modular, 200 mm by 400 mm (8 inches by 16 inches) nominal face dimension; thickness as indicated on drawings.
3. For molded faces used as a finished surface, use concrete masonry units with uniform fine to medium surface texture unless specified otherwise.

4. Use bullnose concrete masonry units at corners exposed in finished work with 25 mm (1 inch) minimum radius rounded vertical exterior corners (bullnose units).
5. Customized Units:
   a. Sound-Absorbing Units:
      1) Vertical slots in face to core areas.
      2) Acoustical absorption insert: Mineral fiber and metal septum, providing unit with NRC rating of 0.70.
   b. Split-Face Units:
      1) Split-Rib Units: Rib shapes as indicated on drawings on exposed faces.
      2) Ground Face Units: Ground finish on exposed faces.
   c. Glazed Face Units: Facing conform to ASTM C744.

B. Concrete Brick: ASTM C55.

2.4 ANCHORS, TIES, AND REINFORCEMENT

A. Steel Reinforcing Bars: ASTM A615/A615M; Grade 60, deformed bars.

B. Joint Reinforcement:
1. Form from wire complying with ASTM A951/A951M.
2. Hot dipped galvanized after fabrication.
3. Width of joint reinforcement 40 mm (1.6 inches) less than nominal thickness of masonry wall or partition.
4. Cross wires welded to longitudinal wires.
5. Joint reinforcement minimum 3000 mm (10 feet) long, factory cut.
6. Joint reinforcement with crimp formed drip is not acceptable.
7. Maximum spacing of cross wires 400 mm (16 inch) to longitudinal wires.
8. Ladder Design:
   a. Longitudinal wires deformed 4 mm (0.16 inch).
   b. Cross wires 4 mm (0.16 inch) diameter.
9. Trussed Design:
   a. Longitudinal and cross wires minimum 4 mm (0.16 inch nominal) diameter.
   b. Longitudinal wires deformed.
10. Multiple Wythes and Cavity Wall Ties:
   a. Longitudinal wires 4 mm (0.16 inch), two in each wythe with ladder truss wires 4 mm (0.16 inch) overlay, welded to each longitudinal wire.

b. Longitudinal wires 4 mm (0.16 inch) with U shape 4 mm (0.16 inch) rectangular ties extending into other wythe minimum 75 mm (3 inches) spaced 400 mm on center (16 inches). Adjustable type with U shape tie designed to receive 4 mm (0.16 inch) pintle projecting into other wythe 75 mm (3 inches min.).

C. Adjustable Veneer Anchor for Framed Walls:

1. Two piece, adjustable anchor and tie.
2. Anchor and tie may be either loop or angle type; provide only one type throughout.
3. Loop Type:
   a. Anchor: Screw-on galvanized steel anchor strap 2.75 mm (0.11 inch) by 19 mm (3/4 inch) wide by 225 mm (9 inches) long, with 9 mm (0.35 inch) offset and 100 mm (4 inch) adjustment. Provide 5 mm (0.20 inch) hole at each end for fasteners.
   b. Ties: Triangular tie, fabricated of 5 mm (0.20 inch) diameter galvanized cold drawn steel wire. Ties long enough to engage anchor and be embedded minimum 50 mm (2 inches) into bed joint of masonry veneer.
4. Angle Type:
   a. Anchor: Minimum 2 mm (16 gage) thick galvanized steel angle shaped anchor strap. Provide hole in vertical leg for fastener. Provide hole near end of outstanding leg to suit upstanding portion of tie.
   b. Tie: Fabricate from 5 mm (0.20 inch) diameter galvanized cold drawn steel wire. Form "L" shape to be embedded minimum 50 mm (2 inches) into the bed joint of masonry veneer and provide upstanding leg to fit through hole in anchor and be long enough to allow 50 mm (2 inches) of vertical adjustment.

D. Dovetail Anchors:

1. Corrugated steel dovetail anchors formed of 1.5 mm (0.06 inch) thick by 25 mm (1 inch) wide galvanized steel, 90 mm (3-1/2 inches) long where used to anchor 100 mm (4 inch) nominal thick masonry units, 140 mm (5-1/2 inches) long for masonry units more than 100 mm (4 inches) thick.
2. Triangular wire dovetail anchor 100 mm (4 inch) wide formed of 4 mm (9 gage) steel wire with galvanized steel dovetail insert. Anchor length to extend minimum 75 mm (3 inches) into masonry, 25 mm (1 inch) into 40 mm (1-1/2 inch) thick units.

3. Form dovetail anchor slots from 0.6 mm (0.02 inch) thick galvanized steel (with felt or fiber filler).

E. Individual Ties:

1. Rectangular ties: Form from 5 mm (3/16 inch) diameter galvanized steel rod to rectangular shape minimum 50 mm (2 inches) wide by sufficient length for ends of ties to extend within 25 mm (1 inch) of each face of wall. Ties that are crimped to form drip are not acceptable.
2. Adjustable Cavity Wall Ties:
   a. Adjustable wall ties may be furnished at Contractor's option.
   b. Two piece type permitting up to 40 mm (1-1/2 inch) adjustment.
   c. Form ties from 5 mm (3/16 inch) diameter galvanized steel wire.
   d. Form one piece to rectangular shape 105 mm (4-1/8 inches) wide by length required to extend into bed joint 50 mm (2 inches).
   e. Form other piece to 75 mm (3 inch) long by 75 mm (3 inch) wide shape, having 75 mm (3 inch) long bent section for engaging 105 mm (4-1/8 inch) wide piece to form adjustable connection.

F. Wall Ties, (Mesh or Wire):

1. Mesh wall ties formed of ASTM A1064/A1064M, W0.5, 2 mm, (0.08 inch) galvanized steel wire 13 mm by 13 mm (1/2 inch by 1/2 inch) mesh, 75 mm (3 inches) wide by 200 mm (8 inches) long.
2. Rectangular wire wall ties formed of W1.4, 3 mm, (0.12 inch) galvanized steel wire 50 mm (2 inches) wide by 200 mm (8 inches) long.

G. Corrugated Wall Tie:

1. Form from 1.5 mm (0.06 inch) thick corrugated, galvanized steel 30 mm (1-1/4 inches) wide by lengths to extend minimum 100 mm (4 inches) into joints of masonry plus 38 mm (1-1/2 inch) turn-up.
2. Provide 5 mm (3/16 inch) hole in turn-up for fastener attachment.

H. Adjustable Steel Column Anchor:

1. Two piece anchor consisting of a 6 mm (1/4 inch) diameter steel rod to be welded to steel with offset ends, rod to permit 100 mm (4 inch) vertical adjustment of wire anchor.
2. Triangular shaped wire anchor 100 mm (4 inches) wide formed from 5 (3/16 inch) diameter galvanized wire, to extend minimum 75 mm (3 inches) into joints of masonry.

I. Adjustable Steel Beam Anchor:

1. Z or C type steel strap, 30 mm (1 1/4 inches) wide, 3 mm (1/8 inch) thick.
2. Flange hook minimum 38 mm (1 1/2 inches) long.
3. Length to embed in masonry minimum 50 mm (2 inches) in 100 mm (4 inch) nominal thick masonry and 100 mm (4 inches) in thicker masonry.
4. Bend masonry end minimum 40 mm (1 1/2 inches).

J. Ridge Wall Anchors:
1. Form from galvanized steel minimum 25 mm (1 inch) wide by 5 mm (3/16 inch) thick by 600 mm (24 inches) long, plus 50 mm (2 inch) bends.
2. Other lengths as indicated on drawings.

2.5 ACCESSORIES

A. Shear Keys:
1. Solid extruded cross-shaped section of rubber, neoprene, or polyvinyl chloride, with durometer hardness of approximately 80 when tested according to ASTM D2240, and minimum shear strength of 3.5 MPa (500 psi).
2. Shear Key Dimensions: Nominal 70 mm by 8 mm for long flange and 38 mm by 16 mm for short flange (2-3/4 inches by 5/16 inch for long flange, and 1-1/2 inches by 5/8 inch for short flange).

B. Cavity Drain Material: Open mesh polyester sheets or strips to prevent mortar droppings from clogging the cavity.

C. Preformed Compressible Joint Filler:
1. Thickness and depth to fill joint.
2. Closed Cell Neoprene: ASTM D1056, Type 2, Class A, Grade 1, B2F1.
3. Non-Combustible Type: ASTM C612, Type 5, Max. Temp.1800 degrees F.

D. Box Board:
1. Mineral Fiber Board: ASTM C612, Type 1.
2. 25 mm (1 inch) thickness.
3. Other spacing material having similar characteristics is acceptable subject to Contracting Officer's Representative's approval.

E. Masonry Cleaner:
1. Detergent type cleaner selected for each type masonry.
2. Acid cleaners are not acceptable.
3. Use soapless type specially prepared for cleaning concrete masonry as appropriate.

F. Fasteners:

1. Concrete Nails: ASTM F1667, Type I, Style 11, 19 mm (3/4 inch) minimum length.
2. Masonry Nails: ASTM F1667, Type I, Style 17, 19 mm (3/4 inch) minimum length.
3. Screws: FS-FF-S-107, Type A, AB, SF thread forming or cutting.

G. Welding Materials: AWS D1.4/D1.4M, type to suit application.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.
   1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

B. Keep finish work free from mortar smears or spatters, and leave neat and clean.

C. Wall Openings:
   1. Fill hollow metal frames built into masonry walls and partitions solid with mortar as laying of masonry progresses.
   2. When items are not available when walls are built, prepare openings for subsequent installation.

D. Tooling Joints:
   1. Do not tool until mortar has stiffened enough to retain thumb print when thumb is pressed against mortar.
   2. Tool while mortar is soft enough to be compressed into joints and not raked out.
   3. Finish joints in exterior face masonry work with jointing tool, and provide smooth, water-tight concave joint unless specified otherwise.
   4. Tool Exposed interior joints in finish work concave unless specified otherwise.

E. Partition Height:
   1. Extend partitions minimum 100 mm (4 inches) above suspended ceiling or to overhead construction where no ceiling occurs.
   2. Extend following partitions to overhead construction.
      a. Full height partitions, and fire partitions and smoke partitions indicated on drawings.
      b. Both walls at expansion joints.

c. Corridor walls.
d. Walls at stairway and stair halls, elevators, dumbwaiters, trash and laundry chute shafts, and other vertical shafts.
e. Walls at refrigerator space.
f. Reinforced masonry partitions.

3. Extend finished masonry partitions minimum 100 mm (4 inches) above suspended ceiling and continue with concrete masonry units to overhead construction:

F. Lintels:

1. Lintels are not required for openings less than 1000 mm (40 inches) wide that have hollow metal frames.
2. Openings 1025 mm (41 inches) wide to 1600 m (63 inches) wide without structural steel lintel or frames, require lintel formed of concrete masonry lintel or bond beam units filled with grout and reinforced with one No. 16 (No. 5) rod top and bottom for each 100 mm (4 inches) of nominal thickness unless shown otherwise.
3. Precast concrete lintels of 25 MPa (3,000 psi) concrete, same thickness as partition, and with one No. 16 (No. 5) deformed bar top and bottom for each 100 mm (4 inches) of nominal thickness, is acceptable in lieu of reinforced CMU masonry lintels.
4. Use steel lintels, for openings greater than 1600 m (63 inches) wide, brick masonry openings, and elevator openings unless shown otherwise.
5. Doors having overhead concealed door closers require steel lintel, and pocket for closer box.
6. Lintel Bearing Length: Minimum 100 mm (4 inches) at both ends.
7. Build masonry openings or arches over wood or metal centering and supports when steel lintels are not used.

G. Wall, Furring, and Partition Units:

1. Lay out field units to provide one-half running bond, unless indicated otherwise.
2. Align head joints of alternate vertical courses.
3. At sides of openings, balance head joints in each course on vertical center lines of openings.
4. Minimum Masonry Unit Length: 100 mm (4 inches).
5. On interior partitions provide 6 mm (1/4 inch) open joint for caulking between exterior walls, and abutting masonry partitions.

6. Use minimum 100 mm (4 inches) nominal thick masonry for free standing furring, unless indicated otherwise.
7. Do not abut existing plastered surfaces except suspended ceilings with new masonry partitions.

H. Use minimum 100 mm (4 inches) nominal thick masonry for fireproofing steel columns unless indicated otherwise.

I. Before connecting new masonry with previously laid masonry, remove loosened masonry or mortar, and clean and wet work in place as specified under wetting.

J. When new masonry partitions start on existing floors, machine cut existing floor finish material down to concrete surface.

K. Structural Steel Encased in Masonry:
1. Where structural steel is encased in masonry and voids between steel and masonry are filled with mortar, provide minimum 25 mm (1 inch) mortar free expansion space between masonry and steel by applying box board material to steel before masonry is laid.
2. Do not install spacing material where steel is bearing on masonry or masonry is bearing on steel.

L. Chases:
1. Do not install chases in masonry walls and partitions exposed to view in finished work, including painted or coated finishes on masonry.
2. Masonry 100 mm (4 inch) nominal thick may have electrical conduits 25 mm (1 inch) or less in diameter when covered with soaps, or other finishes.
3. Fill recess chases after installation of conduit, with mortar and finish flush.
4. When pipes or conduits, or both occur in hollow masonry unit partitions retain minimum one web of hollow masonry units.

M. Wetting and Wetting Test:
1. Test and wet brick and clay tile according to BIA TN 11B.
2. Do not wet concrete masonry units or glazed structural facing tile before laying.

N. Temporary Formwork: Provide formwork and shores as required for temporary support of reinforced masonry elements.

O. Construct formwork to conform to shape, line and dimensions indicated on drawings. Make sufficiently tight to prevent mortar, grout, or concrete leakage. Brace, tie and support formwork as required to

maintain position and shape during construction and curing of reinforced masonry.

P. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other reasonable temporary construction loads.

Q. Minimum Curing Times Before Removing Shores and Forms:
   1. Girders and Beams: 10 days.
   2. Slabs: 7 days.
   3. Reinforced Masonry Soffits: 7 days.

3.2 INSTALLATION - ANCHORAGE

A. Veneer to Framed Walls:
   1. Install adjustable veneer anchors.
   2. Fasten anchor to stud through sheathing with self-drilling and tapping screw, one at both ends of loop type anchor.
   3. Space anchors maximum 400 mm (16 inches) on center vertically at each stud.

B. Veneer to Concrete Walls:
   1. Install dovetail slots in concrete vertically at 400 mm (16 inches) on centers.
   2. Locate dovetail anchors at 400 mm (16 inch) maximum vertical intervals.
   3. Anchor new masonry facing to existing concrete with adjustable cavity wall ties spaced at 400 mm, (16 inches) maximum vertical intervals, and at 400 mm (16 inches) maximum horizontal intervals. Fasten ties to concrete with power actuated fasteners or concrete nails.

C. Masonry Facing to Backup and Cavity Wall Ties:
   1. Use individual ties for new work.
   2. Stagger ties in alternate courses, and space at 400 mm (16 inches) maximum vertically, and 400 mm (16 inches) horizontally.
   3. At openings, provide additional ties spaced maximum 900 mm (36 inches) apart vertically around perimeter of opening, and within 300 mm (12 inches) from edge of opening.
   4. Anchor new masonry facing to existing masonry with adjustable cavity wall ties spaced at 400 mm (16 inch) maximum vertical intervals and at every second masonry unit horizontally. Fasten ties to masonry with masonry nails.

5. Option: Install joint reinforcing for multiple wythes and cavity wall ties spaced maximum 400 mm (16 inches) vertically.
6. Tie interior and exterior wythes of reinforced masonry walls together with individual ties. Provide ties at intervals maximum 400 mm (16 inches) on center horizontally, and 400 mm (16 inches) on center vertically. Lay ties in the same line vertically in order to facilitate vibrating of the grout pours.

D. Anchorage of Abutting Masonry:
1. Anchor interior 100 mm (4 inch) thick masonry partitions to exterior masonry walls with wall ties. Space ties at 600 mm (24 inches) maximum vertical intervals. Extend ties 100 mm (4 inches) minimum into masonry.
2. Anchor interior masonry bearing walls or interior masonry partitions over 100 mm (4 inches) thick to masonry walls with rigid wall anchors spaced at 400 mm (16 inch) maximum vertical intervals.
3. Anchor abutting masonry walls and partitions to concrete with dovetail anchors. Install dovetail slots vertically in concrete at centerline of abutting wall or partition. Locate dovetail anchors at 400 mm (16 inch) maximum vertical intervals. Secure anchors to existing wall with two 9 mm (3/8 inch) by 75 mm (3 inch) expansion bolts or two power-driven fasteners.
4. Anchor abutting interior masonry partitions to existing concrete and existing masonry construction, with adjustable wall ties. Extend ties minimum 100 mm (4 inches) into joints of new masonry. Fasten ties to existing concrete and masonry construction, with powder actuated drive pins, nail or other means that provides rigid anchorage. Install anchors at 400 mm (16 inch) maximum vertical intervals.

E. Masonry Furring:
1. Anchor masonry furring less than 100 mm (4 inches) nominal thick to masonry walls or to concrete with adjustable wall ties or dovetail anchors.
2. Space at maximum 400 mm (16 inches) on center in both directions.

F. Anchorage to Steel Beams or Columns:
1. Use adjustable beam anchors on each flange.
2. At columns weld steel rod to steel columns at 300 mm (12 inch) intervals, and place wire ties in masonry courses at 400 mm (16 inches) maximum vertically.

3.3 INSTALLATION - REINFORCEMENT

A. Joint Reinforcement:

1. Install joint reinforcement in CMU wythe of combination brick and CMU, cavity walls, and single wythe concrete masonry unit walls or partitions.
2. Reinforcing is acceptable in lieu of individual ties for anchoring brick facing to CMU backup in exterior masonry walls.
3. Locate joint reinforcement in mortar joints at 400 mm (16 inch) maximum vertical intervals.
4. Additional joint reinforcement is required in mortar joints at both 200 mm (8 inches) and 400 (16 inches) above and below windows, doors, louvers and similar openings in masonry.
5. Wherever brick masonry is backed up with stacked bond masonry, install multiple wythe joint reinforcement in every two courses of CMU backup, and in corresponding joint of facing brick.

B. Steel Reinforcing Bars:

1. Install reinforcing bars in cells of hollow masonry units where required for vertical reinforcement and in bond beam units for horizontal reinforcement. Install in wall cavities of reinforced masonry walls where indicated on drawings.
2. Bond Beams:
   a. Form Bond beams of load-bearing concrete masonry units filled with grout and reinforced with two No. 15m (No. 5) reinforcing bars unless shown otherwise. Do not cut reinforcement.
   b. Brake bond beams only at expansion joints and at control joints, if shown.
3. Stack Bond:
   a. Locate additional joint reinforcement in vertical and horizontal joints as indicated on drawings.
   b. Anchor vertical reinforcement into foundation or wall or bond beam below.
   c. Provide temporary bracing for walls over 8 feet tall until permanent horizontal bracing is completed.

3.4 INSTALLATION - BRICK EXPANSION AND CMU CONTROL JOINTS

A. Provide CMU control joints (CJ) where indicated on drawings.

B. Keep joint free of mortar and other debris.

C. Joints Occur In Masonry Walls:

1. Install preformed compressible joint filler in brick wythe.

2. Install cross shaped shear keys in concrete masonry unit wythe with preformed compressible joint filler on both sides of shear key.

D. Use standard notched concrete masonry units (sash blocks) made in full and half-length units where shear keys are used to create a continuous vertical joint.

E. Interrupt joint reinforcement at expansion and control joints.

F. Fill opening in exposed face of expansion and control joints with sealant as specified in Section 07 92 00, JOINT SEALANTS.

3.5 INSTALLATION - BUILDING EXPANSION AND SEISMIC JOINTS

A. Keep expansion and seismic joints open and free of mortar. Remove mortar and other debris.

B. Install non-combustible, compressible type joint filler to fill space completely except where sealant is shown on joints in exposed finish work.

C. Fill opening in exposed face of expansion and seismic joints with sealant as specified in Section 07 92 00, JOINT SEALANTS.

3.6 INSTALLATION - ISOLATION JOINT

A. Where full height walls and partitions lie parallel or perpendicular to and under structural beams and shelf angles, provide minimum 9 mm (3/8 inch) separation between walls and partitions and bottom of beams and shelf angles.

B. Insert continuous full width strip of non-combustible type compressible joint filler.

C. Fill opening in exposed face of isolation joints with sealant as specified in Section 07 92 00, JOINT SEALANTS.

3.7 INSTALLATION - CONCRETE MASONRY UNITS

A. Types and Uses:

1. Provide special concrete masonry shapes as required, including lintel and bond beam units, sash units, and corner units. Provide solid concrete masonry units, where full units cannot be installed, or where needed for anchorage of accessories.
2. Provide solid load-bearing concrete masonry units or grout cell of hollow units at jambs of openings in walls, where structural members impose loads directly on concrete masonry, and where shown.
3. Provide rounded corner (bullnose) shapes at opening jambs in exposed work and at exterior corners.
4. Do not install brick jambs in exposed finish work.

5. Install concrete building brick only as filler in backup material where not exposed.
6. Construct fire resistance in fire rated partitions meeting fire ratings indicated on drawings.
7. Structural Clay Tile Units (Option):
   a. Structural clay tile units load-bearing or non-load bearing as required, may be installed in lieu of concrete masonry units, only, but not as an exposed surface, foundation walls or where otherwise noted.
   b. Set units as specified for concrete masonry units.
   c. Install brick or load-bearing structural clay tile units, with cores set vertically, and filled with grout where structural members impose concentrated load directly on structural clay tile masonry.
8. Where lead-lined concrete masonry unit partitions terminate below underside of overhead floor or roof deck, fill remaining open space between top of partition and underside of overhead floor or roof deck, with standard concrete masonry units of same thickness as lead lined units.

B. Laying:
1. Lay concrete masonry units with 9 mm (3/8 inch) joints, with a bond overlap of minimum 1/4 of unit length, except where stack bond is indicated on drawings.
2. Do not wet concrete masonry units before laying.
3. Bond external corners of partitions by overlapping alternate courses.
4. Lay first course in a full mortar bed.
5. Set anchorage items as work progress.
6. Where ends of anchors, bolts, and other embedded items, project into voids of units, completely fill voids with mortar or grout.
7. Provide 6 mm (1/4 inch) open joint for sealant between exterior walls, and abutting masonry partitions.
8. Lay concrete masonry units with full face shell mortar beds and fill head joint beds for depth equivalent to face shell thickness.
9. Lay concrete masonry units so cores of units, that are to be filled with grout, are vertically continuous with joints of cross webs of such cores completely filled with mortar. Unobstructed core openings minimum 50 mm (2 inches) by 75 mm (3 inches).

10. Do not wedge masonry against steel reinforcing. Minimum 13 mm (1/2 inch) clear distance between reinforcing and masonry units.
11. Install deformed reinforcing bars of sizes indicated on drawings.
12. At time of placement, ensure steel reinforcement is free of loose rust, mud, oil, and other contamination capable of affecting bond.
13. Place steel reinforcement at spacing indicated on drawings before grouting.
14. Minimum clear distance between parallel bars: One bar diameter.
15. Hold vertical steel reinforcement in place vertically by centering clips, caging devices, tie wire, or other approved methods.
16. Support vertical bars near each end and at maximum 192 bar diameter on center.
17. Splice reinforcement or attach reinforcement to dowels by placing in contact and securing with wire ties.
18. Stagger splices in adjacent horizontal reinforcing bars. Lap reinforcing bars at splices a minimum of 40 bar diameters.
19. Grout cells of concrete masonry units, containing reinforcing bars, solid as specified.
20. Install cavity and joint reinforcement as masonry work progresses.
21. Rake joints 6 to 10 mm (1/4 to 3/8 inch) deep for pointing with colored mortar when colored mortar is not full depth.

C. Waterproofing Parging:
1. Parge earth side of concrete masonry unit basement walls with mortar applied in two coats, each coat 6 mm (1/4 inch) thick.
2. Clean wall surfaces to receive parging of dirt, oil, or grease, and moisten before application of first coat.
3. Roughen first coat when partially set, permit to hardened for 24 hours, and moisten before application of second coat.
4. Keep second coat damp for minimum 48 hours.
5. Thicken parging and round to form a cove at the junction of outside wall face and footing.

3.8 POINTING

A. Fill joints with pointing mortar using rubber float trowel to apply mortar solidly into raked joints.
B. Wipe off excess mortar from joints of glazed masonry units with dry cloth.
C. Tool exposed joints to smooth concave joint.
D. At joints with existing work, match existing joint.

3.9 GROUTING

A. Preparation:
   1. Clean grout space of mortar droppings before placing grout.
   2. Close cleanouts.
   3. Install vertical solid masonry dams across grout space for full height of wall at intervals of maximum 9000 mm (30 feet). Do not bond dam units into wythes as masonry headers.
   4. Verify reinforcing bars are installed as indicated on drawings.

B. Placing:
   1. Place grout in grout space in lifts as specified.
   2. Consolidate each grout lift after free water has disappeared but before plasticity is lost.
   3. Do not slush with mortar or use mortar with grout.
   4. Interruptions:
      a. When grouting must be stopped for more than an hour, top off grout 40 mm (1-1/2 inches) below top of last masonry course.
      b. Grout from dam to dam on high lift method.
      c. Longitudinal run of masonry may be stopped off only by raking back one-half masonry unit length in each course and stopping grout 100 mm (4 inches) back of rake on low lift method.

C. Puddling Method:
   1. Consolidate by puddling with grout stick during and immediately after placing.
   2. Grout cores of concrete masonry units containing reinforcing bars solid as masonry work progresses.

D. Low Lift Method:
   1. Construct masonry to 1.5 m (5 feet) maximum height before grouting.
   2. Grout in one continuous operation and consolidate grout by mechanical vibration and reconsolidate after initial water loss and settlement has occurred.

E. High Lift Method:
   1. Do not pour grout until masonry wall has cured minimum of 4 hours.
   2. Place grout in 1.5 m (5 feet) maximum lifts.
   3. Exception:
      a. Where following conditions are met, place grout in 3.86 m (12.67 feet) maximum lifts.
      b. Masonry has cured minimum of 4 hours.

c. Grout slump is maintained between 250 and 275 mm (10 and 11 inches).

d. No intermediate reinforced bond beams are placed between top and bottom of grout lift.

4. When vibrating succeeding lifts, extend vibrator 300 to 450 mm (12 to 18 inches) into preceding lift.

3.10 PLACING REINFORCEMENT

A. General: Clean reinforcement of loose rust, mill scale, earth, ice or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on drawings or approved submittal drawings, or bars with reduced cross-section due to excessive rusting or other causes.

B. Position reinforcement accurately at spacing indicated on drawings. Support and secure vertical bars against displacement. Install horizontal reinforcement as masonry work progresses. Where vertical bars are shown in close proximity, provide clear distance between bars of minimum one bar diameter or 25 mm (1 inch), whichever is greater.

C. For columns, piers and pilasters, maintain clear distance between vertical bars as indicated on drawings, minimum 1.5 bar diameters or 38 mm (1-1/2 inches), whichever is greater. Provide lateral ties as indicated on drawings.

D. Splice reinforcement bars only where indicated on drawings, unless approved by Contracting Officer's Representative. Provide lapped splices. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.

E. Provide minimum lap as indicated on approved submittal drawings, or if not indicated, minimum 48 bar diameters.

F. Weld splices where indicated on drawings according to AWS D1.4/D1.4M.

G. Embed metal ties in mortar joints as work progresses, with minimum mortar cover of 15 mm (5/8 inch) on exterior face of walls and 13 mm (1/2 inch) at other locations.

H. Embed prefabricated horizontal joint reinforcement as work progresses, with minimum cover of 15 mm (5/8 inch) on exterior face of walls and 13 mm (1/2 inch) at other locations. Lap joint reinforcement minimum 150 mm (6 inches) at ends. Use prefabricated “L” and “T” sections to provide continuity at corners and intersections. Cut and bend joint reinforcement for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

I. Anchoring: Anchor reinforced masonry work to supporting structure as indicated on drawings.

J. Anchor reinforced masonry walls at intersections with non-reinforced masonry.

3.11 INSTALLATION OF REINFORCED CONCRETE UNIT MASONRY

A. Do not wet concrete masonry units (CMU).

B. Lay CMU units with full-face shell mortar beds. Fill vertical head joints (end joints between units) solidly with mortar from face of unit to distance behind face equal to thickness of longitudinal face shells. Solidly bed cross-webs of starting courses in mortar. Maintain head and bed 9 mm (3/8 inch) joint widths.

C. Where solid CMU units are shown, lay with full mortar head and bed joints.

D. Walls:

1. Pattern Bond: Lay CMU wall units in 1/2-running bond with vertical joints in each course centered on units in courses above and below, unless otherwise indicated. Bond and interlock each course at corners and intersections. Use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams and other special conditions.

2. Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide minimum clear dimension indicated and to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.

3. Where horizontally reinforced beams (bond beams) are indicated on drawings, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms.

E. Columns, Piers and Pilasters:

1. Use CMU units of size, shape and number of vertical core spaces shown. If not shown, use units which provide minimum clearances and grout coverage for number and size of vertical reinforcement bars shown.

2. Provide pattern bond shown, or if not shown, alternate head joints in vertical alignment.

F. Grouting:
   1. Use fine grout for filling spaces less than 100 mm (4 inches) in one or both horizontal directions.
   2. Use coarse grout for filling 100 mm (4 inch) spaces or larger in both horizontal directions.
   3. Grouting Technique: At Contractor’s option, use either low-lift or high-lift grouting techniques.
G. Low-Lift Grouting:
   1. Provide minimum clear dimension of 50 mm (2 inches) and clear area of 5160 sq. mm (8 sq. inches) in vertical cores to be grouted.
   2. Place vertical reinforcement before grouting of CMU. Extend above elevation of maximum pour height as required for splicing. Support in position at vertical intervals not exceeding 192 bar diameters nor 3 m (10 feet).
   3. Lay CMU to maximum pour height. Do not exceed 1.5 m (5 feet) height, or if bond beam occurs below 1.5 m (5 feet) height, stop pour 38 mm (1-1/2 inches) below top of bond beam.
   4. Rod or vibrate grout during placing. Place grout continuously; do not interrupt pouring of grout for more than one hour. Terminate grout pours 38 mm (1-1/2 inches) below top course of pour.
   5. Bond Beams: Stop grout in vertical cells 38 mm (1-1/2 inches) below bond beam course. Place horizontal reinforcement in bond beams; lap at corners and intersections as indicated on drawings. Place grout in bond beam course before filling vertical cores above bond beam.

3.12 CONSTRUCTION TOLERANCES

A. Lay masonry units plumb, level and true to line within tolerances according to ACI 530.1/ASCE 6/TMS 602 and as follows:
B. Maximum variation from plumb:
   1. In 3000 mm (10 feet) - 6 mm (1/4 inch).
   2. In 6000 mm (20 feet) - 9 mm (3/8 inch).
   3. In 12,000 mm (40 feet) or more - 13 mm (1/2 inch).
C. Maximum variation from level:
   1. In any bay or up to 6000 mm (20 feet) - 6 mm (1/4 inch).
   2. In 12,000 mm (40 feet) or more - 13 mm (1/2 inch).
D. Maximum variation from linear building lines:
   1. In any bay or up to 6000 mm (20 feet) - 13 mm (1/2 inch).
   2. In 12,000 mm (40 feet) or more - 19 mm (3/4 inch).

E. Maximum variation in cross-sectional dimensions of columns and thickness of walls from dimensions shown:
   1. Minus 6 mm (1/4 inch).
   2. Plus 13 mm (1/2 inch).
F. Maximum variation in prepared opening dimensions:
   1. Accurate to minus 0 mm (0 inch).
   2. Plus 6 mm (1/4 inch).

3.13 CLEANING AND REPAIR

A. General:
   1. Clean exposed masonry surfaces on completion.
   2. Protect adjoining construction materials and landscaping during cleaning operations.
   3. Cut out defective exposed new joints to depth of approximately 19 mm (3/4 inch) and repoint.
   4. Remove mortar droppings and other foreign substances from wall surfaces.
B. Brickwork:
   1. First wet surfaces with clean water, then wash down with detergent solution. Do not use muriatic acid.
   2. Brush with stiff fiber brushes while washing, and immediately wash with clean water.
   3. Remove traces of detergent, foreign streaks, or stains of any nature.
C. Concrete Masonry Units:
   1. Immediately following setting, brush exposed surfaces free of mortar or other foreign matter.
   2. Allow mud to dry before brushing.
D. Glazed Structural Facing Tile or Brick Units:
   1. Clean as recommended manufacturer. Protect light colored mortar joints from discoloration during cleaning.
   2. Use on solid masonry walls.
   3. Prepare schedule of test locations.

- - E N D - -

SECTION 04 26 13 - MASONRY VENEER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Brick - BRK-1.
2. Mortar materials.
3. Ties and anchors.
4. Embedded flashing.
5. Accessories.
6. Mortar mixes.

B. Products Installed but not Furnished under This Section:

1. Steel lintels in masonry veneer.
2. Steel shelf angles for supporting masonry veneer.

C. Related Requirements:

1. Section 05 12 00 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
2. Section 07 62 00 "Sheet Metal Flashing and Trim" for sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:

1. Masonry Units: Indicate sizes, profiles, coursing, and locations of special shapes.
2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

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C. Samples for Initial Selection:

1. Clay face brick , in the form of straps of five or more bricks.
2. Colored mortar.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of the following:

1. Masonry units.
   a. Include data on material properties .
   b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
   c. For exposed brick, include test report for efflorescence in accordance with ASTM C67/C67M.
2. Cementitious materials. Include name of manufacturer, brand name, and type.
3. Mortar admixtures.
4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
5. Anchors, ties, and metal accessories.

B. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test in accordance with ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.

C. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.6 MOCKUPS

A. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 01 40 00 "Quality Requirements" for mockups.

1. Build sample panels for typical exterior and interior walls in sizes approximately 48 inches long by 48 inches high.
2. Build sample panels facing south.
3. Clean one-half of exposed faces of panels with masonry cleaner indicated.
4. Protect approved sample panels from the elements with weather-resistant membrane.
5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by COR in writing.

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a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by COR in writing.

B. Integrated Wall Mockup: Build mockup ,. and to set quality standards for installation . See Section 01 43 39 "Mockups" for additional construction requirements for integrated exterior mockups.

1. Build mockup as indicated on Drawings .
2. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
3. Protect accepted mockups from the elements with weather-resistant membrane.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless COR specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of veneer, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down face of veneer, and hold cover securely in place.

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B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry. Immediately remove grout, mortar, and soil that come in contact with masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain exposed masonry units from single producer or manufacturer.

B. For exposed masonry units and cementitious mortar components, obtain each color and grade from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects will be exposed in the completed Work and will be within 20 ft. vertically and horizontally of a walking surface.

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2.3 BRICK

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units.

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including corners, movement joints, bond beams, sashes, and lintels .

B. Clay Face Brick - BRK-1:Facing brick complying with ASTM C216 .

1. Basis-of-Design: Red brick to match Building 209 or approved equal.
2. Brick Source: Morin Brick, PO Box 1510, 130 Morin Brick Road, Auburn, ME 04210. Contact: Jason Lachance, 207-784-9375. jlachance@morinbrick.com
3. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested in accordance with ASTM C67/C67M.
4. Efflorescence: Provide brick that has been tested in accordance with ASTM C67/C67M and is rated "not effloresced."
5. Surface Coating: Brick with colors or textures produced by application of coatings withstand 50 cycles of freezing and thawing in accordance with ASTM C67/C67M with no observable difference in the applied finish when viewed from 10 ft. or have a history of successful use in Project's area.
6. Size (Actual Dimensions): 2 1/4" x 3 5/8" x 7 5/8" long . To match Building 209 .
7. Color and Texture: To match Building 209 .

2.4 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content will not be more than 0.1 percent when tested in accordance with ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Aggregate for Mortar: ASTM C144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

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3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

E. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C , and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Manufacturers: Subject to compliance with requirements, provide one of the following:
   a. Euclid Chemical Company (The); an RPM company.
   b. GCP Applied Technologies Inc.

F. Water: Potable.

2.5 TIES AND ANCHORS

A. General: Ties and anchors extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Stainless Steel Wire: ASTM A580/A580M, Type 304 .
2. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304 .

C. Ties and Anchors: See Structural Notes on Sheet MCR-SN-101, Article on Brick and Masonry Anchored Veneer.

2.6 EMBEDDED FLASHING

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

1. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304 , 0.016 inch thick.
2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 ft.. Provide splice plates at joints of formed, smooth metal flashing.
3. Fabricate through-wall flashing with sealant stop indicated. Fabricate by bending metal back on itself 3/4 inch at exterior face of wall and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
4. Fabricate metal for sawtooth metal flashing from plain metal flashing of same metal as sawtooth flashing and extending at least 3 inches into wall with hemmed inner edge to receive sawtooth flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam sheds water.
5. Fabricate metal drip edges from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.

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6. Fabricate metal sealant stops from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
7. Solder metal items at corners.

B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.7 ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.

B. Weep/Vent Products: Use the following unless otherwise indicated:

1. Rectangular Plastic Weep/Vent Tubing: Clear butyrate, 3/8 by 1-1/2 by 3-1/2 inches long.

C. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Mortar Deflector: Strips, full depth of cavity and 16 inches high, with dovetail-shaped notches that prevent clogging with mortar droppings.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Advanced Building Products Inc.
      2) Hohmann & Barnard, Inc.
      3) Keene Building Products.
      4) Mortar Net Solutions.
      5) Wire-Bond.
      6) York Manufacturing, Inc.
2. Rainscreen Drainage Mat: Sheets or strips not less than full depth of cavity thick and installed to full height of cavity, with additional strips 4 inches high at weep holes and thick enough to fill entire depth of cavity to prevent weep holes from clogging with mortar.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Advanced Building Products Inc.
      2) CavClear; a division of Archovations, Inc.
      3) Keene Building Products.
      4) Mortar Net Solutions.
      5) Wire-Bond.

D. Proprietary Acidic Masonry Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or

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damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Diedrich Technologies, Inc.; a Hohmann & Barnard company.
   b. EaCo Chem, Inc.
   c. PROSOCO, Inc.

2.8 MORTAR MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime mortar unless otherwise indicated.
3. For exterior masonry, use portland cement-lime mortar.
4. For reinforced masonry, use portland cement-lime mortar.
5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Use Type N unless another type is indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp,

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unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

D. Matching Existing Masonry in Building 209: Match coursing, bonding, color, and texture of existing masonry.

E. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested in accordance with ASTM C67/C67M. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 ft., or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 ft., 1/4 inch in 20 ft., or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 ft., 3/8 inch in 20 ft., or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 ft., 1/4 inch in 20 ft., or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 ft., 3/8 inch in 20 ft., or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 ft., or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

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1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch .
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in stack bond ; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

A. Lay masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

B. Lay hollow brick with face shells fully bedded in mortar and with head joints of depth equal to bed joints. At starting course, fully bed entire units, including area under cells.

1. At anchors and ties, fully bed units and fill cells with mortar as needed to fully embed anchors and ties in mortar.

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C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.6 ANCHORED MASONRY VENEERS

A. Anchor masonry veneers to wall framing and concrete and masonry backup with seismic masonry-veneer anchors to comply with the following requirements:

1. Fasten screw-attached and seismic anchors through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
2. Embed connector sections and continuous wire in masonry joints.
3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
4. Space anchors as indicated, but not more than 18 inches o.c. vertically and 24 inches o.c. horizontally, with not less than one anchor for each 2 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 8 inches, around perimeter.

B. Provide not less than 2 inches of airspace between back of masonry veneer and face of insulation unless otherwise shown.

1. Keep airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete to comply with the following:

1. Provide an open space not less than 1 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.8 EXPANSION JOINTS

A. General: Install expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span expansion joints without provision to allow for in-plane wall or partition movement.

B. Form expansion joints as follows:

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1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
2. Build flanges of factory-fabricated, expansion-joint units into masonry.
3. Build in compressible joint fillers where indicated.
4. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 07 92 00 "Joint Sealants."

C. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 07 92 00 "Joint Sealants," but not less than 3/8 inch .

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.9 LINTELS

A. Install steel lintels where indicated.

B. Provide offset angle supports where indicate and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are indicated without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.10 FLASHING, WEEP HOLES, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. Extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under air and water barrier , lapping at least 4 inches.
3. At lintels and shelf angles, extend flashing 6 inches minimum , to edge of next full unit at each end. At heads and sills, extend

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flashing 6 inches minimum and turn ends up not less than 2 inches to form end dams.

4. Interlock end joints of sawtooth sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 07 92 00 "Joint Sealants" for application indicated.
5. Install metal drip edges and sealant stops with sawtooth sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 07 92 00 "Joint Sealants" for application indicated.

C. Install reglets and nailers for flashing and other related construction where they are indicated to be built into masonry.

D. Install weep holes in veneers in head joints of first course of masonry immediately above embedded flashing.

1. Use specified weep/cavity vent products to form weep holes.
2. Space weep holes 24 inches o.c. unless otherwise indicated.
3. Space weep holes formed from plastic tubing 16 inches o.c.
4. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.

E. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Accessories" Article.

F. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements will be at Contractor's expense.

B. Inspections: Special inspections in accordance with Level 2 in TMS 402.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.

C. Testing Prior to Construction: One set of tests.

D. Clay Masonry Unit Test: For each type of unit provided, in accordance with ASTM C67/C67M for compressive strength.

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E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, in accordance with ASTM C780.

3.12 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.13 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in each dimension.

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2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 31 20 00 "Earth Moving."
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 26 13

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SECTION 04 72 00 - CAST STONE MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Trim units - CST-1.
2. Decorative elements - CST-1.
3. Mortar materials.
4. Accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For cast stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.

1. Include building elevations showing layout of units and locations of joints and anchors.

C. Samples for Initial Selection: For colored mortar.

D. Samples for Verification:

1. For each color and texture of cast stone required, 4 inches square in size.
2. For each trim shape required, 4 inches in length.
3. For colored mortar, make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer .

1. Include copies of material test reports, indicating compliance of cast stone with ASTM C1364.

B. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C1364.

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1. Provide test reports based on testing within previous six months.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer of cast stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by CSI or APA or PCI for Group A, Category AT.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockup for typical cornice piece and installation including accessories.
   a. Size: As indicated on Drawings.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless COR specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work and to minimize the need for on-site storage.

B. Pack, handle, and ship cast stone units in suitable packs or pallets.

1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units if required, using dollies with wood supports.
2. Store cast stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

1.6 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in TMS 602.

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1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements in TMS 602.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Cast Stone: Obtain cast stone units from single source from single manufacturer.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

2.2 CAST STONE MATERIALS

A. General: Comply with ASTM C1364.

B. Portland Cement: ASTM C150/C150M, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C114. Provide natural color or white cement as required to produce cast stone color indicated.

C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C33/C33M; gradation and colors as needed to produce required cast stone textures and colors.

D. Fine Aggregates: Natural sand or crushed stone complying with ASTM C33/C33M, gradation and colors as needed to produce required cast stone textures and colors.

E. Color Pigment: ASTM C979/C979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.

F. Admixtures: Use only admixtures specified or approved in writing by Architect.

1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.
2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.
3. Air-Entraining Admixture: ASTM C260/C260M. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate

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to result in an air content of 4 to 6 percent, except do not add to zero-slump concrete mixes.
4. Water-Reducing Admixture: ASTM C494/C494M, Type A.
5. Water-Reducing, Retarding Admixture: ASTM C494/C494M, Type D.
6. Water-Reducing, Accelerating Admixture: ASTM C494/C494M, Type E.

G. Reinforcement:

1. Plain-Steel, Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.
2. Galvanized-Steel, Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from galvanized-steel wire into flat sheets.

H. Embedded Anchors and Other Inserts: Fabricated from stainless steel complying with ASTM A240/A240M, ASTM A276/A276M, or ASTM A666, Type 304 .

2.3 CAST STONE UNITS

A. Cast Stone Units - CST-1: Comply with ASTM C1364.

1. Basis-of-Design: Architectural Cast Stone, Mix #1569. Address: 2775 Norton Creek Drive, West Chicago, IL 60185. Ph: 630-377-4800. www.ACScaststone.com. Or approved equal.
2. Units are manufactured using the manufacturer's selected method.
3. Wall Panels: Sizes as indicated on Drawings .
4. Trim units including window sills lintels copings cornices wall caps keystones .

B. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.

1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
3. Provide drips on projecting elements unless otherwise indicated.

C. Fabrication Tolerances:

1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch.
2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch, whichever is greater, but in no case by more than 1/4 inch.
3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch, whichever is greater.
4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch on formed surfaces of units and 3/8 inch on unformed surfaces.

D. Cure Units as Follows:

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1. Cure units in enclosed, moist curing room at 95 percent relative humidity and temperature of 100 deg F for 12 hours or 70 deg F for 16 hours.
2. Keep units damp and continue curing to comply with one of the following:
   a. No fewer than five days at mean daily temperature of 70 deg F or above.
   b. No fewer than seven days at mean daily temperature of 50 deg F or above.

E. Acid etch units after curing to remove cement film from surfaces to be exposed to view.

F. Colors and Textures: To match stone on Building 200. COR to select from manufacturer's full range of colors.

2.4 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Aggregate for Mortar: ASTM C144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.

E. Water: Potable.

2.5 ACCESSORIES

A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A240/A240M, ASTM A276/A276M, or ASTM A666 .

B. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

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a. Diedrich Technologies, Inc.; a Hohmann & Barnard company.
b. EaCo Chem, Inc.
c. PROSOCO, Inc.

2.6 MORTAR MIXES

A. Do not use admixtures including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime mortar unless otherwise indicated.

B. Comply with ASTM C270, Proportion Specification.

1. For setting mortar, use Type N.
2. For pointing mortar, use Type N .

C. Preblended dry mortar mix complying with ASTM C1714/C1714M and capable of producing mortar strength as indicated in ASTM C270.

1. For setting mortar, use Type N.
2. For pointing mortar, use Type N .

2.7 SOURCE QUALITY CONTROL

A. Engage a qualified independent testing agency to sample and test cast stone units according to ASTM C1364.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING ANCHORED CAST STONE WITH SEALANT-FILLED JOINTS

A. Set cast stone as indicated in TMS 604.

B. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.

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1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
2. Shim and adjust anchors, supports, and accessories to set cast stone in locations indicated with uniform joints.

C. Keep cavities open where unfilled space is indicated between back of cast stone units and backup wall; do not fill cavities with mortar or grout.

D. Fill anchor holes with sealant.

1. Where dowel holes occur at pressure-relieving joints, provide compressible material at ends of dowels.

E. Set cast stone supported on clip or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths. Hold shims back from face of cast stone a distance at least equal to width of joint.

F. Keep joints free of mortar and other rigid materials. Remove temporary shims and spacers from joints after anchors and supports are secured in place and cast stone units are anchored. Do not begin sealant installation until temporary shims and spacers are removed.

1. Form open joint of width indicated, but not less than 3/8 inch .

G. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.

H. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 07 92 00 "Joint Sealants."

3.3 INSTALLATION TOLERANCES

A. Variation from Plumb: Do not exceed , 1/4 inch in 20 ft., or 1/2 inch maximum.

B. Variation from Level: Do not exceed , 1/4 inch in 20 ft., or 1/2 inch maximum.

C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less.

D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch, except where variation is due to warpage of units within tolerances specified.

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3.4 ADJUSTING AND CLEANING

A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.

B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean cast stone as work progresses.

1. Remove mortar fins and smears before tooling joints.
2. Remove excess sealant immediately, including spills, smears, and spatter.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain COR's approval of sample cleaning before proceeding with cleaning of cast stone.
3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean cast stone by methods described in Cast Stone Institute Technical Bulletin #39.
6. Clean cast stone with proprietary acidic cleaner applied according to manufacturer's written instructions.

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SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Structural steel shapes, plates, and bars.
   2. Bolts, nuts, and washers.

1.2 RELATED REQUIREMENTS

A. Materials Testing And Inspection During Construction: Section 01 45 29, TESTING LABORATORY SERVICES.
B. Steel Joist: Section 05 21 00, STEEL JOIST FRAMING.
C. Steel Decking: Section 05 31 00, STEEL DECKING.
D. Steel Support: Section 10 13 00, DIRECTORIES.
E. Painting: Section 09 91 00, PAINTING.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.
B. American Institute of Steel Construction (AISC):
   1. AISC Manual - Steel Construction Manual, 14th Ed.
   2. 303-10 - Code of Structural Steel Buildings and Bridges.
   3. 360-10: Specification for Structural Steel Buildings.
C. The American Society of Mechanical Engineers (ASME):
   1. B18.22.1-09 - Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers.
D. American Welding Society (AWS):
   1. D1.1/D1.1M-15 - Structural Welding Code - Steel.
E. ASTM International (ASTM):
   1. A6/A6M-14 - General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
   2. A36/A36M-14 - Carbon Structural Steel.
   3. A53/A53M-12 - Pipe, Steel, Black and Hot-Dip, Zinc-Coated, Welded and Seamless.
   4. A123/A123M-15 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   5. A242/A242M-13 - High-Strength Low-Alloy Structural Steel.
   6. A283/A283M-13 - Low and Intermediate Tensile Strength Carbon Steel Plates.

7. A307-14 - Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
8. A500/A500M-13 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing and Rounds and Shapes.
9. A501/A501M-14 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing and Rounds and Shapes.
10. A572/A572M-15 - High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
11. A992/A992M-15 - Structural Shapes.
12. F2329/F2329M-15 - Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy steel Bolts, Screws, washers, Nuts, and Special Threaded Fasteners.
13. F3125/F3125M-15 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions

F. Master Painters Institute (MPI):
1. No. 18 - Primer, Zinc Rich, Organic.

G. Military Specifications (Mil. Spec.):
1. MIL-P-21035 - Paint, High Zinc Dust Content, Galvanizing, Repair.

H. Occupational Safety and Health Administration (OSHA):
1. 29 CFR 1926.752(e) - Guidelines For Establishing The Components Of A Site-Specific Erection Plan.
2. 29 CFR 1926-2001 - Safety Standards for Steel Erection.

I. Research Council on Structural Connections (RCSC) of The Engineering Foundation:
1. Specification for Structural Joints Using ASTM F3125 Bolts.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:
1. Show size, configuration, and fabrication and installation details.

C. Sustainable Construction Submittals:
1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

D. Test Reports: Certify products comply with specifications.
1. Welders' qualifying tests.

E. Certificates: Certify each product complies with specifications.

1. Structural steel.
2. Steel connections.
3. Welding materials.
4. Shop coat primer paint.

F. Qualifications: Substantiate qualifications comply with specifications.
1. Fabricator.
2. Installer.
3. Welders and welding procedures.

G. Delegated Design Drawings and Calculations: Signed and sealed by responsible Architect/Engineer.
1. Connection calculations.

H. Record Surveys: Signed and sealed by responsible surveyor or engineer.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: AISC Quality Certification participant designated as AISC Certified Plant, Category STD.
1. Regularly fabricates specified products.
2. Fabricated specified products with satisfactory service on five similar installations for minimum five years.

B. Installer Qualifications: AISC Quality Certification Program participant designated as AISC-Certified Erector, Category ACSE.
1. Regularly installs specified products.
2. Installed specified products with satisfactory service on five similar installations for minimum five years.

C. Before commencement of Work, ensure steel erector provides written notification required by OSHA 29 CFR 1926.752(e). Submit a copy of the notification to Contracting Officer's Representative.

D. Welders and Welding Procedures Qualifications: AWS D1.1/D1.1M.

1.6 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Delegated Design: Prepare submittal documents including design calculations and drawings signed and sealed by registered design professional, licensed in state where project is located.

B. Design structural steel framing connections complying with specified performance:

1. Load Capacity: Resist full capacity of supported framing member. Account for connection and member loads and eccentricities.
   a. Request additional design criteria when necessary to complete connection design.
2. Configuration: Design and detail all connections for each member size, steel grade and connection type to resist the loads and reactions indicated on the drawings or specified herein. Use details consistent with details shown on drawings, supplementing where necessary. The details shown on drawings are conceptual and do not indicate the required weld sizes or number of bolts unless specifically noted. Use rational engineering design and standard practice in detailing, accounting for all loads and eccentricities in both the connection and the members. Promptly notify the Contracting Officer Representative of any location where the connection design criteria is not clearly indicated. The design of all connections is subject to the review and acceptance of the Contracting Officer's Representative. Submit structural calculations prepared and sealed by a qualified engineer registered in the state where the project is located. Submit calculations for review before preparation of detail drawings.
3.

2.2 MATERIALS

A. W-Shapes:

1. ASTM A992/A992M.
2. ASTM A572/A572M; Grade 50.
3. ASTM A529; Grade 50.

B. Channel and Angles:

1. ASTM A36/A36M.
2. ASTM A572/A572M; Grade 50.
3. ASTM A529; Grade 50.

C. Plates and Bars:
   1. ASTM A36/A36M.
   2. ASTM A572/A572M; Grade 50.
   3. ASTM A529; Grade 50.
D. Hollow Structural Sections:
   1. ASTM A500/A500M.
E. Structural Pipe: ASTM A53/A53M, Grade B.
F. Bolts, Nuts and Washers: Galvanized for galvanized framing and plain finish for other framing.
   1. High-strength bolts, including nuts and washers: ASTM F3125.
   2. Bolts and nuts, other than high-strength: ASTM A307, Grade A.
   3. Plain washers, other than those in contact with high-strength bolt heads and nuts: ASME B18.22.1.
G. Welding Materials: AWS D1.1, type to suit application.

2.3 PRODUCTS - GENERAL

A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.
B. Sustainable Construction Requirements:
   1. Steel Recycled Content: 30 percent total recycled content, minimum.
   2. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
      a. Paints and coatings.

2.4 FABRICATION

A. Fabricate structural steel according to Chapter M, AISC 360.
B. Shop and Field Connections:
   1. Weld connections according to AWS D1.1/D1.1M. Welds shall be made only by welders and welding operators who have been previously qualified by tests as prescribed in AWS D1.1 to perform type of work required.
   2. High-Strength Bolts: High-strength bolts tightened to a bolt tension minimum 70 percent of their minimum tensile strength. Tightening done with properly calibrated wrenches, by turn-of-nut method or by use of direct tension indicators (bolts or washers). Tighten bolts in connections identified as slip-critical using Direct Tension Indicators. Twist-off torque bolts are not an acceptable alternate fastener for slip critical connections.

2.5 FINISHES

A. Shop Priming:
   1. Prime paint structural steel according to AISC 303, Section 6.
      a. Interstitial Space Structural Steel: Prime paint, unless indicated to receive sprayed on fireproofing.

B. Shop Finish Painting: Apply primer and finish paint as specified in Section 09 91 00, PAINTING.

C. Do not paint:
   1. Surfaces within 50 mm (2 inches) of field welded joints.
   2. Surfaces indicated to be encased in concrete.
   3. Surfaces receiving sprayed on fireproofing.
   4. Beam top flanges receiving shear connector studs applied.

D. Structural Steel Galvanizing: ASTM A123/A123M, hot dipped, after fabrication. Touch-up after erection: Clean and wire brush any abraded and other spots worn through zinc coating, including threaded portions of bolts and welds and touch-up with galvanizing repair paint.
   1. Galvanize structural steel framing installed at exterior locations.

E. Bolts, Nuts, and Washers Galvanizing: ASTM F2329, hot-dipped.

2.6 ACCESSORIES

A. General: Shop paint steel according to AISC 303, Section 6.

B. Finish Paint System: Primer and finish as specified in Section 09 91 00, PAINTING.

C. Galvanizing Repair Paint: MPI No. 18.

PART 3 - EXECUTION

3.1 ERECTION

A. Erect structural steel according to AISC 303 and AISC 360.

B. Set structural steel accurately at locations and elevations indicated on drawings.

C. Maintain erection tolerances of structural steel within AISC 303 requirements.
   1. Pour Stop Elevation Tolerance: 6 mm (1/4 inch), maximum, before concrete placement.

D. Weld and bolt connections as specified for shop connections.

3.2 FIELD PAINTING

A. After welding, clean and prime weld areas to match adjacent finish.

B. Touch-up primer damaged by construction operations.

C. Apply galvanizing repair paint to galvanized coatings damaged by construction operations.

D. Finish Painting: As specified in Section 09 91 00, PAINTING.

3.3 FIELD QUALITY CONTROL

A. Record Survey:

1. Engage registered land surveyor or registered civil engineer as specified in Section 01 00 00, GENERAL REQUIREMENTS to perform survey.
2. Measure and record structural steel framing plumbness, level, and alignment after completing bolting and welding and before installation of work supported by structural steel.
3. Identify deviations from allowable tolerances specified in AISC Manual.

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SECTION 05 21 00
STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies open web, longspan, and deep longspan steel joists and joist girders.

1.2 RELATED WORK:

A. Structural Steel: Section 05 12 00, STRUCTURAL STEEL FRAMING.

B. Finish Painting: Section 09 91 00, PAINTING.

1.3 DESIGN REQUIREMENTS:

Design all elements with the latest published version of applicable Codes.

1.3 TOLERANCES:

Deviation from a straight line between ends of any installed joist shall not exceed 10 mm in 3 m (3/8 inch in 10 feet).

1.4 REGULATORY REQUIREMENTS:

STEEL JOIST INSTITUTE: Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders, (Latest Edition).

1.5 SUBMITTALS:

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop and Erection Drawings: Complete.

1. Fabrication drawings including details and schedules for the fabrication and assembly of each joist.
2. Erection drawings showing the size and location of each joist, bridging, cross bracing, bearing details, connections, welds, bolts and bearing plates.

C. Certificates: STEEL JOIST INSTITUTE compliance.

D. Design Calculations: If requested by the Resident Engineer, submit complete calculations covering the design of all members and connections. Calculations must be specifically applicable to the joists supplied.

1.6 QUALITY ASSURANCE:

Provide documentation that the joist manufacturer is a member of the Steel Joist Institute and has satisfactorily completed work of a similar scope and nature.

1.7 APPLICABLE PUBLICATIONS:

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.

B. American Institute of Steel Construction (AISC):

1. Specification for Structural Steel Buildings – Allowable Stress Design and Plastic Design (Latest Edition).
2. Load and Resistance Factor Design Specification for Structural Steel Buildings (Latest Edition).

C. American Society for Testing and Materials (ASTM):

A307-07.....Carbon Steel Bolts and Studs, 400 MPa (60,000 psi) Tensile Strength

F3125/F3125M-15.....Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions

D. American Welding Society (AWS):

D1.1-08.....Structural Welding Code – Steel

E. SSPC: The Society for Protective Coatings:

Steel Structures Painting Manual, Volumes 1 and 2

F. Steel Joist Institute (STEEL JOIST INSTITUTE):

Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders (Latest Edition).

G. U.S. Army Corps of Engineers:

CRD-C-621.....Specification for Non-Shrink Grout

PART 2 - PRODUCTS

2.1 OPEN WEB STEEL JOISTS:

K-Series conforming to STEEL JOIST INSTITUTE standard specifications.

2.2 LONGSPAN STEEL JOISTS AND DEEP LONGSPAN STEEL JOISTS:

LH-Series and DLH-Series conforming to STEEL JOIST INSTITUTE standard specifications.

2.3 ACCESSORIES – FITTINGS:

A. Accessories and fittings, including end supports and bridging, in accordance with standard STEEL JOIST INSTITUTE specification under which joists were designed.

B. Unfinished Threaded Fasteners: ASTM A307, Grade A, regular hexagon type, low carbon steel.

C. High-strength bolts, including nuts and washers: ASTM F3125 heavy hexagon structural bolts.

2.4 BEDDING MORTAR:

A. For joist ends bearing on concrete or masonry, provide bedding mortar as follows:

1. Portland cement and sand, mixed at a ratio of 1 part cement to 3 parts sand, by volume, with enough water for placement and hydration.
2. Non-metallic, shrinkage-resistant mortar; premixed, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C-621.

PART 3 - EXECUTION

3.1 FABRICATION:

A. Fabrication and assembly in accordance with applicable standard STEEL JOIST INSTITUTE specification:

1. Make chord splices with full penetration welds capable of developing the ultimate strength in tension of the parent material. Make no allowance for the strength of back-up bars or other material incidental to welding.
2. Provide shop-welded connection plates at panel points to receive supplemental framing.
3. Holes in Chord Members: Provide holes in chord members where shown for securing other work to steel joists; however, deduct area of holes from the area of chord when calculating strength of member.
4. Extended Ends: Provide extended ends on joists where shown, complying with manufacturer’s standards and requirements of applicable STEEL JOIST INSTITUTE specifications.

5. Bridging: Provide horizontal or diagonal type bridging for joists and joist girders, complying with STEEL JOIST INSTITUTE specifications. Provide bridging anchors for ends of bridging lines terminating at walls or beams. Provide bridging adequate to resist the loads indicated on the Contract Documents.
6. End Anchorage: Provide end anchorages, including bearing plates, to secure joists to adjacent construction, complying with STEEL JOIST INSTITUTE specifications, unless otherwise indicated. Design all end anchorages to resist a minimum net uplift of 1.6 kPa (35 pounds per square foot) of supported area.
7.
8. Provide supplemental steel support framing for metal deck where normal deck bearing is precluded by other framing members and minor openings.

3.2 SHOP PAINTING:

A. Shop painting in accordance with applicable STEEL JOIST INSTITUTE standard specification.
B. Shop paint joists and accessories with a rust-inhibiting primer paint. For joists which will be finish painted, limit paint to a primer which is compatible with specified finish paint. In high humidity areas, shop paint joists with a zinc-rich primer to receive top coats per the paint system manufacturer’s recommendations.

3.3 ERECTION:

A. Installation of joists in accordance with applicable STEEL JOIST INSTITUTE standard specification.
B. Handle joists in a manner to avoid damaging of joists. Remove damaged joists from site, except when field repair is approved and such repairs are satisfactorily made in accordance with manufacturer's recommendations.

C. Accurately set joists and end anchorage in accordance with the applicable STEEL JOIST INSTITUTE standard specification. Secure joists resting on masonry or concrete bearing surfaces by welding or bolting to the steel bearing plates as indicated on the Contract Documents. Secure bridging and anchoring in place prior to application of any construction loads. Distribute any temporary loads so that carrying

capacity of any joist is not exceeded. Loads shall not be applied to bridging where joist lengths are 12 m (40 feet) and longer. Where joist lengths are 12 m (40 feet) and longer, install a center row of bolted diagonal bridging to provide lateral stability before slackening of hoisting lines.

3.4 FIELD PAINTING:

A. Clean abraded, corroded, and field welded areas and touch up with same type of paint used in shop painting.

B. Finish painting of steel surfaces is specified in Section 09 91 00, PAINTING.

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SECTION 05 31 00
STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single pan fluted metal form deck supporting concrete fill as roof substrate.
2. Corrugated metal form deck supporting concrete fill as roof substrate.
3. Single pan fluted metal roof deck as roof substrate.
4. Acoustic metal roof deck as roof substrate.

1.2 RELATED WORK

A. Section 01 81 13. SUSTAINABLE CONSTRUCTION REQUIREMENTS.

B. Section 05 21 00, STRUCTURAL STEEL FRAMING: Structural Steel Shapes.

C. Section 09 06 00, SCHEDULE FOR FINISHES: Color.

D. Section 09 91 00, PAINTING: Finish Painting.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. AISI - American Iron and Steel Institute.

S100-16.....Specification for the Design of Cold-formed Steel Structural Members.

C. American Welding Society (AWS):

D1.1/D1.1M-20.....Structural Welding Code - Steel.

1.3/D1.3M-18..... Structural Welding Code - Sheet Steel.

D. ASTM International (ASTM):

A36/A36M-19.....Standard Specification for Carbon Structural Steel.

A653/A653M-20.....Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

A1008/A1008M-20.....Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Baked Hardenable.

C423-17.....Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

E119-20.....Standard Test Methods for Fire Tests of Building Construction and Materials.

E. FM Global (FM):

1-28-15.....Wind Design.

Factory Mutual Research Approval Guide.

F. Master Painters Institute (MPI):

No. 18.....Primer, Zinc Rich, Organic.

G. Military Specifications (Mil. Spec.):

MIL-P-21035B..... Paint, High Zinc Dust Content, Galvanizing Repair.

H. Steel Deck Institute (SDI):

No. 31-07.....Design Manual for Composite Deck, Form Decks, and Roof Decks.

I. UL LLC (UL):

Listed Online Certifications Directory.

580.....Tests for Uplift Resistance of Roof Assemblies.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. All items indicated below are required submittals requiring Contracting Officer’s Representative (COR) review and approval.

B. Submittal Drawings:

1. Show layout, connections to supporting members, anchorage, sump pans, accessories, deck openings and reinforcements.
2. Show similar information necessary for completing installation as shown and specified, including supplementary framing, ridge and valley plates, cant strips, cut openings, special jointing or other accessories.
3. Show welding, side lap, closure, deck reinforcing and closure reinforcing details.
4. Show openings required for work of other trades, including openings not shown on structural drawings. Indicate where temporary shoring is required to satisfy design criteria.

C. Manufacturer's Literature and Data:

1. Description of each product.
2. Show steel decking section properties and structural characteristics.

D. Sustainable Construction Submittals:

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

E. Certificates: Certify each product complies with specifications.

1. Fire Resistance Product Listing: For each metal deck type and thickness supporting concrete slab or fill.

2. Show steel decking is UL Listed for specified application.

3. Show noise reduction coefficient test results.

F. Qualifications: Substantiate qualifications comply with specifications.

1. Welders and welding procedures.

G. Insurance Certification: Assist the Government in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance.

1.5 QUALITY ASSURANCE

A. FM Listing: Provide metal roof deck units which have been evaluated by Factory Mutual Global and are listed in “Factory Mutual Research Approval Guide” for “Class 1” fire rated construction.

B. Welders and Welding Procedures Qualifications: AWS D1.3/D1.3M.

1.6 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design steel decking and accessories according to AISI S100.

1. Wind Uplift Resistance and Corner Conditions:
   a. Eave Overhang: 2.1 kPa (45 per square foot), minimum.
   b. Other Roof Areas: 1.4 kPa (30 per square foot), minimum.

2. Fire Resistance: ASTM E119; as component of 0 hour rated roof assembly.
3. Design side and end closures and attachment to supporting steel to safely support wet weight of concrete and construction loads.
4. Cantilever Closure Deflection: 3 mm (1/8 inch), maximum.

2.2 MATERIALS

A. Galvanized Steel Sheet: ASTM A653/A653M; G60 coating.

B. Painted Steel Sheet: ASTM A1008/A1008M, Grade C or D, shop primed.

C. Primer for Shop Painted Sheets: Manufacturer's standard primer (2 coats). When finish painting of steel decking is specified in Section 09 91 00, PAINTING primer coating shall be compatible with specified finish painting.

D. Steel Shapes: ASTM A36/A36M.

2.3 PRODUCTS - GENERAL

A. Basis of Design: Section 09 06 00, SCHEDULE FOR FINISHES.

B. Sustainable Construction Requirements:

1. Steel Recycled Content: 30 percent total recycled content, minimum.

2.4 METAL ROOF DECK

A. Metal Roof Deck: UL Listed as metal roof deck panels.
1. Steel decking of the type, depth, thickness, and section properties as shown.

B. Metal Form Deck - Type 1: Single pan fluted units as permanent form for reinforced concrete slabs.
1. Depth and Thickness: As indicated on drawings.
2. Material: Galvanized sheet steel.

C. Metal Roof Deck: Single pan fluted units with flat horizontal top surfaces as permanent support for superimposed loads.

1. Deck Style:
a. Wide Rib (Type B) deck.
2. Depth and Thickness: As indicated on drawings.

3. Material: Galvanized sheet steel.

D. Do not use steel deck for hanging supports of building components including suspended ceilings, electrical light fixtures, plumbing, heating, or air conditioning pipes or ducts or electrical conduits.
E. Include integral system for steel decking units used for interstitial levels.
   1. Provide system suitable for simple point of attachment for light duty hanger devices.
   2. Provide system suitable to allow for flexibility for attaching hangers for support of suspended ceilings, electrical, plumbing, heating, or air conditioning items, weight not to exceed 50 kg/m2 (10 psf).
   3. Provide a minimum spacing pattern of 300 mm (12 inches) on centers longitudinally and 600 mm (24 inches) on centers transversely.
   4. Maximum allowable load suspended from any hanger: 23 kg (50 pounds).
   5. System consisting of fold-down type hanger tabs or lip hanger is acceptable.

2.5 FABRICATION

A. Fabricate steel decking in sufficient lengths to extend over 3 or more supports, except for interstitial levels.
   1. Cut metal deck units to proper length in shop.
B. Fabricate accessories required to complete installation of steel decking.
   1. Exposed to View: Fabricate from sheet steel matching metal decking.
   2. Concealed from View: Fabricate from galvanized sheet steel.
C. Sheet Metal Accessories:
   1. Metal Cover Plates: For end-abutting decking, to close gaps at changes in deck direction, columns, walls and openings.
      a. Sheet Steel: Minimum 1.0 mm (0.04 inch) thick.
   2. Continuous Sheet Metal Edging: At openings, concrete slab edges and roof deck edges.
      a. Sheet Steel: Minimum 1.0 mm (0.04 inch) thick.
   3. Metal Closure Strips: For openings between decking and other construction. Form to configurations required to provide tight-fitting closures at open ends of flutes and sides of decking.
      a. Sheet Steel: Minimum 1.0 mm (0.04 inch) thick.

4. Ridge and Valley Plates: Minimum 100 mm (4 inch) wide ridge and valley plates where roof slope exceeds 1/24 (1/2 inch per foot).
   a. Sheet Steel: Minimum 1.0 mm (0.04 inch) thick.
5. Cant Strips: Provide bent metal 45 degree leg cant strips where indicated on the drawings. Fabricate cant strips with minimum 125 mm (5 inch) face width.
   a. Sheet Steel: Minimum 0.8 mm (0.03 inch) thick.
6. Seat Angles for Deck: Provide where beam does not frame into column.
7. Sump Pans for Roof Drains: Fabricated from single piece galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain. Provide sump pans of adequate size to receive roof drains and with bearing flanges minimum 75 mm (3 inches) wide. Recess pans minimum 38 mm (1-1/2 inches) below roof deck surface, unless otherwise shown or required by deck configuration. Drain holes will be field cut.
   a. Sheet Steel: Minimum 1.7 mm (0.06 inch) thick.

2.6 FINISHES

A. Shop prime painted sheet steel with two coats of primer.

2.7 ACCESSORIES

A. Primer: Manufacturer's standard primer compatible with finish painting specified in Section 09 91 00, PAINTING.
B. Welding Materials: AWS D1.1, type to suit application.
C. Galvanizing Repair Paint: MPI No. 18.
D. Touch-Up Paint: Match shop finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.
B. Protect existing construction and completed work from damage.
C. Remove contaminates from structural steel surfaces where steel decking will be welded.
D. Verify structural steel framing installation is completed, plumbed, and aligned with temporary bracing installed where required.
E. Coordinate with structural steel erector to prevent overloading of structural members when placing steel decking for installation.

3.2 ERECTION

A. Do not use floor deck units for storage or working platforms until permanently secured. Do not overload deck units once placed. Replace

deck units that become damaged after erection and before casting concrete at no cost additional to the Government.

B. Place steel decking at right angles to supporting members with ends located over supports.

C. Lap end joints 50 mm (2 inches), minimum.

D. Fluted Form Deck Fastening:

1. Fasten form deck to steel supporting members by welding.
   a. Welds: 16 mm (5/8 inch) diameter puddle welds or elongated welds of equal strength.
   b. Weld Spacing: Maximum 300 mm (12 inches) on center with minimum two welds per unit at each support.
   c. Where two units abut, fasten each unit individually to supporting steel framework.
2. End Closure Fastening: Tack weld or self-tapping No. 8 or larger machine screws at 900 mm (3 feet) on center.
   a. Longitudinal End Closure Fastening: Tack weld only.
3. Weld side laps of adjacent decking units.
   a. Fastener Locations: Mid-span and maximum 900 mm (3 feet) on center.

E. Corrugated Form Deck Fastening:

1. Weld end laps of corrugated form deck units in valley of side lap and at middle of sheet.
   a. Weld Spacing: Maximum 380 mm (15 inches) on center.
2. Weld corrugated deck to intermediate supports in X-pattern. Weld in valley of side laps on every other support and in valley of center corrugation on remaining support.
   a. Weld Spacing: Maximum 760 mm (30 inches) on center.

F. Roof Deck Fastening:

1. Fasten decking to steel supporting members by welding.
   a. Welds: 16 mm (5/8 inch) diameter puddle welds or elongated welds of equal strength.
   b. Weld Spacing: Maximum 300 mm (12 inches) on center at every support. Use closer spacing where required for lateral force resistance by diaphragm action.

2. Fasten split or partial decking panels to structure in every valley.
3. Fasten decking to each supporting member at ribs where side laps occur.
   a. Power driven fasteners is acceptable in lieu of welding if strength equivalent to welding specified above is provided. Submit test data and design calculations verifying equivalent design strength.
4. Mechanically fasten decking side laps with self-tapping No. 8 or larger machine screws.
   a. Fastener Locations: Mid-span and maximum 900 mm (3 feet) on center.
5. Provide additional fastening necessary to comply with UL Listing for specified performance.

G. Cutting and Fitting:
1. Field cut steel decking to accommodate columns and other penetrating items.
2. Cut openings located and dimensioned on Structural Drawings.
3. Coordinate openings for other penetrations shown on approved submittal drawings but not shown on Structural Drawings.
   a. Cut and reinforce required opening.
4. Make cuts neat and trim using metal saw, drill or punch-out device. Cutting with torches is prohibited.
5. Do not make cuts in the metal deck that are not shown on the approved metal decking submittal drawings.
   a. When additional openings are required, submit scaled drawing, locating required opening and other openings and supports in immediate area.
   b. Do not cut the opening until drawing is approved by Contracting Officer's Representative.
   c. Provide additional reinforcing and framing required for opening.
   d. Failure to comply with these requirements is cause for rejection of the work and removal and replacement of the affected steel decking.
6. Opening Reinforcement: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work.

H. Touch up damaged factory finishes.

1. Apply galvanizing repair paint to damaged galvanized surfaces.
2. Apply touch up paint to damaged shop painted surfaces.

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SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies materials and services required for installation of cold-formed steel, including tracks and required accessories as shown and specified. This Section includes the following:

1. Exterior load-bearing steel stud walls.
2. Interior load-bearing steel stud walls.
3. Exterior non-load-bearing steel stud curtain wall.

1.2 RELATED WORK

A. Section 01 81 13 SUSTAINABLE CONSTRUCTION REQUIREMENTS.
B. Section 05 12 00, STRUCTURAL STEEL FRAMING: Structural steel framing.
C. Section 05 21 00, STEEL JOIST FRAMING: Open web steel joists.
D. Section 09 22 16, NON-STRUCTURAL METAL FRAMING: Non-load-bearing metal stud framing assemblies.
E. Section 09 29 00, GYPSUM BOARD: Gypsum board assemblies.

1.3 DESIGN REQUIREMENTS

A. Design steel in accordance with American Iron and Steel Institute Publication "Specification for the Design of Cold-Formed Steel Structural Members", except as otherwise shown or specified.

B. Structural Performance: Engineer, fabricate and erect cold-formed metal framing with the minimum physical and structural properties indicated.

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. All items indicated below are required submittals requiring Contracting Officer’s Representative (COR) review and approval
B. Shop Drawings: Shop and erection drawings showing steel unit layout, connections to supporting members, and information necessary to complete installation as shown and specified.
C. Manufacturer's Literature and Data: Showing steel component sections and specifying structural characteristics.

D. Design of the light gauge for this project shall be provided by the contractor's structural engineer for the loads shown on the construction documents. Submit signed and sealed calculations performed by a structural engineer with at least 5 years experience in the design of light gauge metal and registered in the state of the project. Calculations shall be submitted with plans elevations and details for review and approval.

E. Sustainable Construction Submittals:

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

1.5 **APPLICABLE PUBLICATIONS**

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.

B. American Iron and Steel Institute (AISI): Specification and Commentary for the Design of Cold-Formed Steel Structural Members (2016)

C. ASTM International (ASTM):

A36/A36M-19.....Standard Specification for Carbon Structural Steel

A123/A123M-17.....Standard Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A153/A153M-16a.....Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

A307-14e1.....Standard Specifications for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength

A653/A653M-20.....Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process

C955-18e1.....Standard Specification for Cold Formed Steel Structural Framing Members

C1107/1107M-20.....Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)

E488/E488M-18.....Standard Test Methods for Strength of Anchors in Concrete Elements

E1190-11(2018).....Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members

D. American Welding Society (AWS):
D1.3/D1.3M-18.....Structural Welding Code-Sheet Steel

E. Military Specifications (Mil. Spec.):
MIL-P-21035B.....Paint, High Zinc Dust Content, Galvanizing Repair

F. VA Physical Security and Resiliency Design Manual October 1, 2020.

PART 2 - PRODUCTS

2.1 **MATERIALS**

A. Sheet Steel for joists, studs and accessories 16 gauge and heavier: ASTM A653, structural steel, zinc coated G90, with a yield of 340 MPa (50 ksi) minimum.

B. Sheet Steel for joists, studs and accessories 18 gauge and lighter: ASTM A653, structural steel, zinc coated G90, with a yield of 230 MPa (33 ksi) minimum.

C. Galvanizing Repair Paint: MIL-P-21035B.

D. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107, with fluid consistency and a 30 minute working time.

2.2 **WALL FRAMING**

A. Steel Studs: Complying with ASTM C 955. Manufacturer’s standard C-shaped steel studs of web depth indicated, with lipped flanges, and complying with the following:

1. Minimum Base-Steel Thickness(uncoated): 0.84 mm (0.0329 inch)

2. Flange Width: (1-5/8 inches)

3. Web: Punched.

B. Steel Track: Manufacturer’s standard U-shaped steel track, unpunched, of web depths indicated, with straight flanges, and complying with the following:

1. Design Uncoated-Steel Thickness: Matching steel studs.
2. Flange Width: Manufacturer’s standard deep flange where indicated, standard flange elsewhere.

2.3 **FRAMING ACCESSORIES**

A. Fabricate steel framing accessories of the same material and finish used for framing members, with a minimum yield strength of 230 MPa (33 ksi).

B. Provide accessories of manufacturer’s standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Gusset plates.
5. Deflection track and vertical slide clips.
6. Stud kickers and girts.
7. Joist hangers and end closures.
8. Reinforcement plates.

2.4 **ANCHORS, CLIPS, AND FASTENERS**

A. Steel Shapes and Clips: ASTM A36, zinc coated by the hot-dip process according to ASTM A123.

B. Cast-in-Place Anchor Bolts and Studs: ASTM A307, Grade A, zinc coated by the hot-dip process according to ASTM A153.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times the design load, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times the design load, as determined by testing per ASTM E1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws. Low-profile head beneath sheathing, manufacturer’s standard elsewhere.

2.5 **REQUIREMENTS**

A. Welding in accordance with AWS D1.3

B. Furnish members and accessories by one manufacturer only.

PART 3 - EXECUTION

3.1 **FABRICATION**

A. Framing components may be preassembled into panels. Panels shall be square with components attached.

B. Cut framing components squarely or as required for attachment. Cut framing members by sawing or shearing; do not torch cut.

C. Hold members in place until fastened.

D. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

1. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
2. Locate mechanical fasteners and install according to cold-formed metal framing manufacturer’s instructions with screw penetrating joined members by not less than 3 exposed screw threads.

E. Where required, provide specified insulation in double header members and double jamb studs which will not be accessible after erection.

3.2 **ERECTION**

A. Handle and lift prefabricated panels in a manner as to not distort any member.

B. Securely anchor tracks to supports as shown.

C. At butt joints, securely anchor two pieces of track to same supporting member or butt-weld or splice together.

D. Plumb, align, and securely attach studs to flanges or webs of both upper and lower tracks.

E. All axially loaded members shall be aligned vertically to allow for full transfer of the loads down to the foundation. Vertical alignment shall be maintained at floor/wall intersections.

F. Install jack studs above and below openings and as required to furnish support. Securely attach jack studs to supporting members.

G. Install headers in all openings that are larger than the stud spacing in that wall.

H. Attach bridging for studs in a manner to prevent stud rotation. Space bridging rows as shown.

I. Studs in one piece for their entire length, splices will not be permitted.

J. Provide a load distribution member at top track where joist is not located directly over bearing stud.

K. Provide joist bridging and web stiffeners at reaction points where shown.

L. Provide end blocking where joist ends are not restrained from rotation.

M. Provide an additional joist under parallel partitions, unless otherwise shown, when partition length exceeds one-half joist span and when floor and roof openings interrupt one or more spanning members.

N. Provide temporary bracing and leave in place until framing is permanently stabilized.

O. Do not bridge building expansion joints with cold-formed metal framing. Independently frame both sides of joints.

P. Fasten reinforcement plate over web penetrations that exceed size of manufacturer’s standard punched openings.

3.3 **TOLERANCES**

A. Vertical alignment (plumbness) of studs shall be within 1/960th of the span.

B. Horizontal alignment (levelness) of walls shall be within 1/960th of their respective lengths.

C. Spacing of studs shall not be more than 3 mm (1/8 inch) +/- from the designed spacing providing that the cumulative error does not exceed the requirements of the finishing materials.

D. Prefabricated panels shall be not more than 3 mm (1/8 inch) +/- out of square within the length of that panel.

3.4 **FIELD REPAIR**

A. Touch-up damaged galvanizing with galvanizing repair paint.

- - - E N D - - -

SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies items and assemblies fabricated from structural steel shapes and other materials as shown and specified.

B. Items specified.

1. Support for Wall and Ceiling Mounted Items: (SD055000-01, SD055000-02, SD102113-01, SD102600-01, SD123100-01 & SD123100-02)
2. Frames:
3. Guards
6. Loose Lintels
7. Shelf Angles
11. Ladders
12. Railings:
14. Trap Doors with Ceiling Hatch
18. Steel Pipe Bollards

1.2 RELATED WORK

A. Colors, finishes, and textures: Section 09 06 00, SCHEDULE FOR FINISHES.

B. Prime and finish painting: Section 09 91 00, PAINTING.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings:

1. Each item specified, showing complete detail, location in the project, material and size of components, method of joining various components and assemblies, finish, and location, size and type of anchors.
2. Mark items requiring field assembly for erection identification and furnish erection drawings and instructions.
3. Provide templates and rough-in measurements as required.

C. Design Calculations for specified live loads including dead loads.

D. Furnish setting drawings and instructions for installation of anchors to be preset into concrete and masonry work, and for the positioning of items having anchors to be built into concrete or masonry construction.

1.4 QUALITY ASSURANCE

A. Each manufactured product shall meet, as a minimum, the requirements specified, and shall be a standard commercial product of a manufacturer regularly presently manufacturing items of type specified.

B. Each product type shall be the same and be made by the same manufacturer.

C. Assembled product to the greatest extent possible before delivery to the site.

D. Include additional features, which are not specifically prohibited by this specification, but which are a part of the manufacturer's standard commercial product.

1.5 APPLICABLE PUBLICATIONS

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

B. American Society of Mechanical Engineers (ASME):

B18.6.1-97.....Wood Screws

B18.2.2-87(R2010).....Square and Hex Nuts

C. American Society for Testing and Materials (ASTM):

A36/A36M-14.....Structural Steel

A47-99(R2014).....Malleable Iron Castings

A48-03(R2012).....Gray Iron Castings

A53-12.....Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

A123-15.....Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A240/A240M-15.....Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications.

A269-15.....Seamless and Welded Austenitic Stainless Steel Tubing for General Service

A307-14.....Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength

A391/A391M-07(R2015)....Grade 80 Alloy Steel Chain
A786/A786M-15.....Rolled Steel Floor Plate
B221-14.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
B456-11.....Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium
B632-08.....Aluminum-Alloy Rolled Tread Plate
C1107-13.....Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
D3656-13.....Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns
F436-16.....Hardened Steel Washers
F468-06(R2015).....Nonferrous Bolts, Hex Cap Screws, Socket Head Cap Screws and Studs for General Use
F593-13.....Stainless Steel Bolts, Hex Cap Screws, and Studs
F1667-15.....Driven Fasteners: Nails, Spikes and Staples

D. American Welding Society (AWS):
D1.1-15.....Structural Welding Code Steel
D1.2-14.....Structural Welding Code Aluminum
D1.3-18.....Structural Welding Code Sheet Steel

E. National Association of Architectural Metal Manufacturers (NAAMM)
AMP 521-01(R2012).....Pipe Railing Manual
AMP 500-06.....Metal Finishes Manual
MBG 531-09(R2017).....Metal Bar Grating Manual
MBG 532-09.....Heavy Duty Metal Bar Grating Manual

F. Structural Steel Painting Council (SSPC)/Society of Protective Coatings:
SP 1-15.....No. 1, Solvent Cleaning
SP 2-04.....No. 2, Hand Tool Cleaning
SP 3-04.....No. 3, Power Tool Cleaning

G. Federal Specifications (Fed. Spec):
RR-T-650E.....Treads, Metallic and Nonmetallic, Nonskid

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

A. In addition to the dead loads, design fabrications to support the following live loads unless otherwise specified.

B. Ladders and Rungs: 120 kg (250 pounds) at any point.
C. Railings and Handrails: 900 N (200 pounds) in any direction at any point.

2.2 MATERIALS

A. Structural Steel: ASTM A36.
B. Stainless Steel: ASTM A240, Type 302 or 304.
C. Aluminum, Extruded: ASTM B221, Alloy 6063-T5 unless otherwise specified. For structural shapes use alloy 6061-T6 and alloy 6061-T4511.
E. Steel Pipe (Bollard): ASTM A53.
   1. Galvanized for exterior locations.
   2. Type S, Grade A unless specified otherwise.
   3. NPS (inside diameter) as shown.
F. Cast-Iron: ASTM A48, Class 30, commercial pattern.
G. Malleable Iron Castings: A47.
H. Primer Paint: As specified in Section 09 91 00, PAINTING.
I. Stainless Steel Tubing: ASTM A269, type 302 or 304.

K. Grout: ASTM C1107, pourable type.
L. Insect Screening: ASTM D3656.

2.3 HARDWARE

A. Rough Hardware:
   1. Furnish rough hardware with a standard plating, applied after punching, forming and assembly of parts; galvanized, cadmium plated, or zinc-coated by electro-galvanizing process. Galvanized G-90 where specified.
   2. Use G90 galvanized coating on ferrous metal for exterior work unless non-ferrous metal or stainless is used.
B. Fasteners:
   1. Bolts with Nuts:
      a. ASME B18.2.2.
      b. ASTM A307 for 415 MPa (60,000 psi) tensile strength bolts.
      c. ASTM F468 for nonferrous bolts.
      d. ASTM F593 for stainless steel.
   2. Screws: ASME B18.6.1.
   3. Washers: ASTM F436, type to suit material and anchorage.

4. Nails: ASTM F1667, Type I, style 6 or 14 for finish work.

2.4 FABRICATION GENERAL

A. Material
1. Use material as specified. Use material of commercial quality and suitable for intended purpose for material that is not named or its standard of quality not specified.
2. Use material free of defects which could affect the appearance or service ability of the finished product.

B. Size:
1. Size and thickness of members as shown.
2. When size and thickness is not specified or shown for an individual part, use size and thickness not less than that used for the same component on similar standard commercial items or in accordance with established shop methods.

C. Connections
1. Except as otherwise specified, connections may be made by welding, riveting or bolting.
2. Field riveting will not be approved.
3. Design size, number and placement of fasteners, to develop a joint strength of not less than the design value.
4. Holes, for rivets and bolts: Accurately punched or drilled and burrs removed.
5. Size and shape welds to develop the full design strength of the parts connected by welds and to transmit imposed stresses without permanent deformation or failure when subject to service loadings.
6. Use Rivets and bolts of material selected to prevent corrosion (electrolysis) at bimetallic contacts. Plated or coated material will not be approved.
7. Use stainless steel connectors for removable members machine screws or bolts.

D. Fasteners and Anchors
1. Use methods for fastening or anchoring metal fabrications to building construction as shown or specified.
2. Where fasteners and anchors are not shown, design the type, size, location and spacing to resist the loads imposed without deformation of the members or causing failure of the anchor or fastener, and suit the sequence of installation.

3. Use material and finish of the fasteners compatible with the kinds of materials which are fastened together and their location in the finished work.
4. Fasteners for securing metal fabrications to new construction only, may be by use of threaded or wedge type inserts or by anchors for welding to the metal fabrication for installation before the concrete is placed or as masonry is laid.
5. Fasteners for securing metal fabrication to existing construction or new construction may be expansion bolts, toggle bolts, power actuated drive pins, welding, self drilling and tapping screws or bolts.

E. Workmanship
1. General:
   a. Fabricate items to design shown.
   b. Furnish members in longest lengths commercially available within the limits shown and specified.
   c. Fabricate straight, true, free from warp and twist, and where applicable square and in same plane.
   d. Provide holes, sinkages and reinforcement shown and required for fasteners and anchorage items.
   e. Provide openings, cut-outs, and tapped holes for attachment and clearances required for work of other trades.
   f. Prepare members for the installation and fitting of hardware.
   g. Cut openings in gratings and floor plates for the passage of ducts, sumps, pipes, conduits and similar items. Provide reinforcement to support cut edges.
   h. Fabricate surfaces and edges free from sharp edges, burrs and projections which may cause injury.
2. Welding:
   a. Weld in accordance with AWS.
   b. Welds shall show good fusion, be free from cracks and porosity and accomplish secure and rigid joints in proper alignment.
   c. Where exposed in the finished work, continuous weld for the full length of the members joined and have depressed areas filled and protruding welds finished smooth and flush with adjacent surfaces.
   d. Finish welded joints to match finish of adjacent surface.

3. Joining:
   a. Miter or butt members at corners.
   b. Where frames members are butted at corners, cut leg of frame member perpendicular to surface, as required for clearance.
4. Anchors:
   a. Where metal fabrications are shown to be preset in concrete, weld 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 150 mm (6 inches) long with 25 mm (one inch) hooked end, to back of member at 600 mm (2 feet) on center, unless otherwise shown.
   b. Where metal fabrications are shown to be built into masonry use 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 250 mm (10 inches) long with 50 mm (2 inch) hooked end, welded to back of member at 600 mm (2 feet) on center, unless otherwise shown.
5. Cutting and Fitting:
   a. Accurately cut, machine and fit joints, corners, copes, and miters.
   b. Fit removable members to be easily removed.
   c. Design and construct field connections in the most practical place for appearance and ease of installation.
   d. Fit pieces together as required.
   e. Fabricate connections for ease of assembly and disassembly without use of special tools.
   f. Joints firm when assembled.
   g. Conceal joining, fitting and welding on exposed work as far as practical.
   h. Do not show rivets and screws prominently on the exposed face.
   i. The fit of components and the alignment of holes shall eliminate the need to modify component or to use exceptional force in the assembly of item and eliminate the need to use other than common tools.

F. Finish:
1. Finish exposed surfaces in accordance with NAAMM AMP 500 Metal Finishes Manual.
2. Aluminum: NAAMM AMP 501.
   a. Mill finish, AA-M10, as fabricated, use unless specified otherwise.

b. Clear anodic coating, AA-C22A41, chemically etched medium matte, with Architectural Class 1, 0.7 mils or thicker.
c. Colored anodic coating, AA-C22A42, chemically etched medium matte with Architectural Class 1, 0.7 mils or thicker.
d. Painted: AA-C22R10.

3. Steel and Iron: NAAMM AMP 504.
   a. Zinc coated (Galvanized): ASTM A123, G90 unless noted otherwise.
   b. Surfaces exposed in the finished work:
      1) Finish smooth rough surfaces and remove projections.
      2) Fill holes, dents and similar voids and depressions with epoxy type patching compound.
   c. Shop Prime Painting:
      1) Surfaces of Ferrous metal:
         a) Items not specified to have other coatings.
         b) Galvanized surfaces specified to have prime paint.
         c) Remove all loose mill scale, rust, and paint, by hand or power tool cleaning as defined in SSPC-SP2 and SP3.
         d) Clean of oil, grease, soil and other detrimental matter by use of solvents or cleaning compounds as defined in SSPC-SP1.
         e) After cleaning and finishing apply one coat of primer as specified in Section 09 91 00, PAINTING.
      2) Non ferrous metals: Comply with MAAMM-500 series.
4. Stainless Steel: NAAMM AMP-504 Finish No. 4.

G. Protection:
1. Insulate aluminum surfaces that will come in contact with concrete, masonry, plaster, or metals other than stainless steel, zinc or white bronze by giving a coat of heavy-bodied alkali resisting bituminous paint or other approved paint in shop.
2. Spot prime all abraded and damaged areas of zinc coating which expose the bare metal, using zinc rich paint on hot-dip zinc coat items and zinc dust primer on all other zinc coated items.

2.5 SUPPORTS

A. General:
1. Fabricate ASTM A36 structural steel shapes as shown.
2. Use clip angles or make provisions for welding hangers and braces to overhead construction.

3. Field connections may be welded or bolted.

C. For Wall Mounted Items:

1. For items supported by metal stud partitions.
2. Steel strip or hat channel minimum of 1.5 mm (0.0598 inch) thick.
3. Steel strip minimum of 150 mm (6 inches) wide, length extending one stud space beyond end of item supported.
4. Steel hat channels where shown. Flange cut and flatted for anchorage to stud.
5. Structural steel tube or channel for grab bar at water closets floor to structure above with clip angles or end plates formed for anchors.
6. Use steel angles for thru wall counters. Drill angle for fasteners at ends and not over 100 mm (4 inches) on center between ends.

D. For Trapeze Bars:

1. Construct assembly above ceilings as shown and design to support not less than a 340 kg (750 pound) working load at any point.
2. Fabricate trapeze supports as shown, with all exposed members, including screws, nuts, bolts and washers, fabricated of stainless steel.
3. Fabricate concealed components of structural steel shapes unless shown otherwise.
4. Stainless steel ceiling plate drilled for eye bolt.
5. Continuously weld connections where welds shown.
6. Use modular channel where shown with manufacturers bolts and fittings.
   a. Weld ends of steel angle braces to steel plates and secure to modular channel units as shown. Drill plates for anchor bolts.
   b. Fabricate eye bolt, special clamp bolt, and plate closure full length of modular channel at ceiling line and secure to modular channel unit with manufacturers standard fittings.

E. For Intravenous Track and Cubical Curtain Track:

1. Fabricate assembly of steel angle as shown.
2. Drill angle bent ends for anchor screws to acoustical suspension system and angle for hanger wires.
3. Provide pipe sleeve welded to angle.

2.6 FRAMES

A. Channel Door Frames:

1. Fabricate of structural steel channels of size shown.
2. Miter and weld frames at corners.
3. Where anchored to masonry or embedded in concrete, weld to back of frame at each jamb, 5 mm (3/16 inch) thick by 44 mm (1-3/4 inch) wide steel strap anchors with ends turned 50 mm (2 inches), and of sufficient length to extend at least 300 mm (12 inches) into wall. Space anchors 600 mm (24 inches) above bottom of frame and 600 mm (24 inches) o.c. to top of jamb. Weld clip angles to bottom of jambs and provide holes for expansion bolts.
4. Where anchored to concrete or masonry in prepared openings, drill holes at jambs for anchoring with expansion bolts. Weld clip angles to bottom of frame and provide holes for expansion bolt anchors as shown. Drill holes starting 600 mm (24 inches) above bottom of frame and 600 mm (24 inches) o.c. to top of jamb and at top of jamb. Provide pipe spacers at holes welded to channel.
5. Where closure plates are shown, continuously weld them to the channel flanges.
6. Weld continuous 19 x 19 x 3 mm (3/4 x 3/4 x 1/8 inch) thick steel angles to the interior side of each channel leg at the head and jambs to form a caulking groove.
7. Prepare frame for installation of hardware specified in Section 08 71 00, DOOR HARDWARE.
   a. Cut a slot in the lock jamb to receive the lock bolt.
   b. Where shown use continuous solid steel bar stops at perimeter of frame, weld or secure with countersunk machine screws at not more than 450 mm (18 inches) on center.

2.7 GUARDS

A. Wall Corner Guards:
   1. Fabricate from steel angles and furnish with anchors as shown.
   2. Continuously weld anchor to angle.

B. Guard Angles for Overhead Doors:
   1. Cut away top portion of outstanding leg of angle and extend remaining portion of angle up wall.
   2. Weld filler piece across head of opening to jamb angles.
   3. Make provisions for fasteners and anchorage.

C. Channel Guard at Loading Platform:
   1. Fabricate from steel channel of size shown.

2. Weld anchors to channels as shown.
3. Drill channel for bumper anchor bolts.

D. Edge Guard Angles for Openings in slabs.
1. Fabricate from steel angles of sizes and with anchorage shown.
2. Where size of angle is not shown, provide 50 x 50 x 6 mm (2 x 2 x 1/4 inch) steel angle with 32 x 5 mm (1-1/4 x 3/16 inch) strap anchors, welded to back.
3. Miter or butt angles at corners and weld.
4. Use one anchor near end and three feet on centers between end anchors.

E. Wheel Guards:
1. Construct wheel guards of not less than 16 mm (5/8 inch) thick cast iron.
2. Provide corner type, with flanges for bolting to walls.

2.8 LOOSE LINTELS

A. Furnish lintels of sizes shown. Where size of lintels is not shown, provide the sizes specified.

B. Fabricate lintels with not less than 150 mm (6 inch) bearing at each end for nonbearing masonry walls, and 200 mm (8 inch) bearing at each end for bearing walls.

C. Provide one angle lintel for each 100 mm (4 inches) of masonry thickness as follows except as otherwise specified or shown.
1. Openings 750 mm to 1800 mm (2-1/2 feet to 6 feet) - 100 x 90 x 8 mm (4 x 3-1/2 x 5/16 inch).
2. Openings 1800 mm to 3000 mm (6 feet to 10 feet) - 150 x 90 x 9 mm (6 x 3-1/2 x 3/8 inch).

D. For 150 mm (6 inch) thick masonry openings 750 mm to 3000 mm (2-1/2 feet to 10 feet) use one angle 150 x 90 x 9 mm (6 x 3-1/2 x 3/8 inch).

E. Provide bearing plates for lintels where shown.

F. Weld or bolt upstanding legs of double angle lintels together with 19 mm (3/4 inch bolts) spaced at 300 mm (12 inches) on centers.

G. Insert spreaders at bolt points to separate the angles for insertion of metal windows, louver, and other anchorage.

H. Where shown or specified, punch upstanding legs of single lintels to suit size and spacing of anchor bolts.

I. Elevator Entrance:

1. Fabricate lintel from plate bent to channel shape, and provide a minimum of 100 mm (4 inch) bearing each end.
2. Cut away the front leg of the channel at each end to allow for concealment behind elevator hoistway entrance frame.

2.9 SHELF ANGLES

A. Fabricate from steel angles of size shown.

B. Fabricate angles with horizontal slotted holes for 19 mm (3/4 inch) bolts spaced at not over 900 mm (3 feet) on centers and within 300 mm (12 inches) of ends.

C. Provide adjustable malleable iron inserts for embedded in concrete framing.

2.10 LADDERS

A. Steel Ladders:

1. Fixed-rail type with steel rungs shouldered and headed into and welded to rails.
2. Fabricate angle brackets of 50 mm (2 inch) wide by 13 mm (1/2 inch) thick steel; brackets spaced maximum of 1200 mm (4 feet) apart and of length to hold ladder 175 mm (7 inches) from wall to center of rungs. Provide turned ends or clips for anchoring.
3. Provide holes for anchoring with expansion bolts through turned ends and brackets.
4. Where shown, fabricate side rails curved, twisted and formed into a gooseneck.
5. Galvanize exterior ladders after fabrication, ASTM A123, G-90.

B. Aluminum Ladders:

1. Fixed-rail type, constructed of structural aluminum, with mill finish.
2. Fabricate side rails and rungs of size and design shown, with the rungs shouldered and headed into and welded to the rails.
3. Where shown fabrication side rails curved, twisted and formed into gooseneck.
4. Fabricate angle brackets at top and bottom and intermediate brackets where shown. Drill for bolting.

C. Ladder Rungs:

1. Fabricate from 25 mm (one inch) diameter steel bars.

2. Fabricate so that rungs will extend at least 100 mm (4 inches) into wall with ends turned 50 mm (2 inches), project out from wall 175 mm (7 inches), be 400 mm (16 inches) wide and be designed so that foot cannot slide off end.
3. Galvanized after fabrication, ASTM A123, G-90 rungs for exterior use and for access to pits.

2.15 RAILINGS

A. In addition to the dead load design railing assembly to support live load specified.
B. Fabrication General:
   1. Provide continuous welded joints, dressed smooth and flush.
   2. Standard flush fittings, designed to be welded, may be used.
   3. Exposed threads will not be approved.
   4. Form handrail brackets to size and design shown.
   5. Exterior Post Anchors.
      a. Fabricate tube or pipe sleeves with closed ends or plates as shown.
      b. Where inserts interfere with reinforcing bars, provide flanged fittings welded or threaded to posts for securing to concrete with expansion bolts.
      c. Provide heavy pattern sliding flange base plate with set screws at base of pipe or tube posts. Base plates are not required on pipe sleeves where ornamental railings occur.
   6. Interior Post Anchors:
      a. Provide flanged fittings for securing fixed posts to floor with expansion bolts, unless shown otherwise.
      b. Weld or thread flanged fitting to posts at base.
      c. For securing removable posts to floor, provide close fitting sleeve insert or inverted flange base plate with stud bolts or rivets concrete anchor welded to the base plate.
      d. Provide sliding flange base plate on posts secured with set screws.
      e. Weld flange base plate to removable posts set in sleeves.
C. Handrails:
   1. Close free ends of rail with flush metal caps welded in place except where flanges for securing to walls with bolts are shown.

2. Make provisions for attaching handrail brackets to wall, posts, and handrail as shown.

D. Steel Pipe Railings:

1. Fabricate of steel pipe with welded joints.
2. Number and space of rails as shown.
3. Space posts for railings not over 1800 mm (6 feet) on centers between end posts.
4. Form handrail brackets from malleable iron.
5. Fabricate removable sections with posts at end of section.
6. Removable Rails:
   a. Provide "U" shape brackets at each end to hold removable rail as shown. Use for top and bottom horizontal rail when rails are joined together with vertical members.
   b. Secure rail to brackets with 9 mm (3/8 inch) stainless steel through bolts and nuts at top rail only when rails joined with vertical members.
   c. Continuously weld brackets to post.
   d. Provide slotted bolt holes in rail bracket.
   e. Weld bolt heads flush with top of rail.
   f. Weld flanged fitting to post where posts are installed in sleeves.
7. Opening Guard Rails:
   a. Fabricate rails with flanged fitting at each end to fit between wall opening jambs.
   b. Design flange fittings for fastening with machine screws to steel plate anchored to jambs.
   c. Fabricate rails for floor openings for anchorage in sleeves.
8. Gates:
   a. Fabricate from steel pipe as specified for railings.
   b. Fabricate gate fittings from either malleable iron or wrought steel.
   c. Hang each gate on suitable spring hinges of clamp on or through bolted type. Use bronze hinges for exterior gates.
   d. Provide suitable stops, so that gate will swing as shown.
9. Chains:
   a. Chains: ASTM A391, Grade 63, straight link style, normal size chain bar 8 mm (5/16 inch) diameter, eight links per 25 mm (foot)

and with boat type snap hook on one end, and through type eye bolt on other end.

b. Fabricate eye bolt for attaching chain to pipe posts, size not less than 9 mm (3/8 inch) diameter.

c. Fabricate anchor at walls, for engagement of snap hook of either a 9 mm (3/8 inch) diameter eye bolt or punched angle.

d. Galvanize chain and bolts after fabrication.

E. Aluminum Railings:

1. Fabricate from extruded aluminum.
2. Use tubular posts not less than 3 mm (0.125 inch) wall thickness for exterior railings.
3. Punch intermediate rails and bottom of top rails for passage of posts and machine to a close fit.
4. Where shown use extruded channel sections for top rail with 13 mm (1/2 inch) thick top cover plates and closed ends.
5. Fabricate brackets of extruded or wrought aluminum as shown.
6. Fabricate stainless pipe sleeves with closed bottom at least six inches deep having internal dimensions at least 13 mm (1/2 inch) greater than external dimensions of posts where set in concrete.

F. Stainless Steel Railings:

1. Fabricate from 38 mm (1-1/2 inches) outside diameter stainless steel tubing, ASTM A269, having a wall thickness of 1.6 mm (0.065 inch).
2. Join sections by an internal connector to form hairline joints where field assembled.
3. Fabricate with continuous welded connections.
4. Fabricate brackets of stainless steel to design shown.
5. Fabricate stainless steel sleeves at least 150 mm (6 inches) deep having internal dimensions at least 13 mm (1/2 inch) greater than external dimensions of post.

2.11 STEEL PIPE BOLLARD

Provide bollard in accordance with ASTM A53 with dimensions as shown in standard detail SD320523-04. Anchor posts in concrete and fill solidly with concrete with a minimum compressive strength of 17 MPa 2500psi.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set work accurately, in alignment and where shown, plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.

B. Items set into concrete or masonry.

1. Provide temporary bracing for such items until concrete or masonry is set.
2. Place in accordance with setting drawings and instructions.
3. Build strap anchors, into masonry as work progresses.

C. Set frames of gratings, covers, corner guards, trap doors and similar items flush with finish floor or wall surface and, where applicable, flush with side of opening.

D. Field weld in accordance with AWS.

1. Design and finish as specified for shop welding.
2. Use continuous weld unless specified otherwise.

E. Install anchoring devices and fasteners as shown and as necessary for securing metal fabrications to building construction as specified. Power actuated drive pins may be used except for removable items and where members would be deformed or substrate damaged by their use.

F. Spot prime all abraded and damaged areas of zinc coating as specified and all abraded and damaged areas of shop prime coat with same kind of paint used for shop priming.

G. Isolate aluminum from dissimilar metals and from contact with concrete and masonry materials as required to prevent electrolysis and corrosion.

H. Secure escutcheon plate with set screw.

3.2 INSTALLATION OF SUPPORTS

A. Anchorage to structure.

1. Secure angles or channels and clips to overhead structural steel by continuous welding unless bolting is shown.
2. Secure supports to concrete inserts by bolting or continuous welding as shown.
3. Secure supports to mid height of concrete beams when inserts do not exist with expansion bolts and to slabs, with expansion bolts. unless shown otherwise.
4. Secure steel plate or hat channels to studs as detailed.

B. Ceiling Hung Toilet Stalls:
   1. Securely anchor hangers of continuous steel channel above pilasters to structure above.
   2. Bolt continuous steel angle at wall to masonry or weld to face of
C. Supports for Wall Mounted items:
   1. Locate center of support at anchorage point of supported item.
   2. Locate support at top and bottom of wall hung cabinets.
   3. Locate support at top of floor cabinets and shelving installed against walls.
   4. Locate supports where required for items shown.
D. Support at Ceiling for X-ray Tube Stand and Radiographic Equipment:
   1. Bolt modular steel channel frames to hangers as shown, anchored to structure above.
   2. Fasten frames with modular channel manufacturers fittings, bolts, and nuts. Space modular channel supports and hangers as shown and as required to suit equipment furnished.
   3. Install closure plates in channels at ceiling where channel opening is visible. Coordinate and cut plates to fit tight against equipment anchors after equipment anchors are installed.
E. Ceiling Support for Operating Light:
   1. Anchor support to structure above as shown.
   2. Set leveling plate as shown level with ceiling.
   3. Secure operating light to leveling plate in accordance with light manufacturer's requirements.
F. Supports for intravenous (IV) Track and Cubicle Curtain Track:
   1. Install assembly where shown after ceiling suspension grid is installed.
   2. Drill angle for bolt and weld nut to angle prior to installation of tile.
G. Support for cantilever grab bars:
   1. Locate channels or tube in partition for support as shown, and extend full height from floor to underside of structural slab above.
   2. Anchor at top and bottom with angle clips bolted to channels or tube with two, 9 mm (3/8 inch) diameter bolts.
   3. Anchor to floors and overhead construction with two 9 mm (3/8 inch) diameter bolts.

4. Fasten clips to concrete with expansion bolts, and to steel with machine bolts or welds.

H. Supports for Trapeze Bars:
1. Secure plates to overhead construction with fasteners as shown.
2. Secure angle brace assembly to overhead construction with fasteners as shown and bolt plate to braces.
3. Fit modular channel unit flush with finish ceiling, and secure to plate with modular channel unit manufacturer's standard fittings through steel shims or spreaders as shown.
   a. Install closure plates in channel between eye bolts.
   b. Install eyebolts in channel.

I. Support for Communion Rail Posts:
1. Anchor steel plate supports for posts as shown.
2. Use four bolts per plate, locate two at top and two at bottom.
3. Use lag bolts.

3.3 FRAMES FOR LEAD LINED DOORS

A. Secure jamb angle clips and plates, at top and bottom with two, 9 mm (3/8 inch) expansion bolts to concrete.
B. Secure 150 x 90 x 13 mm (6 x 3-1/2 x 1/2 inch) angle to steel framing for anchorage when expansion bolts to concrete is not possible.
C. Secure clips by welding to steel.
D. At interstitial spaces, anchor jamb angles as shown.

3.4 DOOR FRAMES

A. Secure clip angles at bottom of frames to concrete slab with expansion bolts as shown.
B. Level and plumb frame; brace in position required.
C. At masonry, set frames in walls so anchors are built-in as the work progresses unless shown otherwise.
D. Set frames in formwork for frames cast into concrete.
E. Where frames are set in prepared openings, bolt to wall with spacers and expansion bolts.

3.5 OTHER FRAMES

A. Set frame flush with surface unless shown otherwise.
B. Anchor frames at ends and not over 450 mm (18 inches) on centers unless shown otherwise.
C. Set in formwork before concrete is placed.

3.6 GUARDS

A. Steel Angle Corner Guards:
   1. Build into masonry as the work progress.
   2. Set into formwork before concrete is placed.
   3. Set angles flush with edge of opening and finish floor or wall or as shown.
   4. At existing construction fasten angle and filler piece to adjoining construction with 16 mm (5/8 inch) diameter by 75 mm (3 inch) long expansion bolts 450 mm (18 inches) on center.
   5. Install Guard Angles at Edges of Dock Leveler and Overhead Doors where shown.

B. Channel Guard at Top Edge of Concrete Platforms:
   1. Install in formwork before concrete is placed.
   2. Set channel flush with top of the platform.

C. Wheel Guards:
   1. Set flanges of wheel guard at least 50 mm (2 inches) into pavement.
   2. Anchor to walls as shown, expansion bolt if not shown.

3.7 STEEL LINTELS

A. Use lintel sizes and combinations shown or specified.

B. Install lintels with longest leg upstanding, except for openings in 150 mm (6 inch) masonry walls install lintels with longest leg horizontal.

C. Install lintels to have not less than 150 mm (6 inch) bearing at each end for nonbearing walls, and 200 mm (8 inch) bearing at each end for bearing walls.

3.8 SHELF ANGLES

A. Anchor shelf angles with 19 mm (3/4 inch) bolts unless shown otherwise in adjustable malleable iron inserts, set level at elevation shown.

B. Provide expansion space at end of members.

3.9 LADDERS

A. Anchor ladders to walls and floors with expansion bolts through turned lugs or angle clips or brackets.

B. In elevator pits, set ladders to clear all elevator equipment where shown on the drawings.
   1. Where ladders are interrupted by division beams, anchor ladders to beams by welding, and to floors with expansion bolts.
   2. Where ladders are adjacent to division beams, anchor ladders to beams with bent steel plates, and to floor with expansion bolts.

C. Ladder Rungs:
1. Set ladder rungs into formwork before concrete is placed. Build ladder rungs into masonry as the work progresses.
2. Set step portion of rung 150 mm (6 inches) from wall.
3. Space rungs approximately 300 mm (12 inches) on centers.
4. Where only one rung is required, locate it 400 mm (16 inches) above the floor.

3.10 RAILINGS

A. Steel Posts:
1. Secure fixed posts to concrete with expansion bolts through flanged fittings except where sleeves are shown with pourable grout.
2. Install sleeves in concrete formwork.
3. Set post in sleeve and pour grout to surface. Apply beveled bead of urethane sealant at perimeter of post or under flange fitting as specified in Section 07 92 00, JOINT SEALANTS—on exterior posts.
4. Secure removable posts to concrete with either machine screws through flanged fittings which are secured to inverted flanges embedded in and set flush with finished floor, or set posts in close fitting pipe sleeves without grout.
5. Secure sliding flanged fittings to posts at base with set screws.
6. Secure fixed flanged fittings to concrete with expansion bolts.
7. Secure posts to steel with welds.

B. Aluminum Railing, Stainless Steel Railing, and Ornamental Railing Posts:
1. Install pipe sleeves in concrete formwork.
2. Set posts in sleeve and pour grout to surface on exterior locations and to within 6 mm (1/4 inch) of surface for interior locations except to where posts are required to be removable.
3. Apply beveled bead of urethane sealant over sleeve at post perimeter for exterior posts and flush with surface for interior posts as specified in Section 07 92 00, JOINT SEALANTS.

C. Anchor to Walls:
1. Anchor rails to concrete or solid masonry with machine screws through flanged fitting to steel plate.
   a. Anchor steel plate to concrete or solid masonry with expansion bolts.
   b. Anchor steel plate to hollow masonry with toggle bolts.

2. Anchor flanged fitting with toggle bolt to steel support in frame walls.

D. Removable Rails:

1. Rest rails in brackets at each end and secure to bracket with stainless steel bolts and nuts where part of a continuous railing.
2. Rest rail posts in sleeves where not part of a continuous railing. Do not grout posts.

E. Gates:

1. Hang gate to swing as shown.
2. Bolt gate hinges to jamb post with clamp on or through bolts.

F. Chains:

1. Eye bolt chains to pipe posts.
2. Eye bolt anchoring at walls.
   a. Expansion bolt to concrete or solid masonry.
   b. Toggle bolt to hollow masonry of frame wall installed support.

G. Handrails:

1. Anchor brackets for metal handrails as detailed.
2. Install brackets within 300 mm (12 inches) of return of walls, and at evenly spaced intermediate points not exceeding 1200 mm (4 feet) on centers unless shown otherwise.
3. Expansion bolt to concrete or solid masonry.
4. Toggle bolt to installed supporting frame wall and to hollow masonry unless shown otherwise.

3.11 INSTALLATION OF STEEL PIPE BOLLARD

Set bollards vertically in concrete piers. Compressive strength of concrete piers shall be 21MPa 3000psi. For dimensions of concrete piers See standard detail SD320523-04.

3.20 CLEAN AND ADJUSTING

A. Adjust movable parts including hardware to operate as designed without binding or deformation of the members centered in the opening or frame and, where applicable, contact surfaces fit tight and even without forcing or warping the components.

B. Clean after installation exposed prefinished and plated items and items fabricated from stainless steel, aluminum and copper alloys, as recommended by the metal manufacture and protected from damage until completion of the project.

- - - E N D - - -

SECTION 05 52 13 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel railings not associated with metal pan stairs - RAIL-1.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Shop primer.
2. Nonshrink, nonmetallic grout.
3. Metal finishes.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For delegated-design professional engineer .

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B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:
   a. Uniform load of 50 lbf/ft. applied in any direction.
   b. Concentrated load of 200 lbf applied in any direction.
   c. Uniform and concentrated loads need not be assumed to act concurrently.
2. Infill of Guards:
   a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
   b. Infill load and other loads need not be assumed to act concurrently.

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2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.3 STEEL RAILINGS - RAIL-1

A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

B. Tubing: ASTM A500/A500M (cold formed) .

C. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

1. Provide galvanized finish for exterior installations and where indicated.

D. Plates, Shapes, and Bars: ASTM A36/A36M.

E. Cast Iron Fittings: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

2.4 FASTENERS

A. Fastener Materials:

1. Ungalvanized-Steel Railing Components: Plated steel fasteners complying with ASTM F1941, Class Fe/Zn 5 for zinc coating.
2. Hot-Dip Galvanized Railing Components: Type 304 stainless steel or hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F2329/F2329M for zinc coating.
3. Finish exposed fasteners to match appearance, including color and texture, of railings.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:

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1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
3. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.5 MISCELLANEOUS MATERIALS

A. Handrail Brackets: Cast iron center of handrail 2-1/2 inches from face of railing or wall.

B. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.

C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

D. Galvanizing Repair Paint: High-zinc-dust-content paint, complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage , but not less than that required to support structural loads.

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B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.

1. Clearly mark units for reassembly and coordinated installation.
2. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that are exposed to weather in a manner that excludes water.

1. Provide weep holes where water may accumulate.
2. Locate weep holes in inconspicuous locations.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded or nonwelded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #2 welds; good appearance, completely sanded joint, some undercutting and pinholes okay

I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection, using an epoxy structural adhesive, if this is manufacturer's standard splicing method.

J. Form changes in direction as follows:

1. By radius bends of radius indicated or by inserting prefabricated elbow fittings of radius indicated.

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K. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

L. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.

M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.

1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
2. Coordinate anchorage devices with supporting structure.

P. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.7 STEEL AND IRON FINISHES

A. Galvanized Railings - At all exterior exposure locations only:

1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
4. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner and as follows.

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1. Comply with SSPC-SP 16.

D. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, hot-dip galvanize anchors to be embedded in exterior concrete or masonry - All Interior Exposure locations only.

E. Preparation for Shop Priming - All Interior Exposure Locations only: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3.

1. Exterior Railings: SSPC-SP 6/NACE No. 3.
2. Railings Indicated To Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3.
3. Other Railings: SSPC-SP 3.

F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1 for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Shop prime uncoated railings with primers specified in Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting" indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Perform cutting, drilling, and fitting required for installing railings.

1. Fit exposed connections together to form tight, hairline joints.
2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.

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6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve, extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

A. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout , mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Leave anchorage joint exposed with anchoring material flush with adjacent surface.

3.5 ATTACHING RAILINGS

A. Anchor railing ends to concrete and masonry with flanges connected to railing ends and anchored to wall construction with anchors and bolts as detailed.

B. Anchor railing ends to metal surfaces with flanges welded to railing ends or connected to railing ends, using nonwelded connections.

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C. Attach handrails to walls with wall brackets , except where end flanges are used. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt .
2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

D. Secure wall brackets and railing end flanges to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.

3.6 REPAIR

A. Touchup Primer Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 23 "Interior Painting." and Section 09 96 00 "High-Performance Coatings."

3.7 CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

3.8 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

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SECTION 06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Rooftop equipment bases and support curbs.
2. Wood blocking , cants, and nailers.
3. Plywood backing panels.

B. Related Requirements:

1. Section 06 16 00 "Sheathing" for sheathing.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal or greater size but less than 5 inches nominal size in least dimension.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated

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temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.

4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Post-installed anchors.
5. Metal framing anchors.

1.6 QUALITY ASSURANCE

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece .
3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

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2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece .

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, stripping, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.

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3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D5664, and design value adjustment factors shall be calculated according to ASTM D6841.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.

E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.

F. Application: Treat items indicated on Drawings, and the following:

1. Concealed blocking.
2. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.
3. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine or southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Hem-fir; WCLIB or WWPA.
5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
6. Western woods; WCLIB or WWPA.
7. Northern species; NLGA.
8. Eastern softwoods; NeLMA.

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C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C , fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

B. 3/4 inch thick, 8' tall (or to extent allowed by ceiling height) plywood panels mounted vertically on walls as indicated in plan and 6 inches above finished floor. Provide blicking as needed. Panels shall be AC grade fire retardant plywood, be certified as fire retardant and documented to be Class A for lame spread and smoke development per ASTM E84, and have a certificate confirming the above conspicuously placed (visible) on each panel. Provide two coats of high gloss fire-resistant which paint over all surfaces. DO NOT COVER THE LABEL.

1. BASIS-OF-DESIGN IS IN ACCORDANCE WITH FIRE RETARDANT BACKER BOARDS AS MANUFACTURERED BY UTECK OR APPROVED EQUAL.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M .

B. Nails, Brads, and Staples: ASTM F1667.

C. Screws for Fastening to Metal Framing: ASTM C1002 , length as recommended by screw manufacturer for material being fastened.

D. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

E. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-

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ES AC01,ICC-ES AC58,ICC-ES AC193,or ICC-ES AC308 as appropriate for the substrate.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

2.7 METAL FRAMING ANCHORS

A. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 coating designation.

1. Use for interior locations unless otherwise indicated.

B. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A653/A653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

1. Use for wood-preservative-treated lumber and where indicated.

2.8 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing Furring to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locatenailers, blocking,and similar supports to comply with requirements for attaching other construction.

C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-

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retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

E. Do not splice structural members between supports unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

H. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

I. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

J. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

K. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

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L. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILER

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 53

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SECTION 06 16 00 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall sheathing - SHTG-1.
2. Sheathing joint-and-penetration treatment materials.

B. Related Requirements:

1. Section 06 10 53 "Miscellaneous Rough Carpentry" for plywood backing panels.
2. Section 07 27 26 "Fluid-Applied Membrane Air Barrier" for water-resistive barrier applied over wall sheathing.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1.3 ACTION SUBMITTALS

A. Product Data:

1. Wall sheathing.
2. Sheathing joint-and-penetration treatment materials.

B. Product Data Submittals: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency in accordance with ASTM D5516.
4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

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1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer .

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated plywood.
2. Fire-retardant-treated plywood.
3. Foam-plastic sheathing.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications:

1. For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on field mockups.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested in accordance with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

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2.2 WOOD PANEL PRODUCTS

A. Emissions: Products are to meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

C. Factory mark panels to indicate compliance with applicable standard.

2.3 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.4 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested in accordance with ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials are to comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering in accordance with ASTM D2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials are to have a moisture content of 28 percent or less when tested in accordance with

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ASTM D3201/D3201M at 92 percent relative humidity. Use where exterior type is not indicated.

4. Design Value Adjustment Factors: Treated lumber plywood is to be tested in accordance with ASTM D5516 and design value adjustment factors are to be calculated in accordance with ASTM D6305. Span ratings after treatment are to be not less than span ratings specified.

C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: Treat plywood indicated on Drawings.

2.5 WALL SHEATHING

A. Plywood Sheathing, Walls - SHTG-1: Either DOC PS 1 or DOC PS 2 , Exterior, Structural I sheathing.

1. Span Rating: Not less than 16/0 .
2. Nominal Thickness: Not less than 1/2 inch.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For wall sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours in accordance with ASTM B117.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or

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optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.10.1, "Fastening Schedule," in the ICC's International Building Code.
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall,, sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 INSTALLATION OF WOOD STRUCTURAL PANEL

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Wall Sheathing:
   a. Nail or staple to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
   b. Screw to cold-formed metal framing.
   c. Space panels 1/8 inch apart at edges and ends.

END OF SECTION 06 16 00

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SECTION 06 41 16 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad architectural cabinets - CAB-2.
2. Cabinet Pull - HW-1.
3. Cabinet hardware and accessories.
4. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.

B. Related Requirements:

1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.
2. Section 12 36 23.13 "Plastic-Laminate-Clad Countertops."

1.2 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Show large-scale details.

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3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.

C. Samples: For each exposed product and for each color and texture specified, in manufacturer's or manufacturer's standard size.

D. Samples for Initial Selection: For each type of exposed finish.

E. Samples for Verification: For the following:

1. Plastic Laminates: 8 by 10 inches , for each type, color, pattern, and surface finish required.
   a. Provide one sample applied to core material with specified edge material applied to one edge.
2. Thermally Fused Laminate (TFL) Panels: 8 by 10 inches , for each color, pattern, and surface finish.
   a. Provide edge banding on one edge.
3. Cabinet Tab Pull: One full-size unit for each type and finish.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and Installer.

B. Product Certificates: For the following:

1. Composite wood products.
2. Thermally fused laminate panels.
3. High-pressure decorative laminate.
4. Adhesives.

1.6 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Manufacturer of products .

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

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1.8 FIELD CONDITIONS

A. Environmental Limitations without Humidity Control: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS - CAB-2

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.

1. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

B. Architectural Woodwork Standards Grade: Custom .

C. Type of Construction: Frameless .

D. Door and Drawer-Front Style: Flush overlay.

E. High-Pressure Decorative Laminate - PLAM-1: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Abet Laminati Inc.
   b. Formica Corporation. Basis-of-Design: See Finish Legend on Sheet 00-GI-013.
   c. Lamin-Art, Inc.
   d. Pionite; a Panolam Industries International, Inc. brand.
   e. Wilsonart LLC.

F. Laminate Cladding for Exposed Surfaces:

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1. Horizontal Surfaces: Grade HGS .
2. Vertical Surfaces: Grade VGS.
3. Edges: PVC edge banding, 3.0 mm thick, matching laminate in color, pattern, and finish.
4. Pattern Direction: Horizontally for drawer fronts, doors, and fixed panels .

G. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS .
   a. Edges of Plastic-Laminate Shelves - PLAM-3: 3mm PVC T-mold matching laminate in color, pattern, and finish .
   b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of melamine .
2. Drawer Sides and Backs: Thermally fused laminate panels with PVC or polyester edge banding.
3. Drawer Bottoms: Thermally fused laminate panels.

H. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.

I. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

J. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

K. Colors, Patterns, and Finishes - PLAM-1: See Finish Legend on Sheet 00-GI-013.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 4 to 9 percent.

B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130 .
2. Thermally Fused Laminate (TFL) Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

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2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 08 71 00 "Door Hardware."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Accuride International.
   b. Blum, Julius & Co., Inc.
   c. CompX International, Inc.
   d. Grass America Inc.
   e. Hardware Resources.
   f. Hettich America L.P.
   g. Knape & Vogt Manufacturing Company.

B. Frameless Concealed Hinges (European Type): ANSI/BHMA A156.9, B01602, 135 degrees of opening , self-closing.

C. Back-Mounted Pulls - HW-1: ANSI/BHMA A156.9, B02011.

1. HW-1: See Finish Legend.

D. Catches: Push-in magnetic catches, ANSI/BHMA A156.9, B03131 .

E. Adjustable Shelf Standards and Supports: ANSI/BHMA A156.9, B04071; with shelf rests, B04081 .

F. Shelf Rests: ANSI/BHMA A156.9, B04013; metal .

G. Drawer Slides: ANSI/BHMA A156.9.

1. Heavy-Duty (Grade 1HD-100 and Grade 1HD-200): Side mount .
   a. Type: Full extension.
   b. Material: Zinc-plated ball bearing slides.
   c. Motion Feature: Push to open and Soft close dampener .
2. Pencil drawers not more than 3 inches high and not more than 24 inches wide, provide 50 lb load capacity.
3. General-purpose drawers more than 3 inches high, but not more than 6 inches high and not more than 24 inches wide, provide 75 lb load capacity.
4. File drawers more than 6 inches high or more than 24 inches wide, provide 100 lb load capacity.
5. Lateral file drawers more than 6 inches high and more than 24 inches but not more than 30 inches wide, provide 150 lb load capacity.
6. Lateral file drawers more than 6 inches high and more than 30 inches wide, provide 200 lb load capacity.
7. Computer keyboard tray, provide 75 lb load capacity.

H. Door Locks: ANSI/BHMA A156.11, E07121.

I. Drawer Locks: ANSI/BHMA A156.11, E07041.

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J. Door and Drawer Silencers: ANSI/BHMA A156.16, L03011.

K. Grommets for Cable Passage: 2-inch OD, molded-plastic grommets and matching plastic caps with slot for wire passage.

1. Color: Black .
2. Locations: Coordinate with Architect.

L. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for ANSI/BHMA finish number indicated.

1. Satin Chromium Plated: ANSI/BHMA 626 for brass or bronze base; ANSI/BHMA 652 for steel base.

M. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in ANSI/BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

C. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement .

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times architectural cabinet fabrication will be complete.
2. Trial fit assemblies at manufacturer's shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and

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check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION

A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.

B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.

C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.

D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.

1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips .

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

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C. Clean cabinets on exposed and semiexposed surfaces.

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SECTION 06 64 00 - PLASTIC PANELING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Plastic sheet paneling - FRP-1.

B. Related Requirements:

1. Section 06 10 53 - Miscellaneous Rough Carpentry" for wood furring for installing plastic paneling.
2. Section 10 26 00 "Wall and Door Protection" for corner guards installed over plastic paneling.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For plastic paneling and trim accessories, in manufacturer's standard sizes.

1.4 QUALITY ASSURANCE

A. Testing Agency: FM Approvals.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

2.2 PLASTIC SHEET PANELING - FRP-1

A. Glass-Fiber-Reinforced Plastic Paneling - FRP-1: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D 5319. Panels shall be USDA accepted for incidental food contact.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Crane Composites, Inc.
   b. Glasteel.
   c. Marlite (Basis-of-Design).
2. Surface-Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E 84. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: 25 or less.
   b. Smoke-Developed Index: 450 or less.
3. Nominal Thickness: Not less than 0.12 inch.
4. Surface Finish: Smooth .
5. Color: See Finish Legend .
6. Location: See Room Finish Schedule and Finish Legend.

2.3 ACCESSORIES

A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.

1. Color: Match panels .

B. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.

C. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.

D. Adhesive: As recommended by plastic paneling manufacturer.

1. Low VOC's.

E. Sealant: Mildew-resistant, single-component, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 07 92 00 "Joint Sealants."

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove wallpaper, vinyl wall covering, loose or soluble paint, and other materials that might interfere with adhesive bond.

B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.

C. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.

D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

E. Lay out paneling before installing. Locate panel joints so that trimmed panels at corners are not less than 12 inches wide.

1. Mark plumb lines on substrate at trim accessory and panel joint locations for accurate installation.
2. Locate trim accessories and panel joints to allow clearance at panel edges according to manufacturer's written instructions.

3.3 INSTALLATION

A. Install plastic paneling according to manufacturer's written instructions.

B. Install FRP panels in a full spread of adhesive.

C. Install trim accessories with adhesive and nails or staples . Do not fasten through panels.

D. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.

E. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

F. Maintain uniform space between adjacent panels and between panels and floors, ceilings, and fixtures. Fill space with sealant.

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G. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

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SECTION 07 13 26 - SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sheet waterproofing - WTRP-1.
2. Insulation drainage panels - INSUL-2B.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

C. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for installation.

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1. Build for each typical waterproofing installation including accessories to demonstrate surface preparation, crack and joint treatments, inside and outside corner treatments, and protection.
   a. Size: 100 sq. ft. in area .
   b. Description: Each type of wall installation.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

   1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.7 WARRANTY

A. Installer's Special Warranty: Specified form, signed by Installer, covering Work of this Section, for warranty period of two years.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Source Limitations for Waterproofing System: Obtain waterproofing materials from single source from single manufacturer.

2.2 SHEET WATERPROOFING

A. Modified Bituminous Sheet Waterproofing - WP-1: Minimum 60-mil nominal thickness, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated on one side to a 4-mil- thick, polyethylene-film reinforcement, and with release liner on adhesive side ; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.

   1. Products: Subject to compliance with requirements, provide products by one of the following:
      a. Carlisle Coatings & Waterproofing Inc; CCW MiraDRI 860/861 .
      b. Henry Company; Blueskin WP 200 .

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c. W. R. Meadows, Inc; Mel-Rol XLT .

2. Physical Properties:
   a. Tensile Strength, Membrane: 250 psi minimum; ASTM D412, Die C, modified.
   b. Ultimate Elongation: 300 percent minimum; ASTM D412, Die C, modified.
   c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D1970/D1970M.
   d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C836/C836M.
   e. Puncture Resistance: 40 lbf minimum; ASTM E154/E154M.
   f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D570.
   g. Water Vapor Permeance: 0.05 perm maximum; ASTM E96/E96M, Water Method.
   h. Hydrostatic-Head Resistance: 200 feet minimum; ASTM D5385.
3. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

2.3 ACCESSORIES

A. Furnish accessory materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

   1. Furnish liquid-type accessory materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne primer recommended for substrate by sheet waterproofing material manufacturer.

2.4 INSULATION DRAINAGE PANELS

A. Unfaced, Wall-Insulation Type VI, Drainage Panels - INSUL-2B: Extruded-polystyrene board insulation in accordance with ASTM C578, Type VI, 40-psi minimum compressive strength; unfaced; fabricated with shiplap or channel edges and with one side having grooved drainage channels.

   1. Manufacturers: Subject to compliance with requirements, provide one of the following:
      a. DiversiFoam Products.
      b. Owens Corning.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of waterproofing.

1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method in accordance with ASTM D4263.
3. Verify that compacted subgrade is dry, smooth, sound, and ready to receive waterproofing sheet.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections.

E. Fill form tie holes, honeycomb, aggregate pockets, holes, and other voids.

F. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks in accordance with ASTM D4258.

G. Bridge and cover isolation joints, expansion joints, and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips of widths according to manufacturer's written instructions.

1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.

H. Corners: Prepare, prime, and treat inside and outside corners in accordance with manufacturer's instructions.

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1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:
   a. At footing-to-wall intersections, extend liquid membrane in each direction from corner or install membrane strip centered over corner.
   b. At plaza-deck-to-wall intersections, extend liquid membrane or sheet strips onto deck waterproofing and to finished height of sheet flashing.

I. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions.

3.3 INSTALLATION OF SHEET WATERPROOFING

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.

   1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.

D. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.

E. Seal edges of sheet waterproofing terminations with termination bar and sealant.

F. Install sheet waterproofing and accessory materials to tie into adjacent waterproofing.

G. Roll waterproofing membrane to firmly adhere to substrate. Roll seams and terminations.

H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.

I. Immediately install protection course with butted joints over waterproofing membrane.

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1. Insulation drainage panels may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer and installed immediately.

3.4 INSTALLATION OF INSULATION DRAINAGE PANELS

A. Install insulation drainage panels over waterproofed surfaces. Cut and fit to within 3/4 inch of projections and penetrations.

B. Ensure that drainage channels are aligned and free of obstructions.

C. On vertical surfaces, set insulation drainage panels in adhesive or tape applied according to manufacturer's written instructions.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests, and to furnish reports to Architect.

B. Waterproofing will be considered defective if it does not pass tests and inspections.

3.6 PROTECTION, REPAIR, AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

D. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

E. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

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SECTION 07 19 00 - WATER REPELLENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes penetrating water-repellent treatments (WRC-1) for the following vertical and horizontal surfaces:

1. Cast-in-place concrete - exterior exposed to view.
2. Cast stone.
3. Concrete unit masonry.
4. Clay brick masonry.

B. Related Requirements:

1. Section 04 20 00 "Unit Masonry."
2. Section 04 26 13 "Masonry Veneer."
3. Section 04 72 00 "Cast Stone Masonry."

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's printed statement of VOC content.
2. Include manufacturer's standard colors.
3. Include manufacturer's recommended number of coats for each type of substrate and spreading rate for each separate coat.
4. Include printout of current "MPI Approved Products List" for each product category specified in Part 2 that specifies water repellents approved by MPI, with the proposed product highlighted.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Applicator testing agency.

B. Product Certificates: For each type of water repellent.

C. Preconstruction Test Reports: For water-repellent-treated substrates.

D. Sample Warranty: For special warranty.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: An employer of workers trained and approved by manufacturer.

B. MPI Standards: Comply with MPI standards indicated and provide water repellents listed in its "MPI Approved Products List."

C. Mockups: Prepare mockups of each required water repellent on each type of substrate required to demonstrate aesthetic effects, for preconstruction testing, and to set quality standards for materials and execution.

1. Locate mockups where shown on Drawings .
   a. Size: 25 sq. ft. each.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing: Engage a qualified testing agency to perform preconstruction testing of water repellents on field mockups .

1. In addition to verifying performance requirements, use mockups to verify manufacturer's written instructions for application procedure and optimum rates of product application to substrates.
2. Propose changes to materials and methods to suit Project.
3. Notify Architect seven days in advance of the dates and times when mockups will be tested.

1.8 FIELD CONDITIONS

A. Limitations: Proceed with application only when the following existing and forecasted weather and substrate conditions permit water repellents to be applied according to manufacturers' written instructions and warranty requirements:

1. Concrete surfaces and mortar have cured for not less than 28 days.
2. Building has been closed in for not less than 30 days before treating wall assemblies.

3. Ambient temperature is above 40 deg F and below 100 deg F and will remain so for 24 hours.
4. Substrate is not frozen and substrate-surface temperature is above 40 deg F and below 100 deg F.
5. Rain or snow is not predicted within 24 hours.
6. Not less than 24 hours have passed since surfaces were last wet.
7. Windy conditions do not exist that might cause water repellent to be blown onto vegetation or surfaces not intended to be treated.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Performance: Water repellents shall meet the following performance requirements as determined by testing on manufacturer's standard substrates representing those indicated for this Project.

B. Water Absorption: Minimum 80 percent reduction of water absorption after 24 hours for treated compared to untreated specimens when tested according to the following:

1. Cast-in-Place Concrete: ASTM C 642.
2. Concrete Masonry Units: ASTM C 140.

C. Water-Vapor Transmission: Comply with one or both of the following:

1. Maximum 10 percent reduction water-vapor transmission of treated compared to untreated specimens, according to ASTM E 96/E 96M.
2. Minimum 80 percent water-vapor transmission of treated compared to untreated specimens, according to ASTM D 1653.

D. Water Penetration and Leakage through Masonry: Minimum 90 percent reduction in leakage rate of treated compared to untreated specimens, according to ASTM E 514/E 514M.

E. Durability: Maximum 5 percent loss of water-repellent performance after 2500 hours of weathering according to ASTM G 154 compared to water-repellent-treated specimens before weathering.

F. Chloride-Ion Intrusion in Concrete: NCHRP Report 244, Series II tests.

1. Reduction of Water Absorption: 80 percent.
2. Reduction in Chloride Content: 80 percent.

2.2 PENETRATING WATER REPELLENTS - WRC-1

A. Proprietary-Blend, Penetrating Water Repellent: Clear, consisting of one or several different resins (silanes or siloxanes), polymers, stearates, or oils plus other compounds or products of components; with 400 g/L or less of VOCs.

1. Basis-of-Design Product: Subject to compliance with requirements, provide PROSOCO, Inc; Sure Klean® Weather Seal Blok-Guard® & Graffti Control Ultra or comparable product by one of the following:
   a. Laticrete International, Inc.
   b. United Gilsonite Laboratories (UGL).
   c. Vexcon Chemicals Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and conditions affecting performance of the Work.

   1. Verify that surfaces are clean and dry according to water-repellent manufacturer's requirements. Check moisture content in three representative locations by method recommended by manufacturer.
   2. Verify that there is no efflorescence or other removable residues that would be trapped beneath the application of water repellent.
   3. Verify that required repairs are complete, cured, and dry before applying water repellent.

B. Test pH level according to water-repellent manufacturer's written instructions to ensure chemical bond to silica-containing or siliceous minerals.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. New Construction and Repairs: Allow concrete and other cementitious materials to age before application of water repellent, according to repellent manufacturer's written instructions.

B. Cleaning: Before application of water repellent, clean substrate of substances that could impair penetration or performance of product according to water-repellent manufacturer's written instructions .

   1. Cast-in-Place Concrete and Concrete Unit Masonry: Remove oil, curing compounds, laitance, and other substances that inhibit penetration or performance of water repellents according to ASTM E 1857 .

C. Protect adjoining work, including mortar and sealant bond surfaces, from spillage or blow-over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass if there is the possibility of water repellent being deposited on surfaces. Cover live vegetation.

D. Coordination with Mortar Joints: Do not apply water repellent until pointing mortar for joints adjacent to surfaces receiving water-repellent treatment has been installed and cured.

E. Coordination with Sealant Joints: Do not apply water repellent until sealants for joints adjacent to surfaces receiving water-repellent treatment have been installed and cured.

1. Water-repellent work may precede sealant application only if sealant adhesion and compatibility have been tested and verified using substrate, water repellent, and sealant materials identical to those required.

3.3 APPLICATION

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect the substrate before application of water repellent and to instruct Applicator on the product and application method to be used.

B. Apply coating of water repellent on surfaces to be treated using 15 psi-pressure spray with a fan-type spray nozzle to the point of saturation. Apply coating in dual passes of uniform, overlapping strokes. Remove excess material; do not allow material to puddle beyond saturation. Comply with manufacturer's written instructions for application procedure unless otherwise indicated.

C. Apply a second saturation coating, repeating first application. Comply with manufacturer's written instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats. Consult manufacturer's technical representative if written instructions are not applicable to Project conditions.

3.4 FIELD QUALITY CONTROL

A. Testing of Water-Repellent Material: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when water repellent is being applied:

1. Owner will engage the services of a qualified testing agency to sample water-repellent material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Owner may direct Contractor to stop applying water repellents if test results show material being used does not comply with product requirements. Contractor shall remove noncomplying material from Project site, pay for testing, and correct deficiency of surfaces treated with rejected materials, as approved by Architect. .

B. Coverage Test: In the presence of Architect, hose down a dry, repellent-treated surface to verify complete and uniform product

application. A change in surface color will indicate incomplete application.

1. Notify Architect seven days in advance of the dates and times when surfaces will be tested.
2. Reapply water repellent until coverage test indicates complete coverage.

3.5 CLEANING

A. Immediately clean water repellent from adjoining surfaces and surfaces soiled or damaged by water-repellent application as work progresses. Correct damage to work of other trades caused by water-repellent application, as approved by Architect.

B. Comply with manufacturer's written cleaning instructions.

END OF SECTION 07 19 00

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Extruded polystyrene foam-plastic board insulation - INSUL-2.
2. Polyisocyanurate foam-plastic board insulation - INSUL-3.
3. Mineral-wool blanket insulation - INSUL-4.

B. Related Requirements:

1. Section 07 21 19 "Foamed-in-Place Insulation" for spray-applied polyurethane foam insulation.
2. Section 07 52 00 "Modified Bitumen Membrane Roofing - Cold-Applied, Solvent-Free for insulation specified as part of roofing construction.
3. Section 09 29 00 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Extruded polystyrene foam-plastic board insulation.
2. Polyisocyanurate foam-plastic board insulation.
3. Glass-fiber blanket insulation.

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

B. Research Reports: For foam-plastic insulation, from ICC-ES.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

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1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indexes less than 25 and 450 when tested in accordance with ASTM E84.

B. Fire-Resistance Ratings: Comply with ASTM E119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from listings of another qualified testing agency.

C. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

D. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

E. Thermal-Resistance Value (R-Value): R-value as indicated on Drawings in accordance with ASTM C518.

2.2 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

A. Extruded Polystyrene Board Insulation (XPS), Type IV - INSUL-2 : ASTM C578, Type IV, 25-psi minimum compressive strength; unfaced.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. DiversiFoam Products.
   b. Dow Chemical Company (The).
   c. Kingspan Insulation Limited.
   d. Owens Corning.
   e. The Dow Chemical Company.
2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

B. Extruded Polystyrene Board Insulation, Type IV, Drainage Panels <**Insert drawing designation>**: ASTM C578, Type IV, 25-psi minimum

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compressive strength; unfaced; fabricated with shiplap or channel edges and with one side having grooved drainage channels.

1. <Click here to find, evaluate, and insert list of manufacturers and products.>

2.3 POLYISOCYANURATE FOAM-PLASTIC BOARD INSULATION

A. Polyisocyanurate Board Insulation, Glass-Fiber-Mat Faced - INSUL-3 : ASTM C1289, glass-fiber-mat faced, Type II, Class 2. Reference Division 07 Section "Modified Bitumen Membrane Roofing."

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Atlas Polyiso Roof and Wall Insulation.
   b. Carlisle Coatings & Waterproofing Inc.
   c. Firestone Building Products.
   d. Johns Manville; a Berkshire Hathaway company.
   e. Rmax, Inc.
2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.4 GLASS-FIBER BLANKET INSULATION

A. Glass-Fiber Blanket Insulation, Unfaced - INSUL-4 : ASTM C665, Type I; passing ASTM E136 for combustion characteristics.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Certainteed; SAINT-GOBAIN.
   b. Johns Manville; a Berkshire Hathaway company.
   c. Owens Corning.

2.5 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. AGM Industries, Inc.
   b. Gemco.
2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.

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B. 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.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. AGM Industries, Inc.
   b. Gemco.

C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. AGM Industries, Inc.
   b. Gemco.

2.6 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Spray Polyurethane Foam Insulation - INSUL-6: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.

B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

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C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF SLAB INSULATION

A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of 36 inches below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of 36 inches in from exterior walls.

3.4 INSTALLATION OF FOUNDATION WALL INSULATION

A. Butt panels together for tight fit.

B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions.
2. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.
3. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
4. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
5. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

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3.5 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face and as recommended by manufacturer.

1. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions, and with faces flush.
2. Press units firmly against inside substrates.

3.6 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.7 INSTALLATION OF ROOF INSULATION - See Section 07 52 00 "Modified Bitumen Membrane Roofing."

3.8 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

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SECTION 07 21 19 - FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Closed-cell spray polyurethane foam - INSUL-8.

B. Related Requirements:

1. Section 07 21 00 "Thermal Insulation" for other types of insulation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Evaluation Reports: For spray-applied polyurethane foam-plastic insulation, from ICC-ES .

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

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PART 2 - PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM - INSUL-8

A. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, Type II, minimum density of 1.5 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. BASF Corporation.
   b. Carlisle Spray Foam Insulation.
   c. Icynene-Lapolla; Icynene.
   d. Johns Manville; a Berkshire Hathaway company.
2. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: 75 or less.
   b. Smoke-Developed Index: 450 or less.
3. Provide insulation with HFO blowing agent. HFC not allowed.
4. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
5. Location: Exterior frame walls. Performance: 3" thickness, R-21 min. Other miscellaneous locations as detailed or as required - INSUL-6.

B. Thermal Barrier: Where closed-cell spray polyurethane foam is not protected by a layer of gypsum board, provide code-required intumescent coating thermal and ignition barrier over spray foam. DC315 by International Fireproofing Technologies, Inc., or approved equal.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.

3.2 INSTALLATION

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Spray insulation to envelop entire area to be insulated and fill voids.

C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.

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D. Framed Walls: Install between stud cavities achieve thickness indicated on Drawings.

E. Miscellaneous Voids: Apply according to manufacturer's written instructions.

3.3 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

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SECTION 07 26 50 - UNDERSLAB VAPOR BARRIER

PART 1 - GENERAL

1.1 SUMMARY

A. Products supplied under this section:

1. Vapor barrier, seam tape, and installation accessories for installation under concrete slabs on grade - VB-1.

B. Related sections:

1. Section 03 30 00 Cast-in-Place Concrete.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):

B. ASTM E1745-11Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

C. ASTM E1643-11Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

D. Technical Reference - American Concrete Institute (ACI):

E. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

F. ACI 302.1R-15 Guide to Concrete Floor and Slab Construction.

1.3 SUBMITTALS

A. Quality control/assurance:

B. Summary of test results per paragraph 9.3 of ASTM E1745.

C. Manufacturer’s samples and literature.

D. Contact vapor barrier manufacturer to coordinate a review of the vapor barrier installation either by digital review or in person.

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PART 2 - PRODUCTS

2.1 MATERIALS

A. Source Limitations: Obtain vapor barrier materials and accessories from single source from single manufacturer.

B. Vapor barrier shall have all the following qualities:

1. Maintain permeance of less than 0.01 Perms grains/(ft2 · hr · inHg) as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
2. Other performance criteria:
   a. Strength: ASTM E1745 Class A.
   b. Thickness: 15 mils minimum

C. Under-Slab Vapor Barrier - VB-1:

1. Basis of Design: Stego Industries Model: Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC., (877) 464-7834 www.stegoindustries.com.
2. Additional Approved Manufacturers:
   a. Vaporguard by Reef Industries, 713-507-4250. www.reefindustries.com.
   b. Moistop Ultra 15 by Fortifiber, 800-773-4777, www.fortifiber.com
3. Location: Under slab as indicated on drawings.

2.2 ACCESSORIES

A. Miscellaneous Materials: Seam tape, mastic, perimeter and edge sealing multilayered and double-sided tape, and penetration prevention specified or acceptable to manufacturer of vapor barrier.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ensure that subsoil is approved by COR.

B. Level and compact base material.

3.2 INSTALLATION

A. Install vapor barrier in accordance ASTM E1643.

1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.

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2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier.
3. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself.
   a. Seal vapor barrier to the entire slab perimeter using StegoCrete Claw, per manufacturer's instructions. At all points of termination (block-outs, interior grade beams, perimeter edge, etc.), seal vapor barrier to the slab itself using StegoCrete Claw, per manufacturer's instructions.
      OR
   b. Seal vapor barrier to the entire perimeter wall or footing/grade beam with double sided StegoTack Tape, per manufacturer’s instructions.
4. Overlap joints 6 inches and seal with manufacturer’s seam tape.
5. Apply seam tape to a clean and dry vapor barrier.
6. Seal all penetrations (including pipes) per manufacturer’s instructions.
   a. For interior forming applications, avoid the use of non-permanent stakes driven through vapor barrier. Used blunt-end nail stakes (screed pad posts) and insert them into Beast Foot. Ensure Beast Foot’s peel-and-stick adhesive base is fully adhered to the vapor barrier
7. Avoid the use of non-permanent stakes driven through vapor retarder.
8. If non-permanent stakes are driven through vapor retarder, repair as recommended by vapor retarder manufacturer.
9. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile.
10. For vapor barrier-safe screeding applications, install Beast Screed (vapor barrier-safe screed system) per manufacturer’s instructions prior to placing concrete.

END OF SECTION 07 26 50

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SECTION 07 27 26 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Vapor-permeable, fluid-applied air and water barrier - AB-2.

B. Related Requirements:

1. Section 06 16 00 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film

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thickness; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.

C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

D. Compatibility Test Reports: For components of fluid-applied membrane air barrier, verify that materials and products required to join the fluid-applied membrane air barrier AWB-1 with the roof membrane EPDM-1and the foundation dampproofing material DP-1 and waterproofing membrane WP-2 are compatible.

E. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.

B. Mockups: Build mockups to set quality standards for materials and execution.

1. Build integrated mockups of exterior wall assembly as indicated on Drawings , incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.

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a. Coordinate construction of mockups to permit inspection and testing of air barrier before external insulation and cladding are installed.
b. Include junction with roofing membrane , building corner condition, and foundation wall intersection.
c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on field mockups.

B. Mockup Testing: Air-barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.

1. Air-Leakage-Location Testing: Mockups will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers .
2. Air-Leakage-Volume Testing: Mockups will be tested for air-leakage rate according to ASTM E 783 or ASTM E 2357.
3. Adhesion Testing: Mockups will be tested for required air-barrier adhesion to substrate according to ASTM D 4541.
4. Notify COR seven days in advance of the dates and times when mockups will be tested.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

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PART 2 - PRODUCTS

2.1 MATERIALS

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Air and Water Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations , tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. , when tested according to ASTM E 2357.

2.3 MEDIUM-BUILD AIR AND WATER BARRIERS, VAPOR PERMEABLE

A. Medium-Build, Vapor-Permeable Air and Water Barrier - AB-2: Synthetic polymer material with an installed dry film thickness, according to manufacturer's written instructions, of17 to 30 mils over smooth, void-free substrates.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Henry Company; Air-Bloc All Weather STPE or VA approved equal product by one of the following:
   a. 3M Industrial Adhesives and Tapes Division.
   b. Carlisle Coatings & Waterproofing Inc.
   c. DuPont de Nemours, Inc.
   d. GE Construction Sealants; Momentive Performance Materials Inc.
   e. Hohmann & Barnard, Inc.
   f. Mar-flex Waterproofing & Building Products.
   g. Rubber Polymer Corporation, Inc.
   h. Sto Corp.
   i. TK Products.
2. Physical and Performance Properties:
   a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
   b. Vapor Permeance: Minimum 10 perms ; ASTM E 96/E 96M, Desiccant Method, Procedure A.
   c. Ultimate Elongation: Minimum 250 percent; ASTM D 412, Die C.
   d. Adhesion to Substrate: Minimum 16 lbf/sq. in. when tested according to ASTM D 4541.

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e. UV Resistance: Can be exposed to sunlight for 180 days according to manufacturer's written instructions.

2.4 ACCESSORY MATERIALS

A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

B. Primer: Liquid primer recommended for substrate by air-barrier material manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Verify that masonry joints are flush and completely filled with mortar.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

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C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

H. Bridge isolation joints expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 ACCESSORIES INSTALLATION

A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier. Use only accessory material that are approved by air-barrier manufacturer. Transition strips and accessory materials shall be reviewed, approved, and coordinated with various related trade contractors for compatibility.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.
3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.

B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior

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door framing, and other construction used in exterior wall openings, using accessory materials.

C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors.

1. Transition Strip: Roll firmly to enhance adhesion.

F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

H. Seal top of through-wall flashings to air barrier with an additional 6-inch- wide, transition strip.

I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.4 PRIMARY AIR AND WATER BARRIER MATERIAL INSTALLATION

A. Apply air and water barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.

1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.

B. Medium-Build Air and Water Barrier: Apply continuous unbroken air-barrier material to substrates according to the following thickness.

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Apply an increased thickness of air-barrier material in full contact around protrusions such as masonry ties.

1. Vapor-Permeable, Medium-Build Air and Water Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements , applied in one or more equal coats. Apply additional material as needed to achieve void- and pinhole-free surface, but do not exceed thickness on which required vapor permeability is based.

C. Do not cover air barrier until it has been tested and inspected by testing agency.

D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Air-barrier dry film thickness.
3. Continuous structural support of air-barrier system has been provided.
4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
5. Site conditions for application temperature and dryness of substrates have been maintained.
6. Maximum exposure time of materials to UV deterioration has not been exceeded.
7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Strips and transition strips have been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

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C. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

D. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

3.6 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 07 27 26

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SECTION 07 42 93 - SOFFIT PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal soffit panels - SOF-1

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

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1. Metal Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

C. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

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1.10 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including rupturing, cracking, or puncturing.
   b. Deterioration of metals and other materials beyond normal weathering.
2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings .
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

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C. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft. .

D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft. .

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F , ambient; 180 deg F , material surfaces .

2.2 METAL SOFFIT PANELS - SOF-1

A. Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

B. Accessories:

1. Exposed trim: Inside corners, outside corners, wide starter strip, j-track, flat-cap and base, U-cap and base, finishing-cap and base, two-piece corner, perforated 2.5 inch vent strip, 2.5 inch non-perforated strip in same material and finishes as siding.corner.

C. Substitutions: See Section 01 60 00 - Product Requirements.

D. Flush-Profile Metal Soffit Panels - SOF-1: Solid panels formed with a flat panwith a v-groove between panel edges.

1. Basis-of-Design Product: Subject to compliance with requirements, provide MBCI Artisan Series, 22 ga., flat panel with no intermediate ribs. Color: Signature 300 PVDF Midnight Bronze or approved equal.
   a. AEP Span.
   b. Berridge Manufacturing Company.
   c. Metal Sales, Inc.
   d. PAC-CLAD, a division of Peterson Aluminum.
2. Panel Coverage: 12 inches .
3. Panel Height: 1 inch .

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2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Subframing: See Section 09 22 16 "Non-Structural Metal Framing."

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.4 FABRICATION

A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels.

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Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. 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.
2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
   a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal soffit panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to

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exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal panel manufacturer.
2. Examine sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal panel manufacturer.
   a. Verify that air- or water-resistive barriers been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.

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6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

E. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels and elsewhere as needed to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

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G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling, and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

3.3 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 42 93

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SECTION 07 52 00

MODIFIED BITUMINOUS MEMBRANE ROOFING - COLD APPLIED- SOLVENT FREE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Styrene-butadiene-styrene (SBS) modified bituminous membrane roofing; cold applied with solvent free no odor adhesive - MOD-1.
2. Installation of roof insulation, substrate board, vapor retarder, and cover board.
3. Installation of EPDM flashings and terminations in conjunction with modified bituminous membrane roofing.
4. Preparation of substrate to receive new roof system.

1.2 RELATED REQUIREMENTS

A. Nailers and Blocking: Section 06 10 00, ROUGH CARPENTRY.

B. Roof insulation, substrate board, vapor retarder, and cover board: Section 07 22 00, ROOF AND DECK INSULATION.

C. Section 07 60 00, FLASHING AND SHEET METAL.

1.3 REFERENCES

A. American Society of Civil Engineers (ASCE):

1. ASCE 7-05, Minimum Design Loads for Buildings and Other Structures.
2. American Society for Testing and Materials (ASTM):
3. ASTM D451 Standard Test Method for Sieve Analysis of Granular Mineral Surfacing for Asphalt Roofing Products.
4. ASTM D1079 Standard Terminology Relating to Roofing, Waterproofing and Bituminous Materials.
5. ASTM D1227 Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing.
6. ASTM D1863 Standard Specification for Mineral Aggregate Used as a Protective Coating for Roofing.
7. ASTM D4586 Standard Specification for Asphalt Roof Cement.
8. ASTM D2824 Standard Specification for Aluminum-Pigmented Asphalt Roof Coating.
9. ASTM D5147 Standard Test Method for Sampling and Testing Modified Bituminous Sheet Materials.

10. ASTM D6162 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.
11. ASTM D6163 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.
12. ASTM E108 Standard Test Methods for Fire Test of Roof Coverings.

B. National Roofing Contractors Association (NRCA):
1. Roofing and Waterproofing Manual.

C. Underwriters Laboratories, Inc. (UL):
1. Fire Hazard Classifications.

D. Warnock Hersey (WH):
1. Fire Hazard Classifications.

1.4 SUBMITTALS FOR REVIEW

A. Product Data: Provide manufacturer's technical product data for each type of roofing product specified. Include data substantiating that materials comply with specified requirements.

B. Shop Drawings: For project-specific roofing system. Include plans, elevations, sections, details, and attachments to other work.
1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Crickets, and tapered edge strips, including slopes.
4. Wind uplift design for each roof area with insulation adhesive patterns for corner, perimeter and field of roof locations.
   a. Insulation fastening patterns, if required, for corner and perimeter locations.
5. Roofing installation details, penetrations and flashings.
6. The shop drawings shall be reviewed and accepted by the manufacturer prior to submitting.

C. Samples: Submit two samples of the following:
1. 1 foot by 1 foot sample of each roofing membrane for review.

D. Any material submitted as equal to the specified material must be accompanied by a report signed and sealed by a professional engineer licensed in the state in which the installation is to take place. This report shall show that the submitted equal meets the Design and Performance criteria in this specification. Substitution requests

submitted without licensed engineer approval will be rejected for non-conformance.

1.5 SUBMITTALS FOR INFORMATION

A. Manufacturer's Installation Instructions: Submit installation instructions and recommendations indicating special precautions required for installing the membrane.

B. Manufacturer's Certificate: Certify that roof system furnished is approved by Factory Mutual, Underwriters Laboratories, Warnock Hersey or approved third party testing facility in accordance with ASTM E108, Class A for external fire and meets local or nationally recognized building codes.

C. Manufacturer's Certificate: Certify that the roof system furnished is approved or accepted by Factory Mutual Approval Standard 4470.

D. Manufacturer's Certificate: Certify that materials are manufactured in North America and conform to requirements specified herein, are chemically and physically compatible with each other, and are suitable for inclusion within the total roof system specified herein.

E. Manufacturer's Certificate: Submit a certified copy of the roofing manufacturer's ISO 9001 compliance certificate.

F. Test Reports: Submit test reports, prepared by an independent testing agency, for all modified bituminous sheet roofing, indicating compliance with ASTM D5147.

G. Written certification from the roofing system manufacturer certifying the applicator is currently authorized for the installation of the specified roof system.

H. Design Loads: Submit copy of manufacturer's minimum design load calculations according to ASCE 7-05, Method 2 for Components and Cladding, sealed by a registered professional engineer. In no case shall the design loads be taken to be less than those detailed in Design and Performance Criteria article of this specification.

I. Qualification data for firms and individuals identified in Quality Assurance Article below.

1.6 CONTRACT CLOSEOUT SUBMITTALS

A. General: Comply with Requirements of Division 01 Section - Closeout Submittals.

B. Special Project Warranty: Provide specified warranty for the Project, executed by the authorized agent of the Manufacturer.

C. Roofing Maintenance Instructions. Provide a manual of manufacturer's recommendations for maintenance of installed roofing systems.

D. Insurance Certification: Assist VA in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

E. Demonstration and Training Schedule: Provide a schedule of proposed dates and times for instruction of VAMC's personnel in the maintenance requirements for completed roofing work. Refer to Part 3 for additional requirements.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this Section with not less than 15 years documented experience and have ISO 9001 certification.

B. Installer Qualifications: Company specializing in modified bituminous roofing installation with not less than 5 years experience and authorized by roofing system manufacturer as qualified to install manufacturer's roofing materials.

C. Installer's Field Supervision: Maintain a full-time Supervisor/Foreman on job site during all phases of roofing work while roofing work is in progress. Maintain proper supervision of workmen.

D. Maintain a copy of the Contract Documents in the possession of the Supervisor/Foreman and on the roof at all times.

E. Source Limitations: Obtain all components of roof system from a single manufacturer. Secondary products that are required shall be recommended and approved in writing by the roofing system Manufacturer.

1. Upon request of the COR, submit Manufacturer's written approval of secondary components in list form, signed by an authorized agent of the Manufacturer.

F. Source Quality Control: Manufacturer shall have in place a documented, standardized quality control program such as ISO-9001.

1.8 PRE-INSTALLATION CONFERENCE

A. Pre-Installation Roofing Conference: Convene a pre-roofing conference approximately two (2) weeks before scheduled commencement of modified bituminous roofing system installation and associated work.

B. Require attendance of installer of each component of associated work, installers of substrate construction to receive roofing work, installers of rooftop units and other work in and around roofing that must precede or follow roofing work (including mechanical work if any), COR, roofing system manufacturer's representative, and other representatives directly concerned with performance of the Work, including (where applicable) testing agencies and governing authorities. Objectives of conference include:

1. Review foreseeable methods and procedures related to roofing work, including set up and mobilization areas for stored material and work area.
2. Tour representative areas of roofing substrates (decks), inspect and discuss condition of substrate, roof drains, curbs, penetrations and other preparatory work.
3. Review structural loading limitations of deck and inspect deck for loss of flatness and for required attachment.
4. Review protection of existing intake louvers from fumes before application of roofing.
5. Review Installation of substrate board, vapor retarder, roof insulation, cover board, roof membrane and flashings.
6. Review roofing system requirements (drawings, specifications and other contract documents).
7. Review terminations and expansion joints.
8. Review transitions and connections to other work.
9. Review required submittals both completed and yet to be completed.
10. Review and finalize construction schedule related to roofing work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
11. Review temporary protection requirements for roofing system during and after installation. Establish monitoring procedures for construction activities and recording of damage by sub-trades.
    a. Review staging, membrane and substrate protection, material placement, construction activity and pedestrian traffic protection requirements for metal composite material (MCM)

wall panel and furring work areas and access paths to areas where work will occur on completed membrane roofing.

12. Review required inspection, testing, certifying and material usage accounting procedures.
13. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not mandatory requirement).
14. Record discussions of conference including decisions and agreements (or disagreements) reached and furnish a copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.
15. Review notification procedures for weather or non-working days.

C. The Contractor shall record the proceedings and promptly distribute them to the participants for record.

D. The intent of the conference is to resolve issues affecting the installation and performance of roofing work. Do not proceed with roofing work until such issues are resolved the satisfaction of to the COR. This shall not be construed as interference with the progress of Work on the part of the COR.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site with seals and labels intact, in manufacturer's original containers, dry and undamaged.

B. Store and handle roofing sheets in a dry, well-ventilated, weather-tight place to prevent moisture exposure. Store rolls of felt and other sheet materials on pallets or other raised surface. Stand all roll materials on end. Cover rolled goods with a canvas tarpaulin or other breathable material (not polyethylene).

C. Do not leave unused materials on the roof overnight or when roofing work is not in progress unless protected from weather and other moisture sources.

D. Secure all material and equipment on the job site. If any material or equipment is stored on the roof, assure that the integrity of the deck is not compromised at any time. Damage to the deck caused by the Contractor's actions will be the sole responsibility of the Contractor, and the deck will be repaired or replaced at his expense.

E. Store all roofing adhesive in a heated area keeping the product above 50°F min. If the product falls below the recommended temperature the adhesive will see increased viscosities.

F. The adhesive is a moisture cured product and the shelf life is six months.

1.10 MANUFACTURER'S INSPECTIONS

A. When the Project is in progress, the roofing system manufacturer shall provide the following:

1. Provide weekly roof progress reports with photos and captions and make available via the internet at no additional cost to the VA.
2. Provide periodic job site inspections at least 2 days per week at no additional cost to the VA.
3. Report to the COR in writing any failure or refusal of the Contractor to correct unacceptable practices called to the Contractor's attention.
4. Confirm after completion that manufacturer has observed no application procedures in conflict with the specifications other than those that may have been previously reported and corrected.

1.11 PROJECT CONDITIONS

A. At areas adjacent to where the new roofing work occurs, protect existing intake louvers from fumes with charcoal filters before application of roofing.

B. Proceed with roofing work only when existing and forecasted weather conditions will permit a unit of work to be installed in accordance with manufacturer's recommendations and warranty requirements.

C. Substrate Conditions: Do not begin roofing installation until substrates have been inspected and are determined to be in satisfactory condition. All surfaces shall be smooth, dry, clean, free of fins or sharp edges, loose or foreign materials, oil or grease. No work shall proceed when moisture is present on roof or in substrate materials.

D. Do not expose materials subject to water or solar damage in quantities greater than can be weatherproofed during same day.

E. Proceed with work so new roofing materials are not subject to construction traffic. When construction traffic is necessary, roof sections shall be protected with plywood or other appropriate material to prevent damage; remove protection after construction traffic has

ceased and re-inspected roofing membranes, new and existing, for possible damage.

1.12 SEQUENCING AND SCHEDULING

A. Sequence installation of roofing with related units of work specified in other Sections to ensure that roof assemblies, including roof accessories, flashing, trim and joint sealers, are protected against damage from effects of weather, corrosion and adjacent construction activity.

B. Complete all roofing field assembly work each day. Phased construction will be accepted when approved by a manufacturer’s representative.

1.13 WARRANTY

A. Upon completion of installation, and acceptance by the COR, the Manufacturer shall supply to the VA a Thirty Year Non-Prorated No Dollar Limit Watertight Warranty.

B. Installer will submit a two-year warranty to the membrane manufacturer with a copy directly to VA.

1.14 DESIGN AND PERFORMANCE CRITERIA

A. Uniform Wind Uplift Load Capacity

1. Installed roof system shall withstand negative (uplift) design wind loading pressures complying with the following criteria, with a safety factor of not less than 2 per FM Global. Sheet material attachment shall be installed as specified in Part 3.

a. Load Resistance: ASCE/SEI 7; Design criteria as indicated on Drawings.

1) Uplift Pressures (Factored Ultimate Pressures):

a) Corner Uplift Pressure: 70 psf.

b) Perimeter Uplift Pressure: 53.2 psf.

c) Field-of-Roof Uplift Pressure: 42 psf.

B. Live Load: 24 psf.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. Basis of Design: Materials, manufacturer's product designations, and/or manufacturer's names specified herein shall be regarded as the minimum standard of quality required for work of this Section. Comply with all manufacturer and contractor/fabricator quality and performance criteria specified in Part 1.

1. Basis-of-Design Products: This information is provided for reference only; it does not exclude other manufacturers that comply with specified product requirements.

B. Substitutions: Products proposed as equal to the products specified in this Section shall be submitted in accordance with Bidding Requirements and Division 01 provisions.

1. Proposals shall be accompanied by a copy of the manufacturer's standard specification section. That specification section shall be signed and sealed by a professional engineer licensed in the state in which the installation is to take place. Substitution requests containing specifications without licensed engineer certification shall be rejected for non-conformance.
2. Include a list of three projects of similar type and extent. In addition, the three projects must be at least five years old and be available for inspection by the COR.
3. Equivalency of performance criteria, warranty terms, submittal procedures, and contractual terms will constitute the basis of acceptance.
4. The COR's decision regarding substitutions will be considered final. Unauthorized substitutions will be rejected.

2.2 ACCEPTABLE MANUFACTURERS

A. Basis-of-Design Products: This information is provided for reference only; it does not exclude other manufacturers that comply with specified product requirements.

B. The design is based upon roofing systems engineered and manufactured by The Garland Company or approved equal:

The Garland Company
3800 East 91st Street
Cleveland, Ohio 44105
Telephone: (800) 762-8225
Website: www.garlandco.com

2.3 DESCRIPTION

A. Modified bituminous sheet roofing work - MOD-1 - including but not limited to:

1. Vapor Retarder - VR-1 - Torch Applied Option (Temp: below 50 degrees): One (1) ply of Garland HPR Torch Base Sheet bonded to

the prepared substrate with polypropylene burnable backer for SBS adherence.

2. Vapor Retarder - VR-1 - Cold Applied Option (Temp: 50 degrees and rising): One (1) ply of Garland HPR Tribase Premium Base Sheet bonded to the prepared substrate with Viking CAVR membrane adhesive (2 gal per 100 SF) installed over a cleaned and primed surface (0.5 gal per 100 SF)
3. Base Ply: One ply of Flexbase 80 SBS bonded to prepared substrate with solvent free, cold applied adhesive.
4. Solvent Free Cold Applied Adhesive: Zero V.O.C., moisture cured, non-asbestos containing cold applied adhesive for roof slopes up to 3:12. Adhesive shall have virtually no odor. Garland Green-Lock Plus membrane adhesive.
5. Base Flashing Ply: One (1) ply of Flexbase 80 SBS base flashing ply covered by an additional layer of modified bitumen membrane and set in solvent free cold applied flashing adhesive.
6. Modified Membrane Cap Sheet: STRESSPLY EUV FRMINERAL; 160 mil SBS and SIS (Styrene-Butadiene-Styrene and Styrene-Isoprene-Styrene) rubber modified membrane incorporating postconsumer recycled rubber and reinforced with a fiberglass and polyester composite scrim. Membrane is mineral surface.

2.4 BITUMINOUS SYSTEM MATERIALS

A. Vapor Retarder Cold Applied Option - Adhesive: CAVR Cold Applied Membrane Adhesive

B. Cold Applied Solvent Free Flashing Adhesive: zero V.O.C.: Green-Lock Plus Flashing Adhesive:
   1. Non-Volatile Content ASTM D4586 100%
   2. Density ASTM D1475 11.8 lbs./gal. (1.17 g/m3)
   3. Viscosity Stormer ASTM D2196 80,000-175,000 cP.
   4. Flash Point 400°F min. (232°C)

C. Cold Applied Solvent Free Membrane and Flood Coat Adhesive: zero V.O.C. compliant Performance Requirements: Green-Lock Plus Membrane Adhesive:
   1. Non-Volatile Content ASTM D4586 100%
   2. Density ASTM D1475 11.4 lbs./gal. (1.36 g/m3)
   3. Viscosity Stormer @ 73.4 +/- 2°F 16,000-20,000 cPs.
   4. Flash Point ASTM D93 400°F min. (232°C)

5. Slope: up to 3:12
6. Roofing Aggregate: To conform to ASTM D1863
   a. Slag, Pea Gravel or White Spar

2.5 SHEET MATERIALS

A. Vapor Retarder - Membrane (cold applied option): HPR Tri-Base Premium. Shingle in direction of slope of roof to shed water on each roof area.
   1. Tensile Strength, ASTM D 514
   2. 2 in/min. @ 73.4 +/- 3.6 deg. F MD 330 lbf/in XD 330 lbf/in
   3. Tear Strength, ASTM D 5147
   4. 2 in/min. @ 73.4 +/- 3.6 deg. F MD 550 lbf XD 550 lbf
   5. Elongation at Maximum Tensile, ASTM D 5147
   6. 2 in/min. @ 73.4 +/- 3.6 deg. F MD 7% XD 9%

B. Base Ply and Base Flashing Ply: FLEXBASE 80, 80 mil SBS modified membrane with woven fiberglass scrim reinforcement with the following minimum performance requirements according to ASTM D6163 Type III. Properties (Finished Membrane):
   1. Tensile Strength (ASTM D5147):
      a. 2 in/min. @ 73.4 ± 3.6°F: MD 225 lbf/in XD 225 lbf/in
      b. 50mm/min. @ 23 ± 3°C MD 39.0 kN/m XD 39.0 kN/m
   2. Tear Strength (ASTM D5147)
      a. 2 in/min. @ 73.4 ± 3.6°F MD 300 lbf XD 300 lbf
      b. 50mm/min. @ 23 ± 3°C MD 1335 N XD 1335 N
   3. Elongation at Maximum Tensile (ASTM D5147)
      a. 2 in/min. @ 73.4 ± 3.6°F MD 7.0% XD 7.0%
      b. 50mm/min. @ 23 ± 3°C MD 4.0% XD 4.0%

C. Modified Membrane Properties (Finished Membranes): STRESSPLY EUV; ASTM D6162, Type III Grade S
   1. Tensile Strength (ASTM D5147):
      a. 2 in/min. @ 73.4 ± 3.6°F MD 700 lbf/in XD 750 lbf/in
      b. 50 mm/min. @ 23 ± 3°C MD 122.5 kN/m XD 131.2 kN/m
   2. Tear Strength (ASTM D5147)
      a. 2 in/min. @ 73.4 ± 3.6°F MD 1300 lbf XD 1400 lbf
      b. 50 mm/min. @ 23 ± 3°C MD 5783 N CMD 6227 N
   3. Elongation at Maximum Tensile (ASTM D5147)
      a. 2 in/min. @ 73.4 ± 3.6°F MD 6.0% XD 6.0%
      b. 50 mm/min. @ 23 ± 3°C MD 6.0% XD 6.0%

4. Low Temperature Flexibility (ASTM D5147): Passes -30°F (-34°C)

2.6 SURFACINGS

A. Non-Fibered Aluminum Roof Coating: Garla-Brite; non-fibered aluminum roof coating having the following characteristics: (exposed flashings only)

1. Flash Point 103°F (39°C) min.
2. Weight/Gallon 7.9 lbs./gal. (1.0 g/cm3)

B. Mineral Surface: Stressply EUV FR Mineral
1. Surfaced with the highly reflective Sunburst white mineral. ASTM D 6162, Type III Grade G

2.7 RELATED MATERIALS

A. Nails and Fasteners: Non-ferrous metal or galvanized steel, except that hard copper nails shall be used with copper; aluminum or stainless steel nails shall be used with aluminum; and stainless steel nails shall be used with stainless steel, I addition plates should be used. Fasteners shall be self-clinching type of penetrating type as recommended by the manufacturer of the deck material. Nails and fasteners shall be flush-driven through flat metal discs of not less than one (1) inch diameter. Omit metal discs when one-piece composite nails or fasteners with heads not less than one (1) inch diameter are used.

B. Metal Discs: Flat discs or caps of zinc-coated sheet metal not lighter than twenty eight (28) gauge and not less than one (1) inch in diameter. Form discs to prevent dishing. Bell or cup shaped caps are not acceptable - termination bar should be extruded aluminum .125 x 1"

C. Rust Inhibitive Paint: As recommended and furnished by the membrane manufacturer for mechanical units and other metal surfaces to control and prevent surface rust.

D. Insulation Adhesive: Insul-Loc HR, highly elastomeric urethane adhesive that contains NO SOLVENTS. ASTM D 412, ASTM D 1875, ASTM D 2556, ASTM D 1876, ASTM D 816.

E. Fiber Cant: Continuous triangular cross Section made of inorganic fibrous glass or organic fiberboard used as a cant strip as recommended and furnished by the membrane manufacturer.

F. Pitch pans: Not permitted. All piping shall receive flashing boot. Fabricate to roof system manufacturer's details.

G. Drain Flashings shall be 4lb sheet lead formed and rolled.

H. Plumbing stacks shall be 4lb sheet lead, or 24 gauge stainless formed and cap. All joints shall be welded/soldered watertight.

PART 3 - EXECUTION

3.1 EXECUTION, GENERAL

A. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast. Damage to existing structures and property from water damage caused by work under this Contract shall be repaired at no additional cost to the VA.

3.2 EXAMINATION

A. Verify that deck surfaces and project conditions are ready to receive work of this section.

B. Verify that deck is clean and smooth, free of depressions, projections or ripples, and is properly sloped to drains.

C. Verify that adjacent roof substrate components do not vary more than 1/4 inch in height.

D. Verify that deck surfaces are dry and free of snow or ice. Verify that metal deck flutes are clean and dry.

E. Confirm that moisture content does not exceed twelve (12) percent by moisture meter tests. On concrete deck pour hot asphalt on to deck if it bubbles / foams and once cooled does not adhere to the substrate, the moisture levels are too high.

F. Verify that openings, curbs, pipes, conduit, sleeves, ducts, and other items which penetrate the roof are set solidly, and that wood cant strips wood nailing strips and reglets are set in place.

3.3 DECK PREPARATION

A. Clean surfaces prior to installation.

3.4 GENERAL INSTALLATION REQUIREMENTS

A. Cooperate with manufacturer, inspection and test agencies engaged or required to perform services in connection with installing the roof system.

B. Protect other work from spillage of roofing materials and prevent materials from entering or clogging drains and conductors. Replace or restore other work damaged by installation of the coal tar modified bituminous roofing system.

C. Coordinate installation of roofing system components so that insulation and roofing plies are not exposed to precipitation or left exposed overnight. Provide cut-offs at end of each day's work to cover exposed ply sheets and insulation with two (2) plies of specified base ply set in membrane adhesive and with joints and edges sealed with flashing adhesive. Remove cut-offs immediately before resuming work.

D. Substrate Joint Penetrations: Prevent membrane adhesive from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

E. Apply roofing materials as specified by manufacturer's instructions, unless more stringent requirements are specified.

1. Keep roofing materials dry before and during application.
2. Do not permit phased construction.
3. Complete application of roofing plies, modified sheet and flashing in a continuous operation.
4. Begin and apply only as much roofing in one day as can be completed that same day.
5. Cut-Offs (Waterstops): At end of each day's roofing installation, protect exposed edge of incomplete work, including ply sheets and insulation. Provide temporary covering of2 plies of specified base ply set in flashing adhesive with joints and edges sealed.

3.5 SUBSTRATE BOARD INSTALLATION - SB-1

3.6 VAPOR RETARDER INSTALLATION

A. Torch Option: Torch apply one ply of HPR Torch Base Sheet as vapor retarder

B. Cold Applied Option: Install CAVR membrane adhesive at 2 gal per sq to roof deck and install HPR Tribase Premiun membrane into adhesive and broom in place.

C. Stagger end laps 12 inches minimum.

D. Extend plies 2 inches beyond top edges of cants at wall and roof projections and equipment bases.

E. Install base flashing ply to all perimeter and projection details. Properly seal all curb penetrations and perimeter, prior to application of remaining roof.

3.7 INSULATION INSTALLATION

A. Immediately place insulation and cover boards into wet adhesive. Do not slide boards into place. Do not allow the adhesive to skin over before installing insulation boards.

B. Briefly step each board into place to ensure contact with the adhesive. Place full 5 gallon adhesive pails on boards for at least 10 minutes to provide in positive firm contact with adhesive over the full surface of the board to ensure proper adhesion.

C. Boards shall be cut and fitted where the roof deck intersects a vertical surface. The boards shall be cut to fit a maximum of 1/4 inch away from the vertical surface.

D. Insulation: Install two base layers of insulation, tapered insulation, tapered insulation for drain sumps and crickets set in Insul-Loc HR adhesive at rates indicated on shop drawings for corner, perimeter and field of roof zones. Stagger joints in second layer joints from joints in insulation layer below.

E. Cover Board - CB-1: Install one layer of 1/2" DensDeck Prime over installed insulation: Adhere fiberboard with Insul-Loc HR adhesive at rates approved by the membrane manufacturer per the approved wind uplift data for corner, perimeter and field of roof zones. Place full, 5 gallon adhesive pails on boards for at least 10 minutes to provide in positive firm contact with adhesive over the full surface of the board to ensure proper adhesion. Stagger joints from joints in insulation layer below.

F. Cant Strips: Install and secure preformed 45-degree cant strips at junctures of roofing membrane system with vertical surfaces or angle changes more than 45 degrees.

3.8 BASE PLY INSTALLATION

A. Base Ply: Cut base ply sheets into 18 foot lengths and allow plies to relax before installing. Install base sheet in Interply Adhesive: applied at the rate required by the manufacturer. Shingle base sheets

uniformly to achieve one ply throughout over the prepared substrate. Shingle in proper direction to shed water on each large area of roofing.

1. Lap ply sheet ends 8 inches. Stagger end laps 12 inches minimum.
2. Solidly bond to the substrate and adjacent ply with specified cold adhesive at the rate of 2 to 2-1/2 gallons per 100 square feet.
3. Roll must push a puddle of adhesive in front of it with adhesive slightly visible at all side laps. Use care to eliminate air entrapment under the membrane.
4. Install subsequent rolls of modified across the roof as above with a minimum of 4 inch side laps and 8 inch staggered end laps. Lay modified membrane in the same direction as the underlayers but the laps shall not coincide with the laps of the base layers.
5. Extend plies 2 inches beyond top edges of cants at wall and projection bases.
6. Install base flashing ply to all perimeter and projection details.
7. Allow the one ply of base sheet to cure at least 30 minutes before installing the modified membrane.

3.9 MODIFIED MEMBRANE APPLICATION

A. Cut cap ply sheets into 18 foot lengths and allow plies to relax before installing. Install in interplay adhesive applied at the rate required by the manufacturer. Shingle sheets uniformly over the prepared substrate to achieve the number of plys specified. Shingle in proper direction to shed water on each large area of roofing.

1. Lap ply sheet ends 8 inches. Stagger end laps 12 inches minimum.
2. Solidly bond to the base layers with specified cold adhesive at the rate of 2 to 2-1/2 gallons per 100 square feet.
3. Roll must push a puddle of adhesive in front of it with adhesive slightly visible at all side laps. Care should be taken to eliminate air entrapment under the membrane.
4. Install subsequent rolls of modified across the roof as above with a minimum of 4 inch side laps and 8 inch staggered end laps. Lay modified membrane in the same direction as the underlayers but the laps shall not coincide with the laps of the base layers.
5. Allow cold adhesive to set for 5 to 10 minutes before installing the top layer of modified membrane.
6. Extend membrane 2 inches beyond top edge of all cants in full beds of the cold adhesive as shown on the Drawings.

3.10 SBS MODIFIED MEMBRANE FLASHING MEMBRANE INSTALLATION GENERAL

A. Seal curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.

1. Prepare all walls, penetrations, expansion joints and where shown on the Drawings to be flashed with required primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
2. Adhere to the underlying base ply with specified flashing ply adhesive unless otherwise specified. Nail off at a minimum of 8

inches (203 mm) o.c. from the finished roof at all vertical surfaces.

3. Solidly adhere the entire flashing ply to the substrate. Secure the tops of all flashings that are not run up and over curb through termination bar fastened at 6 inches (152 mm) O.C. and sealed at top.
4. Seal all vertical laps of flashing ply with a three-course application of trowel-grade mastic and fiberglass mesh.
5. Coordinate counter flashing, cap flashings, expansion joints and similar work with modified bitumen roofing work as specified.
6. Coordinate roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices with the roofing system work.
7. Secure the top edge of the flashing sheet using a termination bar only when the wall surface above is waterproofed, or nailed 4 inches on center and covered with an acceptable counter flashing.

3.11 SBS MODIFIED MEMBRANE FLASHING MEMBRANE INSTALLATION

A. Seal curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.

B. Prepare all walls, penetrations, expansion joints and where shown on the Drawings to be flashed with required primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.

C. Adhere to the underlying base flashing ply with specified flashing ply adhesive unless otherwise specified. Nail off at a minimum of 8 inches (203 mm) o.c. from the finished roof at all vertical surfaces.

D. Coordinate counter flashing, cap flashings, expansion joints and similar work with modified bitumen roofing work as specified.

E. Coordinate roof accessories, miscellaneous sheet metal accessory items with the roofing system work.

F. All stripping shall be installed prior to flashing cap sheet installation.

G. Heat and scrape granules when welding or adhering at cut areas and seams to granular surfaces at all flashings.

H. Secure the top edge of the flashing sheet using a termination bar only when the wall surface above is waterproofed, or nailed 4 inches on center and covered with an acceptable counter flashing.

3.11 MODIFIED MEMBRANE SYSTEM ACCESSORIES

A. Surface Mounted Counterflashing Cap:
1. Minimum flashing height is eight (8) inches (203mm) above finished roof height. Prime vertical wall at a rate of 100 square feet per gallon and allow drying.

2. Set cant in specified flashing adhesive or insulation adhesive. Run all field plies over cant a minimum of two (2) inches (50mm).
3. Install base flashing ply covering wall set in specified adhesive with six
4. inches (152mm) on to field of roof.
5. Install a second ply of modified flashing ply in specified adhesive over the base flashing ply, nine (9) inches on to the field of the roof. Apply a three-course application of mastic and mesh at all seams and allow curing and aluminizing.
6. Apply butyl tape to wall behind flashing. Secure termination bar through flashing, butyl tape and into wall. Alternatively use caulk to replace the butyl tape.
7. Secure counterflashing set on butyl tape above flashing. Fasten eight (8) inches (203mm) o.c. and caulk top of counterflashing.

B. Reglet Mounted Counterflashing:

1. Minimum flashing height is eight (8) inches (203mm) above finished roof height. Maximum flashing height is 24 inches. Prime vertical wall at a rate of 100 square feet per gallon and allow drying.
2. Set cant in specified flashing adhesive or insulation adhesive. Run all field plies over cant a minimum of two (2) inches (50mm).
3. Install base flashing ply covering wall set in specified adhesive with six inches (152mm) on to field of the roof.
4. Install a second ply of modified flashing ply in specified adhesive over the base flashing ply, nine (9) inches (228mm) on to the field of the roof. Apply a three-course application of mastic and mesh at all vertical seams and allow curing and aluminizing.
5. Apply butyl tape to wall behind flashing. Secure termination bar through flashing, butyl tape and into wall. Alternatively use caulk to replace the butyl tape.
6. Cut reglet in masonry one joint above flashing.
7. Secure reglet counterflashing with expansion fasteners and caulk reglet opening.

C. Equipment Support:

1. Minimum curb height is eight (8) inches (203mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow drying.
2. Set cant in specified adhesive. Run all field plies over cant a minimum of two (2) inches (50mm).
3. Install base flashing ply covering curb set in specified adhesive with six (6) inches (152mm) on to field of the roof.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, nine (9) inches (228mm) on to the field of the

roof. Attach top of membrane to top of curb and nail at eight (8) inches (203mm) o.c. Apply a three-course application of specified adhesive and mesh at all vertical seams and allow curing and aluminizing.

5. Install pre-manufactured cover. Fasten sides at 24 inches (609mm) o.c. with fasteners and neoprene washers. Furnish all joint cover laps with butyl tape between metal covers.
6. Set equipment on neoprene pad and fasten as required by equipment manufacturer.

D. Curb Detail/Air Handling Station:

1. Minimum curb height is eight (8) inches (203mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow drying.
2. Set cant in specified adhesive. Run all field plies over cant a minimum of two (2) inches (50mm).
3. Install base flashing ply covering curb set in specified adhesive with six (6) inches (152mm) on to field of the roof.
4. Install a second ply of modified flashing ply in specified adhesive over the base flashing ply, nine (9) inches (228mm) on to the field of the roof. Apply a three-course application of mastic and mesh at all vertical seams and allow curing and aluminizing.
5. Install pre-manufactured counterflashing with fasteners and neoprene washers or per manufacturer's recommendations.
6. Set equipment on neoprene pad and fasten as required by equipment manufacturer.

E. Exhaust Fan:

1. Minimum curb height is eight (8) inches (203mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow drying.
2. Set cant in bitumen. Run all plies over cant a minimum of two (2) inches (50mm).
3. Install base flashing ply covering curb with six (6) inches (152mm) on to field of the roof.
4. Install a second ply of modified flashing ply installed over the base flashing ply, nine (9) inches (228mm) on to field of the roof. Attach top of membrane to top of wood curb and nail at

eight (8) inches (203mm) o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow curing and aluminizing.

5. Install metal exhaust fan over the wood nailers and flashing to act as counterflashing. Fasten per manufacturer's recommendation.

F. Plumbing Stack:

1. Minimum stack height is 12 inches (609mm).
2. Run roof system over the entire surface of the roof. Seal the base of the stack with elastomeric sealant.
3. Prime flange of new sleeve. Install properly sized sleeves set in 1/4 inch (6mm) bed of roof cement.
4. Install base flashing ply in bitumen.
5. Install membrane in bitumen.
6. Caulk the intersection of the membrane with elastomeric sealant.
7. Turn sleeve a minimum of one (1) inch (25mm) down inside of stack.

3.12 APPLICATION OF SURFACING

G. Prior to installation of the surface, obtain approval from manufacturer as to work completed. On average, at least 5-7 days are required prior to final surfacing.

H. Reflective Coating: (exposed flashings only)

1. Allow all cold applied mastics and coating to properly dry and cure before installing the aluminum coating.
2. Paint all exposed membrane with manufacturer's non-fibrated aluminum paint installed at a rate of 1/2 gallon per square per coat. This shall be a two-coat application with the finished stroke in one direction.

3.13 FIELD QUALITY CONTROL

A Perform field inspection and testing as required under provisions of Division 01.

I. Correct defects or irregularities discovered during field inspection.

J. Require attendance of roofing and insulation materials manufacturers' representatives at site during installation of the roofing system. A copy of the specification shall also be on site at all times.

3.14 CLEANING

K. Remove adhesive drippings from all walls, windows, floors, ladders and finished surfaces.

L. In areas where finished surfaces are soiled by asphalt or any other sources of soiling caused by work of this section, consult manufacturer of surfaces for cleaning instructions and conform to their instructions.

M. Repair or replace defaced or disfigured finishes caused by work of this section.

3.2 CONSTRUCTION WASTE MANAGEMENT

A. Remove and properly dispose of waste products generated during roofing procedures. Comply with requirements of authorities having jurisdiction.

3.3 FINAL INSPECTION

A. At completion of roofing installation and associated work, meet with Contractor, installer, installer of associated work, COR, roofing system manufacturer's representative and other representatives directly concerned with performance of roofing system.

B. Walk roof surface areas of the building, inspect perimeter building edges as well as flashing of roof penetrations, walls, curbs and other equipment. List all items requiring correction or completion and furnish copy of list to each party in attendance.

C. The roofing system manufacturer reserves the right to request a thermo graphic scan of the roof during final inspection to determine if any damp or wet materials have been installed. The thermo graphic scan shall be provided by the Roofing Contractor.

D. If core cuts verify the presence of damp or wet materials, the Roofing Contractor shall be required to replace the damaged areas at his own expense.

E. Repair or replace deteriorated or defective work found at time above inspection as required to a produce an installation which is free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

F. Notify the Contractor and COR upon completion of corrections.

G. Following the final inspection, provide written notice of acceptance of the installation from the roofing system manufacturer.

3.4 PROTECTION

A. Protect roofing system from traffic and construction operations.

1. Protect roofing system when used for subsequent work platform, materials storage, or staging.

2. Distribute scaffolding loads to exert maximum 50 percent roofing system materials compressive strength.

B. Loose lay temporary membrane and insulation board overlaid with plywood or OSB.

1. Weight boards to secure against wind uplift.

C. Remove protection when no longer required and approved by the Contacting Officer's Representative.

D. Repair damage.

- - - E N D - - -

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Formed wall sheet metal fabrications - FLASH-1.
2. Underlayment - UNDER-1.

B. Related Requirements:

1. Section 06 10 53 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 04 20 00 "Unit Masonry" and Section 04 26 13 "Masonry Veneer" " " for materials and installation of manufactured sheet metal through-wall flashing and trim integral with masonry.
3. Section 07 71 00 "Roof Specialties" for manufactured copings, roof-edge specialties, roof-edge drainage systems, reglets, and counterflashings.
4. Section 07 72 00 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

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2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.

1.5 ACTION SUBMITTALS

A. Product Data: For each of the following

1. Underlayment materials.
2. Elastomeric sealant.
3. Butyl sealant.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches .

C. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for

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this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested , shop shall be listed as able to fabricate required details as tested and approved.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
2. Protect stored sheet metal flashing and trim from contact with water.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.8 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, 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. Finish Warranty Period: 10 years from date of Substantial Completion.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. FM Approvals Listing: Manufacture and install roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90 . Identify materials with name of fabricator and design approved by FM Approvals.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F , ambient; 180 deg F , material surfaces .

2.2 SHEET METALS

A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Stainless Steel Sheet: ASTM A240/A240M, Type 304 , dead soft, fully annealed; with smooth, flat surface.

1. Finish: ASTM A480/A480M, No. 4 (polished directional satin) .
   a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
   b. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
      1) Run grain of directional finishes with long dimension of each piece.
      2) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

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C. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet in accordance with ASTM A653/A653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet in accordance with ASTM A792/A792M, Class AZ50 coating designation, Grade 40; prepainted by coil-coating process to comply with ASTM A755/A755M.

1. Surface: Smooth, flat .
2. Exposed Coil-Coated Finish:
   a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (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.
3. Color: As selected by Architect from manufacturer's full range .
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet Underlayment - UNDER-1: Minimum30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer in accordance with underlayment manufacturer's written instructions.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Carlisle WIP Products; a brand of Carlisle Construction Materials; WIP 300HT.
   b. Henry Company; Blueskin PE200 HT.
   c. Metal-Fab Manufacturing, a Drexel Metals Company; MetShield.
   d. Owens Corning; WeatherLock Metal High-Temperature Underlayment
   e. Polyglass U.S.A., Inc.; Polystick® MTS Plus
   f. Protecto Wrap Company; Protecto Jiffy Seal Ice & Water Guard HT.
   g. SDP Advanced Polymer Products Inc; Palisade SA-HT.
2. Source Limitations: Obtain underlayment from single source from single manufacturer.
3. Low-Temperature Flexibility: ASTM D1970/D1970M; passes after testing at minus 20 deg F or lower.

2.4 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners , solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended

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by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
   a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
   b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
   c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
2. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
3. Fasteners for Zinc-Coated (Galvanized) or Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

D. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

2.5 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.

1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

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B. Fabrication Tolerances:

1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

G. Seams:

1. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

H. Do not use graphite pencils to mark metal surfaces.

2.6 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12-foot- long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch- high, end dams. Fabricate from the following materials:

1. Stainless Steel: 0.0156 inch thick.

B. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch- high, end dams. Fabricate from the following materials:

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1. Stainless Steel: 0.0156 inch thick.

2.7 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.0188 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

A. Self-Adhering, High-Temperature Sheet Underlayment:

1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
2. Prime substrate if recommended by underlayment manufacturer.
3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses.
5. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller.
6. Roll laps and edges with roller.
7. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to

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installation characteristics required unless otherwise indicated on Drawings.

1. Install fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of sealant.
3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
5. Install continuous cleats with fasteners spaced not more than 12 inches o.c.
6. Space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
8. Do not field cut sheet metal flashing and trim by torch.
9. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
3. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws .

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

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1. Use sealant-filled joints unless otherwise indicated.
   a. Embed hooked flanges of joint members not less than 1 inch into sealant.
   b. Form joints to completely conceal sealant.
   c. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way.
   d. Adjust setting proportionately for installation at higher ambient temperatures.
      1) Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

3.4 INSTALLATION OF WALL FLASHINGS

A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.5 INSTALLATION OF MISCELLANEOUS FLASHING

A. Equipment Support Flashing:

1. Coordinate installation of equipment support flashing with installation of roofing and equipment.
2. Weld or seal flashing with elastomeric sealant to equipment support member.

3.6 INSTALLATION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 CLEANING

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

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3.8 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

C. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 07 62 00

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SECTION 07 72 00 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof hatches - HATCH-1.

B. Related Requirements:

1. Section 05 50 00 "Metal Fabrications" for metal vertical ladders, ships' ladders, and stairs for access to roof hatches.
2. Section 07 62 00 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.

1.3 COORDINATION

A. Coordinate layout and installation of roof accessories with interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories.

1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

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1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
4. Required clearances.

B. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.7 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Wind-Restraint Performance: As indicated on Drawings .

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2.2 ROOF HATCHES - HATCH-1

A. Roof Hatches: Metal roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, straight sides, and integrally formed deck-mounting flange at perimeter bottom.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AES Industries, Inc.
   b. Babcock-Davis.
   c. BILCO Company (The).
   d. Milcor; a division of Hart & Cooley, Inc.

B. Type and Size: Single-leaf lid, 30 by 36 inches .

C. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.

D. Hatch Material: Aluminum-zinc alloy-coated steel sheet.

1. Thickness: Manufacturer's standard thickness for hatch size indicated .
2. Finish: Two-coat fluoropolymer .
3. Color: As selected by Architect from manufacturer's full range .

E. Construction:

1. Insulation: 2-inch- thick, polyisocyanurate board.
   a. R-Value: 12.0 according to ASTM C1363.
2. Nailer: Factory-installed wood nailer continuous around hatch perimeter.
3. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
4. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
5. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
6. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
7. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate curb with perimeter curb height that is tapered to accommodate roof slope so that top surfaces of perimeter curb are level. Equip hatch with water diverter or cricket on side that obstructs water flow.

F. Hardware: Spring operators, hold-open arm, galvanized steel spring latch with turn handles, galvanized steel butt- or pintle-type hinge system, and padlock hasps inside and outside.

1. Provide two-point latch on lids larger than 84 inches.
2. Provide remote-control operation.

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G. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.

1. Height: 42 inches above finished roof deck.
2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches in diameter or galvanized-steel tube, 1-5/8 inches in diameter.
3. Flat Bar: Galvanized steel, 2 inches high by 3/8 inch thick.
4. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in diameter.
5. Chain Passway Barrier: Galvanized proof coil chain with quick link on fixed end.
6. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
7. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
8. Fabricate joints exposed to weather to be watertight.
9. Fasteners: Manufacturer's standard, finished to match railing system.
10. Finish: Manufacturer's standard .

H. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.

1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
2. Height: 42 inches above finished roof deck.
3. Material: Steel tube .
4. Post: 1-5/8-inch- diameter pipe.
5. Finish: Manufacturer's standard baked enamel or powder coat .
   a. Color: As selected by Architect from manufacturer's full range .

2.3 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, G90 coating designation.

1. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A755/A755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight.
2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.

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B. Steel Shapes: ASTM A36/A36M, hot-dip galvanized according to ASTM A123/A123M unless otherwise indicated.

C. Steel Tube: ASTM A500/A500M, round tube.

D. Galvanized-Steel Tube: ASTM A500/A500M, round tube, hot-dip galvanized according to ASTM A123/A123M.

E. Steel Pipe: ASTM A53/A53M, galvanized.

2.4 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Polyisocyanurate Board Insulation: ASTM C1289, thickness and thermal resistivity as indicated.

C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches thick.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

E. Underlayment:

1. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

F. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A153/A153M or ASTM F2329.

G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

H. Elastomeric Sealant: ASTM C920, elastomeric polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

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I. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

J. Asphalt Roofing Cement: ASTM D4586/D4586M, asbestos free, of consistency required for application.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

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B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Roof-Hatch Installation:

1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
2. Attach safety railing system to roof-hatch curb.
3. Attach ladder-assist post according to manufacturer's written instructions.

D. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

A. Clean exposed surfaces according to manufacturer's written instructions.

B. Clean off excess sealants.

C. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 72 00

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SECTION 07 84 00
FIRESTOPPING GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide UL or equivalent approved firestopping system for the closures of openings in walls, floors, and roof decks against penetration of flame, heat, and smoke or gases in fire resistant rated construction.

B. Provide UL or equivalent approved firestopping system for the closure of openings in walls against penetration of gases or smoke in smoke partitions.

C. This VA campus does not maintain fire life safety drawings that identify fire or smoke rated walls for all buildings. For the basis of bidding, the contractor is to assume all wall penetrations including but not limited to cables, pipes, ducts, etc. Require firestopping. Contractor to match penetration rating to barrier construction ratings as encountered in actual field conditions.

D. As outlined in specification 07 84 00, the contractor is required to provide UL or equivalent firestopping systems for the closures of openings in walls, floors, and roof decks against penetration of flame, heat and smoke or gases in fire resistant rated construction.

E. The contractor is required to engage a qualified third party inspector to perform inspections and final reports of all firestopping systems and fire caulking.

F. A UL or equivalent listed firestopping system is required for all rated walls and penetrations through rated walls, including but not limited to: cable tray penetrations, other cable penetrations, pipe penetrations, duct penetrations, and 1 hour, 2 hour, and 3 hour rated wall assemblies the contractor must submit all proposed penetrations assemblies to the VA prior to beginning construction. The contractor must identify the UL system number proposed for the penetration assemblies. Product data alone will not be acceptable. The firestopping assembly must be installed and inspected according to the UL system number.

G. The contractor must seal any penetrations in rated walls that are abandoned due to work completed for this scope in accordance with a listed penetration assembly corresponding to the appropriate rating of the barrier being penetrated.

1.2 RELATED WORK

A. Section 07 92 00, JOINT SEALANTS: Sealants and application.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Installer qualifications.

C. Inspector qualifications.

D. Manufacturers literature, data, and installation instructions for types of firestopping and smoke stopping used.

E. UL System Numbers to be installed. It is imperative that the UL listed System Number proposed for use is identified for each type of barrier being penetrated. The firestopping penetrations must be inspected against the selected UL System Number.

F. Certified laboratory test reports for ASTM E814 tests for systems not listed by FM, UL, or WH proposed for use.

G. Submit certificates from manufacturer attesting that firestopping materials comply with the specified requirements.

1.4 DELIVERY AND STORAGE

A. Deliver materials in their original unopened containers with manufacturer’s name and product identification.

B. Store in a location providing protection from damage and exposure to the elements.

1.5 QUALITY ASSURANCE

A. FM, UL, or WH or other approved laboratory tested products will be acceptable.

B. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991 or been evaluated by UL and found to comply with UL’s “Qualified Firestop Contractor Program Requirements.” Submit qualification data.

C. Inspector Qualifications: Contractor to engage a qualified inspector to perform inspections and final reports. The inspector to meet the criteria contained in ASTM E699 for agencies involved in quality assurance and to have a minimum of two years’ experience in construction field inspections of firestopping systems, products, and assemblies. The inspector to be completely independent of, and divested from, the Contractor, the installer, the manufacturer, and the supplier of material or item being inspected. Submit inspector qualifications.

1.6 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.

B. ASTM International (ASTM):

E84-20.....Surface Burning Characteristics of Building Materials

E699-16.....Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components

E814-13a(2017).....Fire Tests of Penetration Firestop Systems

E2174-20a.....Standard Practice for On-Site Inspection of Installed Firestop Systems

E2393-20.....Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers

C. FM Global (FM):

Annual Issue Approval Guide Building Materials

4991-13.....Approval of Firestop Contractors

D. Underwriters Laboratories, Inc. (UL):

Annual Issue Building Materials Directory

E. Annual Issue Fire Resistance Directory

723-Edition 11(2018)....Standard for Test for Surface Burning Characteristics of Building Materials

1479-04(2015).....Fire Tests of Penetration Firestops

F. Intertek Testing Services - Warnock Hersey (ITS-WH):

Annual Issue Certification Listings

G. Environmental Protection Agency (EPA):

40 CFR 59(2014).....National Volatile Organic Compound Emission Standards for Consumer and Commercial Products

PART 2 - PRODUCTS

2.1 FIRESTOP SYSTEMS

A. Provide either factory built (Firestop Devices) or field erected (through-Penetration Firestop Systems) to form a specific building system maintaining required integrity of the fire barrier and stop the passage of gases or smoke. Firestop systems to accommodate building movements without impairing their integrity.

B. Through-penetration firestop systems and firestop devices tested in accordance with ASTM E814 or UL 1479 using the "F" or "T" rating to maintain the same rating and integrity as the fire barrier being sealed. "T" ratings are not required for penetrations smaller than or equal to 101 mm (4 inches) nominal pipe or 0.01 square meter (16 square inches) in overall cross sectional area.

C. Firestop sealants used for firestopping or smoke sealing to have the following properties:
   1. Contain no flammable or toxic solvents.
   2. Release no dangerous or flammable out gassing during the drying or curing of products.
   3. Water-resistant after drying or curing and unaffected by high humidity, condensation or transient water exposure.
   4. When installed in exposed areas, capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.
   5. VOC Content: Firestopping sealants and sealant primers to comply with the following limits for VOC content when calculated according to 40 CFR 59, (EPA Method 24):
      a. Sealants: 250 g/L.
      b. Sealant Primers for Nonporous Substrates: 250 g/L.
      c. Sealant Primers for Porous Substrates: 775 g/L.

D. Firestopping system or devices used for penetrations by glass pipe, plastic pipe or conduits, unenclosed cables, or other non-metallic materials to have following properties:
   1. Classified for use with the particular type of penetrating material used.
   2. Penetrations containing loose electrical cables, computer data cables, and communications cables protected using firestopping systems that allow unrestricted cable changes without damage to the seal.

E. Maximum flame spread of 25 and smoke development of 50 when tested in accordance with ASTM E84 or UL 723. Material to be an approved firestopping material as listed in UL Fire Resistance Directory or by a nationally recognized testing laboratory.

F. FM, UL, or WH rated or tested by an approved laboratory in accordance with ASTM E814.

G. Materials to be nontoxic and noncarcinogen at all stages of application or during fire conditions and to not contain hazardous chemicals. Provide firestop material that is free from Ethylene Glycol, PCB, MEK, and asbestos.

H. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For floor penetrations with annular spaces exceeding 101 mm (4 inches) or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means acceptable to the firestop manufacturer.
3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

2.2 SMOKE STOPPING IN SMOKE PARTITIONS

A. Provide silicone sealant in smoke partitions as specified in Section 07 92 00, JOINT SEALANTS.

B. Provide mineral fiber filler and bond breaker behind sealant.

C. Sealants to have a maximum flame spread of 25 and smoke developed of 50 when tested in accordance with ASTM E84.

D. When used in exposed areas capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Submit product data and installation instructions, as required by article, submittals, after an on-site examination of areas to receive firestopping.

B. Examine substrates and conditions with installer present for compliance with requirements for opening configuration, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove dirt, grease, oil, laitance and form-release agents from concrete, loose materials, or other substances that prevent adherence and bonding or application of the firestopping or smoke stopping materials.

B. Remove insulation on insulated pipe for a distance of 150 mm (6 inches) on each side of the fire rated assembly prior to applying the firestopping materials unless the firestopping materials are tested and approved for use on insulated pipes.

C. Prime substrates where required by joint firestopping system manufacturer using that manufacturer’s recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

D. Masking Tape: Apply masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing seal of firestopping with substrates.

3.3 INSTALLATION

A. Do not begin firestopping work until the specified material data and installation instructions of the proposed firestopping systems have been submitted and approved.

B. Install firestopping systems with smoke stopping in accordance with FM, UL, WH, or other approved system details and installation instructions.

C. Install smoke stopping seals in smoke partitions.

D. Properly seal all abandoned penetrations though rated walls and floors. In floors, use grout, the full thickness of the slab, to meet fire rated requirements.

E. Install temporary fire stopping system at each penetration between rated floors or wall assemblies at the end of each working shift until permanent fire stopping systems have been installed.

3.4 CLEAN-UP

A. As work on each floor is completed, remove materials, litter, and debris.

B. Clean up spills of liquid type materials.

C. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.

D. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to provide firestopping complying with specified requirements.

3.5 INSPECTIONS AND ACCEPTANCE OF WORK

A. Do not conceal or enclose firestop assemblies until inspection is complete and approved by the Contracting Officer Representative (COR).

B. Furnish service of approved inspector to inspect firestopping in accordance with ASTM E2393 and ASTM E2174 for firestop inspection, and document inspection results. Submit written reports indicating locations of and types of penetrations and type of firestopping used at each location; type is to be recorded by UL listed printed numbers.

- - - E N D - - -

SECTION 07 84 43 - JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Joint firestopping (JFS-#)

1. Joints in or between fire-resistance-rated constructions.
2. Joints in smoke barriers.

B. Related Requirements:

1. Section 07 84 13 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers and for wall identification.
2. Section 09 22 16 "Non-Structural Metal Framing" for firestop tracks for metal-framed partition heads.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Listed System Designs: For each joint firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approvals according to FM Approvals 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

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1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain joint firestop systems for each type of joint opening indicated from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
   a. Joint firestop systems installed with products bearing the classification marking of a qualified product certification agency in accordance with Listed System Designs published by a qualified testing agency.
      1) UL in its online directory "Product iQ."

B. Rain/Water Resistance: For perimeter fire-barrier system applications, where inclement weather or greater-than-transient water exposure is expected, use products that dry rapidly and cure in the presence of atmospheric moisture sufficient to pass ASTM D6904 early rain-resistance test (24-hour exposure).

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2.3 JOINT FIRESTOPPING SYSTEMS (JFS-#)

A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems must accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

1. Joint firestopping systems that are compatible with one another, with the substrates forming openings, and with penetrating items, if any.
2. Provide products that, upon curing, do not re-emulsify, dissolve, leach, breakdown, or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture.
3. Provide firestop products that do not contain ethylene glycol.

B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E1966 or UL 2079.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. 3M Fire Protection Products.
   b. ClarkDietrich.
   c. Grabber Construction Products, Inc.
   d. Hilti, Inc.
   e. Owens Corning.
   f. ROCKWOOL.
   g. Tremco Incorporated.
2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

C. Joints in Smoke Barriers: Provide joint firestopping systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. 3M Fire Protection Products.
   b. Hilti, Inc.
   c. Owens Corning.
   d. ROCKWOOL.
   e. Tremco Incorporated.
2. L-Rating: Not exceeding 5.0 cfm/ft. of joint at both ambient and elevated temperatures.

D. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

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2.4 ACCESSORIES

A. Provide components of joint firestopping systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing joint firestopping systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Apply a suitable bond-breaker to prevent three-sided adhesion in applications where this condition occurs, such as the intersection of a gypsum wall to floor or roof assembly where the joint is backed by a steel ceiling runner or track.

3.3 INSTALLATION

A. General: Install joint firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

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B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install elastomeric fill materials for joint firestopping systems by proven techniques to produce the following results:

1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 ft. from end of wall and at intervals not exceeding 30 ft..

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2393.

B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.

C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are

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approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated joint firestopping systems immediately and install new materials to produce joint firestopping systems complying with specified requirements.

3.7 JOINT FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's online directory "Product iQ" under product Category XHBN or Category XHDG.

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SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: (JSLT-#)

1. Nonstaining silicone joint sealants - JSLT-1.
2. Urethane joint sealants - JSLT-2.
3. Mildew-resistant joint sealants - JSLT-3.
4. Latex joint sealants - JSLT-4.

B. Related Requirements:

1. Section 07 92 19 "Acoustical Joint Sealants" for sealing joints in sound-rated construction.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Joint sealants.
2. Joint-sealant backing materials.

B. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.3 CLOSEOUT SUBMITTALS

A. Manufacturers' special warranties.

B. Installer's special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Authorized representative who is trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified in accordance with ASTM C1021 to conduct the testing indicated.

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1.5 MOCKUPS

A. Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.6 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

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PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain joint sealants from single manufacturer.

2.2 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 NONSTAINING SILICONE JOINT SEALANTS - JSLT-1

A. Nonstaining Joint Sealants: No staining of substrates when tested in accordance with ASTM C1248.

B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. DOWSIL.
   b. GE/Momentive Performance Materials.
   c. Pecora Corporation.
   d. Sika Corporation.
   e. Tremco Incorporated.
   f. Sika Corporation - Building Components; Sikasil WS-290 .

2.4 URETHANE JOINT SEALANTS - JSLT-2

A. Urethane, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses T and NT.

1. Products: Subject to compliance with requirements, provide the following:
   a. Sika Corporation - Building Components; Sikaflex®-219 LM .

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2.5 MILDEW-RESISTANT JOINT SEALANTS - JSLT-3

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silane-Modified Polymer, Mildew Resistant, S, NS, 50, NT: Mildew-resistant, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, silyl-terminated polyurethane joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Master Builders Solutions.

2.6 LATEX JOINT SEALANTS - JSLT-4

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Sherwin-Williams Company (The).
b. Tremco Incorporated.

2.7 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Construction Foam Products; a division of Nomaco, Inc.
b. Master Builders Solutions.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

1. Use Type B for exterior enclosure sealants.

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2.8 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
   a. Concrete.
   b. Masonry.
   c. Unglazed surfaces of ceramic tile.
   d. Exterior insulation and finish systems.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave

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residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
a. Metal.
b. Glass.
c. Porcelain enamel.
d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

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F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.
4. Provide flush joint profile at locations indicated on Drawings in accordance with Figure 8B in ASTM C1193.
5. Provide recessed joint configuration of recess depth and at locations indicated on Drawings in accordance with Figure 8C in ASTM C1193.
   a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
   a. Extent of Testing: Test completed and cured sealant joints as follows:
      1) Perform 10 tests for the first 1000 ft. of joint length for each kind of sealant and joint substrate.
   b. Test Method: Test joint sealants in accordance with Method A, Tail Procedure, in ASTM C1521.
      1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
   c. Inspect tested joints and report on the following:
      1) Whether sealants filled joint cavities and are free of voids.
      2) Whether sealant dimensions and configurations comply with specified requirements.
      3) Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
   d. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations,

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sealant material, sealant configuration, and sealant dimensions.

e. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

2. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

C. Prepare test and inspection reports.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

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SECTION 07 92 19 - ACOUSTICAL JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical joint sealants. (AJSLT-#)

B. Related Requirements:

1. Section 07 92 00 "Joint Sealants" for elastomeric, latex, and butyl-rubber-based joint sealants for nonacoustical applications.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Acoustical joint sealants.

B. Acoustical Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.3 INFORMATIONAL SUBMITTALS

1.4 CLOSEOUT SUBMITTALS

A. Warranty Documentation:

1. Manufacturers' special warranties.
2. Installer's special warranties.

1.5 WARRANTY

A. Installer's Special Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

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B. Manufacturer's Special Warranty: Manufacturer agrees to furnish acoustical joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ACOUSTICAL JOINT SEALANTS (AJSLT-#)

A. Acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies in accordance with ASTM E90.

B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C834.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Grabber Construction Products, Inc.
   b. Hilti, Inc.
   c. Tremco Incorporated.
   d. USG Corporation.
2. Colors of Exposed Acoustical Joint Sealants: As selected by Architect from manufacturer's full range of colors .

2.2 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by acoustical joint-sealant manufacturer where required for adhesion of sealant to joint substrates.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive acoustical joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where recommended by acoustical joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.

B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C919, ASTM C1193, and manufacturer's written instructions for closing off sound-flanking paths around or through assemblies, including sealing partitions to underside of floor slabs above acoustical ceilings.

C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

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3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of acoustical joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect acoustical joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated acoustical joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 92 19

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SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Interior standard hollow-metal doors and frames - HMD-1 and HMF-1.
2. Exterior standard steel doors and frames - HMD-2 and HMF-2.

B. Related Requirements:

1. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.4 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

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1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
7. Details of anchorages, joints, field splices, and connections.
8. Details of accessories.
9. Details of moldings, removable stops, and glazing.

C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.7 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of fire-rated hollow-metal door and frame assembly windborne-debris impact resistance door and thermally rated door assemblies for tests performed by a qualified testing agency indicating compliance with performance requirements.

B. Field quality control reports.

C. Blast Design Calculations at Equipment Enclosures:

1. Submit design calculations for exterior hollow metal door assemblies installed within equipment enclosures demonstrating anchorage is capable of withstanding ultimate loading conditions for doors as specified. Anchor calculations are to be performed by a qualified professional engineer.

1.8 CLOSEOUT SUBMITTALS

A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.9 QUALITY ASSURANCE

A. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the

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qualifications set forth in NFPA 80, section 5.2.3.1 and the following:

1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

B. Egress Door Inspector Qualifications: Inspector for field quality control inspections of egress door assemblies shall meet the qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:

1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ceco Door; ASSA ABLOY.
2. Curries Company; ASSA ABLOY.
3. Custom Metal Products.
4. Mesker Door Inc.
5. Pioneer Industries.
6. Republic Doors and Frames.
7. Steelcraft; an Allegion brand.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to

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authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure according to NFPA 252 or UL 10C.

B. Fire-Rated, Borrowed-Lite Assemblies: Assemblies complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

C. Thermally Rated Door Assemblies - Exterior exposure only: Provide door assemblies with U-factor of not more than 0.38 deg Btu/F x h x sq. ft. when tested according to ASTM C518.

D. Blast Resistant Doors in Equipment Enclosures: Doors, Frames, and Anchorage - For door openings in equipment enclosures, provide door assemblies in compliance with Section 6.3.3 of the 2022 VA Physical Security and Resiliency Design Manual by implementing the following requirements:

1. Provide conventional, vertically stiffened hollow metal doors with a minimum thickness of 14-ga.

2. Design framing anchors at perimeter of openings for door edge reactions of 100 lbs/in for single doors and 170 lbs/in for double doors.

3. Double doors are to be supported for blast using either multiple point latches or mullions. For multiple point latches, design top and bottom latches to resist ultimate shear loads of 4-kips. For mullions, provide mullions with a moment of inertia fo 2.39 in^4 and a section modulus of 1.60 in^3 as minimums. Design anchors at floor slabs to resist ultimate shear loads of 5.3 kips.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A. At locations indicated in the Door and Frame Schedule .

1. Doors - HMD-1:
   a. Type: As indicated in the Door and Frame Schedule.
   b. Thickness: 1-3/4 inches.
   c. Face: Uncoated steel sheet, minimum thickness of 0.053 inch.
   d. Edge Construction: Model 2, Seamless .
   e. Edge Bevel: Bevel lock and hinge edges 1/8 inch in 2 inches .
   f. Core: Polyurethane .
   g. Fire-Rated Core: Manufacturer's standard laminated mineral board core for fire-rated and temperature-rise-rated doors.

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2. Frames - HMF-1:
   a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
   b. Frames: Fabricated from same thickness material as adjacent door frame.
   c. Construction: Full profile welded.
3. Exposed Finish: Prime . Doors and frames to be field painted.

2.4 EXTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A. At locations indicated in the Door and Frame Schedule .

1. Doors - HMD-2:
   a. Type: As indicated in the Door and Frame Schedule.
   b. Thickness: 1-3/4 inches.
   c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
   d. Edge Construction: Model 2, Seamless .
   e. Edge Bevel: Bevel lock and hinge edges 1/8 inch in 2 inches .
   f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
   g. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
   h. Core: Polyurethane .
2. Frames - HMF-2:
   a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
   b. Construction: Full profile welded.
   c. Exterior frames to be thermally broken.
3. Exposed Finish: Prime . Doors and frames to be field painted.

2.5 BORROWED LITES

A. Fabricate of uncoated steel sheet, minimum thickness of 0.053 inch .

B. Construction: Full profile welded.

C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.

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D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.6 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
3. Postinstalled Expansion Anchor: Minimum 3/8-inch- diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

C. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized according to ASTM A153/A153M, Class B.

2.7 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

D. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.

F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

G. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool;

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with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

H. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

2.8 FABRICATION

A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.

1. Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
   b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to ANSI/SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.

1. Provide stops and moldings flush with face of door, and with beveled stops unless otherwise indicated.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.

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4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

2.9 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.

B. Hollow-Metal Frames: Comply with ANSI/SDI A250.11 .

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
   a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
   b. Install frames with removable stops located on secure side of opening.
2. Fire-Rated Openings: Install frames according to NFPA 80.
3. Floor Anchors: Secure with postinstalled expansion anchors.

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a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

4. Solidly pack mineral-fiber insulation inside frames.
5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
6. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.

1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8 .
2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

A. Inspection Agency: Owner will engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections:

1. Fire-Rated Door Inspections: Inspect each fire-rated door according to NFPA 80, Section 5.2.
2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements according to NFPA 101, Section 7.2.1.15.

C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

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3.4 REPAIR

A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 11 13

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SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Access doors and frames - ACCD-1.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details , fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.

B. Product Schedule: For access doors and frames. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

A. Record Documents: For fire-rated doors, list of applicable room name and number in which access door is located.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES

A. Flush Access Doors with Exposed Flanges - ACCD-1 :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. ACUDOR Products, Inc.
   b. Babcock-Davis.
   c. J. L. Industries, Inc.; Activar Construction Products Group, Inc.
   d. Larsen's Manufacturing Company.

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e. Milcor; Hart & Cooley, Inc.
f. Nystrom, Inc.

2. Description: Face of door flush with frame, with exposed flange and concealed hinge.
3. Locations: Wall and ceiling .
4. Door Size: As required for equipment access .
5. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch , 16 gage , factory primed .
6. Frame Material: Same material, thickness, and finish as door .
7. Latch and Lock: Cam latch, key operated .

2.2 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A879/A879M, with cold-rolled steel sheet substrate complying with ASTM A1008/A1008M, Commercial Steel (CS), exposed.

C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

D. Frame Anchors: Same material as door face.

E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.

1. For concealed flanges with drywall bead, provide edge trim for gypsum panels securely attached to perimeter of frames.

D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling. Provide access sleeves for each latch operator and install in holes cut through finish.

E. Latch and Lock Hardware:

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1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
2. Keys: Furnish two keys per lock and key all locks alike.

2.4 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. 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.

D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 FIELD QUALITY CONTROL

A. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

B. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

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3.4 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 08 31 13

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SECTION 08 33 23 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Service doors.
2. Insulated service doors - OHCD-1.

B. Related Requirements:

1. Section 05 50 00 "Metal Fabrications" for miscellaneous steel supports and door-opening.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
3. Include description of automatic-closing device and testing and resetting instructions.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
5. Show locations of controls, locking devices , detectors or replaceable fusible links, and other accessories.
6. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

1. Include similar Samples of accessories involving color selection.

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1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

B. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of doors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.

1. Obtain operators and controls from overhead coiling-door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Complying with NFPA 80; listed and labeled by qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 .

B. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1 .

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C. Structural Performance, Exterior Doors: Capable of withstanding the following design wind loads:

1. Design Wind Load: As indicated on Drawings .
2. Testing: According to ASTM E330/E330M .
3. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
4. Operability under Wind Load: Design overhead coiling doors to remain operable under design wind load, acting inward and outward.

D. Seismic Performance: Overhead coiling doors are to withstand the effects of earthquake motions determined according to ASCE/SEI 7 .

1. Component Importance Factor: 1.0.

2.3 DOOR ASSEMBLY - OHCD-1

A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.

1. Manufacturers: Subject to compliance with requirements, provide one of the following:
   a. Alpine Overhead Doors, Inc.
   b. Amarr; an ASSA ABLOY Group company.
   c. Clopay Building Products.
   d. Cookson; a CornellCookson company.
   e. Cornell; a CornellCookson company. Basis-of-Design: Cornell Thermiser Max, Model ESD30.
   f. McKeon Door Company.
   g. Overhead Door Corporation.
   h. Raynor Garage Doors.
   i. Wayne Dalton; a division of Overhead Door Corporation.

B. Operation Cycles: Door components and operators capable of operating for not less than 50,000 . One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1. Include tamperproof cycle counter.

C. Air Infiltration: Maximum rate of 0.3 cfm/sq.ft. at 15 and 25 mph when tested according to ASTM E283 .

D. Insulated Door Curtain R-Value: R-8. .

E. Door Curtain Material: Galvanized steel . Exterior: 22 Ga. Interior 22 Ga.

F. Door Curtain Slats: Flat profile slats of 2-5/8-inch center-to-center height.

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1. Insulated-Slat Interior Facing: Metal .
2. Gasket Seal. Manufacturer's standard continuous gaskets between slats.

G. Bottom Bar: Two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick ; fabricated from aluminum extrusions and mill finished to match door .

H. Curtain Jamb Guides: Thermally-broken structural steel with exposed finish matching curtain slats.

I. Hood: Match curtain material and finish .

1. Shape: Square As indicated on Drawings .
2. Mounting: As indicated on Drawings.

J. Locking Devices: Equip door with locking device assembly .

1. Locking Device Assembly: Cremone-type, both jamb sides locking bars, operable from inside with thumbturn,outside with cylinder .

K. Electric Door Operator:

1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day .
2. Operator Location: As indicated on Drawings.
3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use ; moving parts of operator enclosed or guarded if exposed and mounted at 8 ft. or lower.
4. Motor Exposure: Interior .
5. Motor Electrical Characteristics:
   a. Horsepower: [**1/2**] [**1**] [**2**] [**3**] <**Insert value>** hp.
   b. Voltage: [**115 V ac, single phase, 60 Hz**] [**208 V ac, single phase, 60 Hz**] [**230 V ac, single phase, 60 Hz**] [**208 V ac, three phase, 60 Hz**] [**230 V ac, three phase, 60 Hz**] [**460 V ac, three phase, 60 Hz**].
6. Emergency Manual Operation: Chain type.
7. Obstruction-Detection Device: Automatic photoelectric sensor .
   a. Sensor Edge Bulb Color: Black .
8. Control Station(s): Interior mounted Where indicated on Drawings .
9. Other Equipment: .

L. Curtain Accessories: Equip door with smoke seals,weatherseals and [**and**] .

M. Door Finish:

1. Aluminum Finish: <**Insert color>**.
2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face .

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2.4 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural-steel sheet; complying with ASTM A653/A653M, with G90 zinc coating; nominal sheet thickness (coated) of 0.028 inch; and as required.
2. Aluminum Door Curtain Slats: ASTM B209 sheet or ASTM B221 extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; thickness of 0.050 inch; and as required.
3. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84 or UL 723. Enclose insulation completely within slat faces.
4. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with minimum steel thickness of 0.010 inch .

B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

2.6 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Aluminum: 0.040-inch- thick aluminum sheet complying with ASTM B209, of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.

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2. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.

2.7 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: As specified in Section 08 71 00 "Door Hardware" .
2. Keys: Three for each cylinder.

B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.8 CURTAIN ACCESSORIES

A. Smoke Seals - all fire-rated doors: Equip each fire-rated door with replaceable smoke-seal perimeter gaskets or brushes for smoke and draft control as required for door listing and labeling by a qualified testing agency.

B. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.

1. At door head, use 1/8-inch- thick, replaceable, continuous-sheet baffle secured to inside of hood or field-installed on the header.
2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch- thick seals of flexible vinyl, rubber, or neoprene .

C. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.

D. Automatic-Closing Device: Equip each fire-rated door with an automatic-closing device or holder-release mechanism and governor unit complying with NFPA 80 and an easily tested and reset release mechanism. Release mechanism for motor-operated doors allows testing without mechanical release of the door. Automatic-closing device is to be designed for activation by the following:

1. Replaceable fusible links with temperature rise and melting point of 165 deg F interconnected and mounted on both sides of door opening.
2. Manufacturer's standard UL-labeled smoke detector and door-holder-release devices.
3. Manufacturer's standard UL-labeled heat detector and door-holder-release devices.
4. Building fire-detection, smoke-detection, and -alarm systems.

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2.9 COUNTERBALANCE MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

1. Fire-Rated Doors: Equip with auxiliary counterbalance spring and prevent tension release from main counterbalance spring when automatic-closing device operates.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.10 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.
2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door Operator Location(s): Operator location indicated for each door.

1. Top-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on top of the door-hood

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assembly and connected to the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.

2. Front-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on coil side of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.
3. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of door and connected to door drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall-mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.
4. Bench Mounted: Operator is mounted to the right or left door head plate and connected to the door drive shaft with drive chain and sprockets. Side room is required for this type of mounting.
5. Through-Wall Mounted: Operator is mounted on other side of wall from coil side of door.

D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each door assembly.

1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For fire-rated doors, activation delays closing.

1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
   a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained or constant pressure on close button.

G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."

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1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
2. Exterior-Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.

H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf .

I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with the accessibility standard.

2.11 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. 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.

2.12 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

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B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.

C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with the accessibility standard.

D. Fire-Rated Doors: Install according to NFPA 80.

E. Smoke-Control Doors: Install according to NFPA 80 and NFPA 105.

F. Power-Operated Doors: Install according to UL 325.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and to furnish reports to Architect.

B. Perform the following tests and inspections:

1. Test door release, closing, and alarm operations when activated by smoke detector or building's fire-alarm system. Test manual operation of closed door. Reset door-closing mechanism after successful test.
2. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.

C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80 and NFPA 101.

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3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.5 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

1. Adjust exterior doors and components to be weather resistant.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide tight fit around entire perimeter.

3.6 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service includes six months' full maintenance by skilled employees of coiling-door Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies are to be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance, including emergency callback service, during normal working hours.
2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 08 33 23

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SECTION 08 34 00.10

HOT AISLE CONTAINMENT SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Provide all labor, materials, and equipment for the complete installation of work called for in the Contract Documents.

B. The Hot Aisle Containment System (HAC-1) for this project is in the Data Center which is Room 111 in MCR Building.

1.2 SCOPE OF WORK

A. This section includes the minimum requirements for Hot Aisle Containment Systems in data center, computer rooms, and communications equipment rooms.

1.3 WARRANTY

A. The warranty specified in this article shall not deprive the Owner of rights under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the manufacturer under requirements of the Contract Documents.

B. Warranty extent: Manufacturer shall agree to repair or replace all components that fail in materials or workmanship within specified warranty period. Warranty shall include all labor, material, and related expenses to restore system and/or components from failures.

C. Warranty period: Five year, unless otherwise noted. Warranty period commences upon completion of startup and successful integrated commissioning.

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Shop Drawings:

1. Half full-size scale for sections and details 1:50 (1/4-inch) for elevations and plans.
2. Show construction and installation.

C. Manufacturer's specifications and installation instructions for all products (submit with bid).

1.5 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification.

B. National Fire Protection Association (NFPA):

70-2021.....National Electric Code

72-2022.....National Fire Alarm Code

75-2022.....Fire Protection of Information Technology Equipment

2001-2022.....Installation of Clean Agent Fire Extinguishing Systems

C. Underwriters Laboratories, Inc. (UL): Fire Protection Equipment As of Contract Award Date Directory

D. Factory Mutual Engineering Corporation (FM): Approval Guide as of Contract Award Date

PART 2 - PRODUCTS

2.1 CONTAINMENT SYSTEM

A. Hot Aisle Containment System (HAC-1)

1. HAC-1: Provide required components to contain the hot aisle between rows of server cabinets. HAC-1 shall be "rack agnostic" and will retain the ability to interface with any server cabinet manufacturer. The HAC-1 for each aisle shall include two Aisle End Door systems (AEDS) to seal to either end of the hot aisle. Floor panels or vinyl meeting fire performance characteristics identified in 2.1(E)(E.5)shall be placed in the event of missing cabinets to retain containment integrity. An overhead ceiling to contain hot air within the aisle shall be provided for the length and width of the aisle.
2. Single Source: Provide the entire HAC-1 from a single manufacturer including doors, ceilings, panels, and accessories.

B. Aisle End Door System

1. The AEDS shall be single sliding in operation in aisles.
2. Door and frames shall be aluminum extrusion.
3. Door frame shall be able to be ordered to size, typically based off the tallest server cabinet in the aisle, in 0.5" increments or less.
4. Sliding doors will operate using roller bearing wheels.
5. The panel inserts for both the frame and doors shall be a translucent plastic material meeting fire performance characteristic identified in 2.1(E)(E.5).

6. Door shall have an auto closing mechanism that operates via pull-spring and will be rated for 1 million cycles.
7. A hold open latch/detent option shall be standard on sliding doors.
8. Doors shall be self-closing and include a dampening "soft close" feature.
9. There shall be no threshold while the door is opened.
10. Doors shall attach to the top of the cabinet with flat or angled brackets and will attach to the floor using angle brackets and/or anchors.

C. Overhead Containment Ceiling

1. The overhead containment ceiling shall consist of an aluminum extruded frame containing an ASTM E84 Class A fire rated 15 mil Polyvinyl Chloride drop tiles to drop away in event of a fire.
2. Drop tiles to be removeable for access above overhead containment ceiling.
3. The overhead containment ceiling shall be ordered to size and will match the dimensions of the aisle to be contained.
4. The overhead containment ceiling shall attach to the aisle end door systems on each end of the aisle.
5. The overhead containment ceiling shall accommodate the inclusion of smoke detection within the hot aisle without impacting performance.
6. The inclusion of smoke detection within hot aisle will require roof to be raised by aluminum frame, and smoke detectors to be run under frame rail of roof, so not to impede function of drop tiles.
7. The overhead containment ceiling shall be coordinated with fire sprinkler temperature rating. Overhead panels shall drop out at a lower rating than the fire sprinklers rated activation temperature above.
8. Panels shall be listed for use below standard response fire sprinklers and installed in accordance with their listing.

D. Panels

1. Floor and over rack mount panels shall be used if missing or varying height server cabinets are present.
2. Panels shall be an aluminum frame with a translucent plastic material meeting fire performance characteristic identified in 2.1 (E)(E.5).
3. Panels shall connect to one another, AEDS, and the overhead ceiling modularly.

E. Material

1. The panel frames and doors shall be aluminum extrusion.
2. The sliding doors shall use roller wheels to open and close.
3. The panel inserts for both the frame and doors shall be a translucent plastic material meeting fire performance characteristics identified in 2.1(E)(5).
4. The overhead ceiling shall consist of ASTM E84 Class A fire rated 15 mil Polyvinyl Chloride drop tiles.
5. All elements of aisle containment shall be constructed of materials that have a maximum flame spread index of 50 and a maximum smoke

development of 450 in accordance with either ASTM E84 or ANSI/UL 723.

F. Color/Finish The aluminum components shall be clear anodized.

G. Approved Manufacturers

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or a government approved equal.
   a. 42U
   b. Enconnex
   c. Polargy
   d. Subzero Engineering
   e. Tate Inc
   f. Tripp Lite

PART 3 - INSTALLATION

3.1 Hot Aisle Containment System

A. Manufacturer to provide all components of the HAC-1. This includes but is not limited to: Aisle end door systems, overhead ceiling, and floor and over rack mount panel. Hardware to install these items shall be included, depending on the environment, additional hardware may be required that is not included.

B. Install aisle end door systems using the manufacturer’s installation instructions. Doors shall attach to the top of the cabinet with flat or angled brackets and will attach to the floor using angle brackets and/or anchors. Additional installation hardware may be required.

C. Install overhead ceiling and floor and over rack panels using the manufacturer’s installation instructions. Additional installation hardware may be required.

- - - END - - -

SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum-framed storefront systems - STFT-1, STFT-2.
2. Aluminum-framed entrance and interior door systems - ALGL-1, ALGL-2.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
   a. Joinery, including concealed welds.
   b. Anchorage.
   c. Expansion provisions.
   d. Glazing.
   e. Flashing and drainage.
3. Show connection to building framings and continuity with adjacent thermal, weather, air, and vapor barriers.
4. Include point-to-point wiring diagrams showing the following:
   a. Power requirements for each electrically operated door hardware.
   b. Location and types of switches, signal device, conduit sizes, and number and size of wires.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

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D. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

E. Delegated Design Submittal: For aluminum-framed entrances and storefronts including attachment to building framing, reactions to building structure and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Blast Design Calculations: Submit calculations for review and approval by a licensed professional engineer with a minimum of 5 years experience in design of blast resistant window systems. Include a blast narrative and supporting calculations that correspond with drawings. Blast resistant glazing must meet the blast performance requirements stated in Section 088000. Blast resistant frames and mullions must meet the blast resistant design requirements for Critical Facilities per Section 6.3 of the VA Physical Security and Resiliency Design Manual. Blast analysis must be performed using the dynamic analysis methods per Section 6.7.3 of the VA Physical Security and Resiliency Design Manual. Alternatively, glazed aluminum framed systems may be certified through testing (Standard Test Method for Glazing Systems Subject to Airblast Loadings ASTM F1642) against the specified design blast load. The tested assembly must be demonstrated to be sufficiently similar in glazing layup, mullions, frames, connections, and hardware to that being constructed for the project.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Installer .
2. For professional engineer's experience with providing delegated design engineering services of the kind indicated, including documentation that engineer is licensed in the state in which Project is located.

B. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency .

C. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

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1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer and that employs a qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors.

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.7 WARRANTY

A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures, including, but not limited to, excessive deflection.
   b. Noise or vibration created by wind and thermal and structural movements.
   c. Deterioration of metals and other materials beyond normal weathering.
   d. Water penetration through fixed glazing and framing areas.
   e. Failure of operating components.
2. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Delta E units when tested in accordance with ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D 4214.
   c. Cracking, peeling, or chipping.
2. Warranty Period: 10 years from date of Substantial Completion.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing venting windows and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:
   a. Thermal stresses transferring to building structure.
   b. Glass breakage.
   c. Noise or vibration created by wind and thermal and structural movements.
   d. Loosening or weakening of fasteners, attachments, and other components.
   e. Failure of operating units.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings .

D. Deflection of Framing Members Supporting Glass: At design wind load, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches .
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch .
   a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.

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3. Cantilever Deflection: Limited to 2L/175 at unsupported cantilevers.

E. Structural: Test in accordance with ASTM E330/E330M as follows:

1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. .

G. Water Penetration under Dynamic Pressure: Test in accordance with AAMA 501.1 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. .
2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

H. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7 .

1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested in accordance with AAMA 501.6 at design displacement and 1.5 times the design displacement.

I. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:

1. Thermal Transmittance (U-factor):
   a. Fixed Glazing and Framing Areas: U-factor for the system of not more than 0.36 Btu/sq. ft. x h x deg F as determined in accordance with NFRC 100.

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b. Entrance Doors: U-factor of not more than 0.77 Btu/sq. ft. x h x deg F as determined in accordance with NFRC 100.

2. Solar Heat-Gain Coefficient (SHGC):
   a. Fixed Glazing and Framing Areas: SHGC for the system of not more than 0.40 as determined in accordance with NFRC 200.
   b. Entrance Doors: SHGC of not more than 0.40 as determined in accordance with NFRC 200.
3. Air Leakage:
   a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft. when tested in accordance with ASTM E283.
   b. Entrance Doors: Air leakage of not more than 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
   c. Venting Windows: Whole window air leakage of not more than 0.3 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft. when tested in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
4. Condensation Resistance Factor (CRF):
   a. Fixed Glazing and Framing Areas: CRF for the system of not less than 55 as determined in accordance with AAMA 1503.
   b. Entrance Doors: CRF of not less than 63 as determined in accordance with AAMA 1503.
   c. Venting Windows: Whole window CRF of not less than 52 as determined in accordance with AAMA 1503.

J. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested in accordance with AAMA 501.5.
   a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F .
   b. Low Exterior Ambient-Air Temperature: 0 deg F .
   c. Interior Ambient-Air Temperature: 75 deg F .

K. Blast Resistance:
1. Blast resistant frames and mullions must be designed to resist a design blast load of 13.5 psi peak pressure and 51 psi-msec impulse (as an equivalent triangular load) applied over the tributary area of the member while sustaining maximum deformations no greater than L/40 (or 3 degrees support rotation). In addition, the frames and mullions must be designed to resist the balanced design load (maximum blast load capacity of the weakest lite of supported glass), but no less than the design blast load, while sustaining maximum deformations no greater than L/20 (or 6 degrees support rotation).
2. Connection between framing members and connections of the frame members to the supporting structure must be designed to resist the applied blast loads and develop the maximum flexural capacity of the supported members.

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2.3 SOURCE LIMITATIONS

A. Obtain all components of exterior and interior storefront systems including framing, entrances and accessories from a single manufacturer.

2.4 STOREFRONT SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. EFCO Corporation.
2. Kawneer North America, an Arconic company - Basis-of-Design.
3. Oldcastle Building Envelope (OBE); CRH Americas.
4. Tubelite Inc.
5. U.S. Aluminum; a brand of C.R. Laurence.

B. Basis-of-Design:

1. Exterior Locations - STFT-1: Kawneer Encore Framin System. Nominal size: 1 3/4" x 6". Glazing plane: front. Glazing thickness: 1". Thermally-broken.
2. Interior Vestibules and Interior Partition Door Openings - STFT-2: Kawneer Trifab 400 Framing System. Nominal Size: 1 3/4" x 4". Non-thermally broken. Glazing plane: Center. Glazing thickness: 1/4".

C. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Exterior Framing Construction: Thermally Broken.
2. Interior Vestibule and Interior Glazed Partition Framing Construction: Non-thermal.
3. Glazing System: Retained mechanically with gaskets on four sides .
4. Glazing Plane: As shown on drawings. .
5. Finish: XXXX .
6. Fabrication Method: Field-fabricated stick system.
7. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
8. Steel Reinforcement: As required by manufacturer.

D. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

E. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

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2.5 ENTRANCE DOOR SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. EFCO Corporation.
2. Kawneer North America, an Arconic company - Basis-of-Design.
3. Oldcastle BuildingEnvelope (OBE); CRH Americas.
4. Tubelite Inc.
5. U.S. Aluminum; a brand of C.R. Laurence.

B. Basis-of-Design

1. GLExterior Aluminum Storefront Doors - ALGL-1: Kawneer 360 Insulclad, Medium Stile, Thermally Broken. 4 1/16" wide x 2 1/4" thick with 1" insulated safety glazing.
2. GLInterior Aluminum Storefront Vestibule Doors - ALGL-2: Kawneer 350 Standard Entrance, Medium Stile, Non-thermal. 3 1/2" wide x 1 3/4" thick with 1/4" safety glazing. Bottom rail 6 1/2".

C. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.

1. Door Construction: 2 1/4-inch and1-3/4-inch overall thickness, with minimum 0.125-inch- 2- to 2-1/4-inch overall thickness, with minimum 0.125-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
   a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior .
2. Door Design: Medium Stile .
3. Glazing Stops and Gaskets: Beveled , snap-on, extruded-aluminum stops and preformed gaskets.
   a. Provide nonremovable glazing stops on outside of door.
4. Finish: Dark Anodized Bronze.

2.6 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 08 71 00 "Door Hardware."

2.7 GLAZING

A. Glazing: Comply with Section 08 80 00 "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: Comply with Section 08 80 00 "Glazing."

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1. Verify sealant has VOC content of 250 g/L or less.
2. Verify sealant complies with the testing and product requirements of the California Department of Public Health's Standard Method of Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Weatherseal Sealants: ASTM C920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.

1. Color: Match structural sealant.

2.8 MATERIALS

A. Sheet and Plate: ASTM B209.

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.

C. Structural Profiles: ASTM B308/B308M.

D. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

E. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

F. Recycled Content of Steel Products: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.

G. Recycled Content of Aluminum Products: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.

2.9 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

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1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads , finished to match framing system .

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.

C. Concealed Flashing: Dead-soft, 0.018-inch- thick stainless steel, complying with ASTM A240/A240M, of type recommended by manufacturer.

D. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.

E. Rigid PVC filler.

2.10 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from exterior .
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Storefront Framing: Fabricate components for assembly using shear-block system or screw-spline system .

F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

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1. At interior and exterior doors, provide compression weather stripping at fixed stops.

G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. Provide offset pivots at each door. See Section 08 71 00 "Door Hardware."
2. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
3. At exterior doors, provide weather sweeps applied to door bottoms.

H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

I. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.11 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker. Color: Dark Bronze.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure nonmovement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

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F. Seal perimeter and other joints watertight unless otherwise indicated.

G. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

H. Set continuous sill members and flashing in full sealant bed, as specified in Section 07 92 00 "Joint Sealants," to produce weathertight installation.

I. Install joint filler behind sealant as recommended by sealant manufacturer.

J. Install components plumb and true in alignment with established lines and grades.

3.3 INSTALLATION OF GLAZING

A. Install glazing as specified in Section 08 80 00 "Glazing."

3.4 INSTALLATION OF WEATHERSEAL SEALANT

A. Install weatherseal sealant to completely fill cavity, in accordance with sealant manufacturer's written instructions, to produce weatherproof joints.

3.5 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE DOORS

A. Install entrance doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware in accordance with entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.6 ERECTION TOLERANCES

A. Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.

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2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:
   a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
   b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
   c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts .

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested in accordance with AAMA 501.2 and shall not evidence water penetration.
   a. Perform a minimum of two tests in areas as directed by Architect.
   b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion .
2. Air Leakage: ASTM E783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
   a. Perform a minimum of two tests in areas as directed by Architect.
   b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion .
3. Water Penetration: ASTM E1105 at a minimum uniform and cyclic static-air-pressure differential of 1.0 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and shall not evidence water penetration. No water leakage permitted.
4. If any test fails, the assembly shall be repaired and retested at the Contractor's expense.

C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

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3.8 MAINTENANCE SERVICE

A. Entrance Door Hardware Maintenance:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

END OF SECTION 08 41 13

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REISSUED 02-18-2026

SECTION 08 41 23 - FIRE-RATED ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
1. Fire-rated glazing and framing systems for installation as borrowed lights in interior openings.

B. Related Sections:
1. Section 07 84 00 "Firestopping:" Firestops between work of this section and other fire resistive assemblies.
2. Section 07 92 00 - "Joint Sealants" for installation of joint sealants installed with steel fire-rated glazed curtain-wall systems and for sealants to the extent not specified in this Section.
3. Section 08 11 13 - "Hollow Metal Doors and Frames" for fire-rated doors.
4. Section 08 71 00 "Door Hardware:" Door hardware other than that provided by the work of this section
5. Section 09 22 16 - "Non-Structural Metal Framing" for wall construction.
6. Section 09 29 00 - "Gypsum Board" for application of gypsum board.

1.2 REFERENCES

A. American Architectural Manufacturers Association (AAMA)
1. AAMA 2603-2002 Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
2. AAMA 2604 -2005 Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
3. AAMA 2605 -2005 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

B. American Society for Testing and Materials (ASTM):
1. Fire safety related:
   a. ASTM E119: Methods for Fire Tests of Building Construction and Materials.

2. Material related:
   a. ASTM A 1008/A 1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2007.

b. ASTM A 1011/A 1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2006b.

C. American Welding Society (AWS)
1. AWS D1.3 - Structural Welding Code - Sheet Steel; 2007

D. Builders Hardware Manufacturers Association, Inc.
1. BHMA A156 - American National Standards for door hardware; 2006 (ANSI/BHMA A156).

E. National Fire Protection Association (NFPA):
1. NFPA 80: Fire Doors and Windows.
2. NFPA 251: Fire Tests of Building Construction & Materials
3. NFPA 252: Fire Tests of Door Assemblies
4. NFPA 257: Fire Test of Window Assemblies

F. Underwriters Laboratories, Inc. (UL):
1. UL 9: Fire Tests of Window Assemblies.
1. UL 10 B: Fire Tests of Door Assemblies
2. UL 10 C: Positive Pressure Fire Tests of Window & Door Assemblies
3. UL 263: Fire tests of Building Construction and Materials
4. UL-752 Ratings of Bullet-Resistant Materials

G. American National Standards Institute (ANSI):
1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings

H. Consumer Product Safety Commission (CPSC):
1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials

I. American Society of Civil Engineers (ASCE)
1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2005

1.3 DEFINITIONS

A. Manufacturer: A firm that produces primary glass, fabricated glass or framing as defined in referenced glazing publications.

1.4 SUBMITTALS

A. Submit in accordance with Section 01 33 23.

B. Product Data:
1. Technical Information: Submit latest edition of manufacturer's product data providing product descriptions, technical data, Underwriters Laboratories, Inc. listings and installation instructions.

C. Shop Drawings:
1. Include plans, elevations and details of product showing component dimensions; framing opening requirements, dimensions, tolerances, and attachment to structure.

D. Structural Calculations (optional):
1. Provide structural calculations sealed by a licensed professional engineer in the State in which the project is located; prepared in compliance with referenced documents and these specifications.

E. Samples (optional). For following products:
1. Glass sample-as provided by manufacturer.
2. Sample of frame.
3. Verification of sample of selected finish.

F. Glazing Schedule: Use same designations indicated on drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

G. Warranties: Submit manufacturer's warranty.

H. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements.
1. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualifications according to:
1. International Accreditation Service for a Type A Third-Party Inspection Body (Field Services ICC-ES Third-Party Inspections Standard Operating Procedures, 00-BL-S0400 and S0401)
2. International Accreditation Service for Testing Body-Building Materials and Systems
   a. Fire Testing
      1) ASTM Standards E 119
      2) CPSC Standards 16 CFR 1201
      3) NFPA Standards 251, 252, 257
      4) UL Standards 9, 10B, 10C, 1784, UL Subject 63
      5) BS 476; Part 22: 1987
      6) EN 1634-1
      7) CAN/ULC Standards S101, S104, S106

B. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are classified and labeled by UL, for fire ratings indicated, based on testing according to NFPA 257 and UL 9.

C. Fire-Rated Wall Assemblies: Assemblies complying with ASTM E119 that are classified and labeled by UL, for fire ratings indicated, based on testing in accordance with UL 263, ASTM E119.

D. Listings and Labels - Fire Rated Assemblies: Under current follow-up service by Underwriters Laboratories® maintaining a current listing or certification. Label assemblies accordance with limits of manufacturer's listing.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle under provisions specified by manufacturer.

1.7 PROJECT CONDITIONS

A. Obtain field measurements prior to fabrication of frame units. If field measurements will not be available in a timely manner coordinate planned measurements with the work of other sections.
1. Note whether field or planned dimensions were used in the creation of the shop drawings.

B. Coordinate the work of this section with others effected including but not limited to: other interior and/or exterior envelope components and door hardware beyond that provided by this section.

1.8 WARRANTY

A. Provide the Pilkington Pyrostop® and Fireframes® standard five-year manufacturer warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer Glazing Material: "Pilkington Pyrostop®" fire-rated glazing as manufactured by the Pilkington Group and distributed by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 phone (800.426.0279) fax (425.396.8300) e-mail sales@fireglass.com, web site http://www.fireglass.com

B. Frame System: "Fireframes® Aluminum Series" fire-rated frame system as manufactured and supplied by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 phone (800.426.0279) fax (425.396.8300 e-mail sales@fireglass.com web site http://www.fireglass.com

C. Substitutions: Substitutions for Glazing Material and Frame System not permitted.

2.2 PERFORMANCE REQUIREMENTS

A. System Description:
1. Steel fire-rated glazed wall and/or window system, dual aluminum cover cap format
   a. Face widths available:
      1) 2”
   b. Duration - Windows Capable of providing a fire rating for 60 minutes.
   c. Duration - Walls: Capable of providing a fire rating for 60 minutes.

B. Structural Performance
1. Design and size the system to withstand structural forces placed upon it without damage or permanent set when tested in accordance with ASTM E330 using load 1.5 times the design wind loads and of 10 seconds in duration.
2. Member deflection: Limit deflection of the edge of the glass normal to the plane of the glass to [flexure limit of glass][1/175 of the glass edge length or ¾ inch, whichever is less][of any framing member
3. Accommodate movement between storefront and adjoining systems

2.3 MATERIALS - GLASS

A. Fire Rated Glazing: Composed of multiple sheets of Pilkington Optiwhite™ high visible light transmission glass laminated with an intumescent interlayer.

B. Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201(Cat. I and II).

C. Properties Interior Glazing

Fire-Rating	45 minute	60 minute		120 minute
Manufacturer’s designation	45-200	60-101	60-201	120-106
Glazing type	single	single	single	IGU
Nominal Thickness	3/4” (19mm)	7/8” (23mm)	1-1/16” (27mm)	2-1/4” (57mm)
Weight in lbs/sf	9.2	10.85	12.5	22.9
Daylight Transmission	86	87%	86%	75%
Sound Transmission Coefficient	40dB	41dB	44dB	46dB

D. Exterior Grade: PVB inner layer installed toward exterior.

E. Logo: Each piece of fire-rated glazing shall be labeled with a permanent logo including name of product, manufacture, testing laboratory (UL), fire rating period, safety glazing standards, and date of manufacture.

F. Glazing Accessories: Manufacturer’s standard compression gaskets, standoff, spacers, setting blocks and other accessories necessary for a complete installation.

2.4 MATERIALS -ALUMINUM FRAMES

A. Aluminum Framing System- 60 min.
1. Steel Frame — The steel framing members are made of two halves, nom. 1.9 in. wide (48.3 mm) with a nom. minimum depth of 1.38 in. (35 mm) with lengths cut according to glazing size.
2. Aluminum Trim — Supplied with the steel framing members. Nom. 2 in. (50.8 mm) wide with a nom. depth of 1.54 in. (39 mm) with lengths cut according to glazing size.
3. Stainless Steel Standoffs — Supplied with the steel framing members. Nom 5/16 in. (8 mm) diameter with a nom. minimum depth of 1 1/8 in. (28 mm) with depth adjusted to match Pilkington Pyrostop® Panel thickness.
4. Stainless Steel Moment and Connecting Braces: — Supplied with the steel framing members. Nom 3/8 in. (10 mm) thick with a nom. minimum depth of 1 1/8 in. (28 mm) with depth adjusted to match Pilkington Pyrostop® Panel thickness.
5. Framing Member Fasteners — Supplied with the steel framing members. Screws are M6 x16mm Button Head Socket Cap Screws for frame assembly and #6 x 1” Pan Head Sheet Metal Screws for door installation.
6. Glazing Gasket —
   a. Interior Gasketing-Supplied with the steel framing members. Nom. 3/4 in. (19 mm) x 3/16 (4.5 mm) black applied to the steel framing members to cushion and seal the glazing material when installed.
   b. Exterior Gasketing- Supplied with the steel framing members. Nom. 2 in. (50 mm) x 3/16 (4.5 mm) black applied to the steel framing members to cushion and seal the glazing material when installed.

B. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
1. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 (ASTM B 221M).

C. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M Standard Specification for Carbon Structural Steel
2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon,

Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable

3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M 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

D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
   1. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
   2. Reinforce members as required to receive fastener threads.

2.5 ACCESSORIES

A. Fasteners: Use fasteners fabricated from Type 304 or Type 316 stainless steel.

B. Glazing Gaskets:

   1. Glazing gaskets for interior applications: ASTM C 864 (extruded EPDM rubber that provides for silicone adhesion) or ASTM C1115 Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories (extruded silicone).

C. Intumescent Tape: As supplied by frame manufacturer.

D. Setting Blocks: ¼" Calcium silicate.

E. Perimeter Anchors: Steel.

F. Flashings: As recommended by manufacturer; same material and finish as cover caps.

G. Silicone Sealant: One-Part Low Modulus, neutral cure High Movement-Capable Sealant: Type S; Grade NS; Class 25 with additional movement capability of 100 percent in extension and 50 percent in compression (total 150 percent); Use (Exposure) NT; Uses (Substrates) M, G, A, and O as applicable. (Use-O joint substrates include: Metal factory-coated with a high-performance coating; galvanized steel; ceramic tile.)
   1. Available Products:
      a. Dow Corning 790, 795 - Dow Corning Corp.
      b. Momentive
      c. Tremco

H. Intumescent Caulk: Single component, latex-based, intumescent caulk designed to stop passage of fire, smoke, and fumes through

fire-rated separations; permanently flexible after cure; will not support mold growth; flame spread/smoke developed 10/10.

1. Available Products:
   a. 3M CP-25 WP+

2.6 SLAG-WOOL-FIBER/ROCK-WOOL-FIBER INSULATION

A. Available Manufacturers:
   1. Fibrex Insulations Inc.
   2. Owens Corning
   3. Thermafiber.
   4. Rockwool

B. Unfaced, Slag-Wool-Fiber/Rock-Wool-Fiber Board Insulation: ASTM C 612, maximum flame-spread and smoke-developed indexes of 15 and 0, respectively; passing ASTM E 136 for combustion characteristics; and of the following nominal density and thermal resistivity:
   1. Nominal density of 4 lb/cu. ft. (64 kg/cu. m), Types IA and IB, thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).
   2. Fiber Color: Regular color, unless otherwise indicated.

2.7 FABRICATION

A. Obtain reviewed shop drawings prior to fabrication.

B. Fabrication Dimensions: Fabricate fire-rated assembly to field dimensions.

C. Field glaze door and frame assemblies.

2.8 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish frames after assembly.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

2.9 POWDERCOAT FINISHES

D. Finish after fabrication.

E. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

F. Steel or Aluminum Finishes
1. Powder-Coat Finish: Polyester Super Durable powder coating which meets AAMA 2604 for chalking and fading. Apply manufacturer's standard powder coating finish system applied to factory-assembled frames before shipping, complying with manufacturer's recommended instructions for surface preparation including pretreatment, application, and minimum dry film thickness.
2. Color and Gloss: [As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range].
3. Acceptable Manufacturers:
a. Tiger Drylac
b. Additional manufacturers as approved by TGP

G. Aluminum Finishes
1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
3. Color: **Dark bronze.**

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer’s instructions. Verify openings are sized to receive borrowed light system and sill plate is level in accordance with manufacturer’s acceptable tolerances.

B. Notify Architect of any conditions which jeopardize the integrity of the proposed fire wall / door system.

C. Do not proceed until such conditions are corrected.

3.2 INSTALLATION

A. See Fireframes Aluminum Series Installation Manual

3.3 REPAIR AND TOUCH UP

A. Anodized Finishes
1. Protect the anodized finish from harsh chemicals such as concrete/mortar or muriatic acid/brick wash. If reasonable care is taken during handling and high and low pH chemicals can be avoided, repair and/or touch-up of an anodize finish will not be needed.
2. Some rub marks on an anodized surface can be removed with a mild abrasive pad such as a Scotch-Brite pad prior to touch up painting.
3. Touch-up paint should be used even more sparingly over anodize. Only the visible raw aluminum in the scratch or gouge should be touched up with a matching paint.

B. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged.

3.4 PROTECTION AND CLEANING

A. Protect glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
1. Do not clean with astringent cleaners. Use a clean "grit free" cloth and a small amount of mild soap and water or mild detergent.
2. Do not use any of the following:
a. Steam jets
b. Abrasives
c. Strong acidic or alkaline detergents, or surface-reactive agents
d. Detergents not recommended in writing by the manufacturer
e. Do not use any detergent above 77 degrees F
f. Organic solvents including but not limited to those containing ester, ketones, alcohols, aromatic compounds, glycol ether, or halogenated hydrocarbons.
g. Metal or hard parts of cleaning equipment must not touch the glass surface

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION

SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY:

A. Section Includes: Finish Hardware for door openings, except as otherwise specified herein.

1. Door hardware for steel (hollow metal) doors.
2. Door hardware for aluminum doors.
3. Door hardware for wood doors.
4. Door hardware for other doors indicated.
5. Keyed cylinders as indicated.

B. Intent of Hardware Groups

1. Should items of hardware not definitely specified be required for completion of the Work, furnish such items of type and quality comparable to adjacent hardware and appropriate for service required.
2. Where items of hardware aren’t definitely or correctly specified, are required for completion of the Work, a written statement of such omission, error, or other discrepancy to Architect, prior to date specified for receipt of bids for clarification by addendum; or, furnish such items in the type and quality established by this specification, and appropriate to the service intended.

C. Allowances

1. Refer to Section 01210 for allowance amount and procedures.

D. Alternates

1. Refer to Section 01230 for Alternates and procedures.

1.2 SUBSTITUTIONS:

A. Comply with Section 01630

B. Approval of equal products must be submitted 15 day prior to bid and be pre-approved. Approval request meeting requirements of section 1 must also contain documentation showing products meet the required standards set in this spec to decrease maintenance costs.

1.3 SUBMITTALS:

A. Comply with Section 01330

B. Special Submittal Requirements: Combine submittals of this Section with Sections listed below to ensure the "design intent" of the system/assembly is understood and can be reviewed together.

C. Product Data: Manufacturer's specifications and technical data including the following:

1. Detailed specification of construction and fabrication.
2. Manufacturer's installation instructions.
3. Wiring diagrams for each electric product specified. Coordinate voltage with electrical before submitting.
4. Submit 6 copies of catalog cuts with hardware schedule.

D. Shop Drawings - Hardware Schedule: Submit 6 complete reproducible copy of detailed hardware schedule in a vertical format.

1. List groups and suffixes in proper sequence.
2. Completely describe door and list architectural door number.
3. Manufacturer, product name, and catalog number.
4. Function, type, and style.
5. Size and finish of each item.
6. Mounting heights.
7. Explanation of abbreviations and symbols used within schedule.
8. Detailed wiring diagrams, specially developed for each opening, indicating all electric hardware, security equipment and access control equipment, and door and frame rough-ins required for specific opening.

E. Templates: Submit templates and "reviewed Hardware Schedule" to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.

1. Templates, wiring diagrams and "reviewed Hardware Schedule" of electrical terms to electrical for coordination and verification of voltages and locations.

F. Samples: (If requested by the Architect)

1. 1 sample of Lever and Rose/Escutcheon design, (pair).
2. 3 samples of metal finishes

G. Contract Closeout Submittals: Comply with Section 01700 including specific requirements indicated.

1. Operating and maintenance manuals: Submit 3 sets containing the following.

   a. Complete information in care, maintenance, and adjustment, and data on repair and replacement parts, and information on preservation of finishes.
   b. Catalog pages for each product.
   c. Name, address, and phone number of local representative for each manufacturer.
   d. Parts list for each product.

2. Copy of final hardware schedule, edited to reflect, "As installed".
3. Copy of final keying schedule
4. As installed “Wiring Diagrams” for each piece of hardware connected to power, both low voltage and 110 volts.
5. One set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

1.4 QUALITY ASSURANCE

A. Comply with Section 01440.

1. Statement of qualification for distributor and installers.
2. Statement of compliance with regulatory requirements and single source responsibility.
3. Distributor's Qualifications: Firm with 3 years experience in the distribution of commercial hardware.

    a. Distributor to employ full time Architectural Hardware Consultants (AHC) for the purpose of scheduling and coordinating hardware and establishing keying schedule.
    b. Hardware Schedule shall be prepared and signed by an AHC.

4. Installer's Qualifications: Firm with 3 years experienced in installation of similar hardware to that required for this Project, including specific requirements indicated.
5. Regulatory Label Requirements: Provide testing agency label or stamp on hardware for labeled openings.

    a. Provide UL listed hardware for labeled and 20 minute openings in conformance with requirements for class of opening scheduled.
    b. Underwriters Laboratories requirements have precedence over this specification where conflict exists.

6. Single Source Responsibility: Except where specified in hardware schedule, furnish products of only one manufacturer for each type of hardware.

B. Review Project for extent of finish hardware required to complete the Work. Where there is a conflict between these Specifications and the existing hardware, notify the Architect in writing and furnish hardware in compliance with the Specification unless otherwise directed in writing by the Architect.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Comply with Section 01700.

1. Deliver products in original unopened packaging with legible manufacturer's identification.
2. Package hardware to prevent damage during transit and storage.
3. Mark hardware to correspond with "reviewed hardware schedule".
4. Deliver hardware to door and frame manufacturer upon request.

B. Storage and Protection: Comply with manufacturer's recommendations.

1.6 PROJECT CONDITIONS:

A. Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for the proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.

B. Review Shop Drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.

1.7 WARRANTY:

A. Refer to Conditions of the Contract

B. Manufacturer’s Warranty:

1. Closers: 30 years
2. Exit Devices: Five Years
3. Cylindrical Locksets: 5 years
4. Mortise Locks: Life of Installation
5. Cylinders: Three years
6. All other Hardware: Two years.

1.8 OWNER'S INSTRUCTION:

A. Instruct Owner's personnel in operation and maintenance of hardware units.

1.9 MAINTENANCE:

A. Extra Service Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1 Closeout Submittals Section.

1. Special Tools: Provide special wrenches and tools applicable to each different or special hardware component.
2. Maintenance Tools: Provide maintenance tools and accessories supplied by hardware component manufacturer.
3. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra service materials.

B. Maintenance Service: Submit for Owner's consideration maintenance service agreement for electronic products installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A.
The manufacturers list below are basis of design to show products similar to the standard set by this owner. All manufacturers below are subject to compliance with requirements of this spec and the contract documents. VA's approval of any of the manufacturers listed below shall be in accordance with their meeting requirements of part 1.7 and 2.2 of this specification, to help reduce long term maintenance costs:

Item:	Manufacturer:
Hinges	Stanley, McKinney, Ives, Bomme
Mortise Locks Locksets - **Locksets shall be Sargent manufactured locksets utilizing the Sargent 6300 LFIC keying system. Provide this manufacturer and keying system. No substitutions permitted.**	
Cylinders	Owners standard
Exit Devices-Premium	Precision Apex, Von Duprin 98, Sargent 19-88
Pulls	Trimco, Rockwood, Ives
Closers- HD	Stanley HD8016, LCN 4041, Sargent 350
Stops	Trimco, Rockwood, Ives
Flat Goods	Trimco, Rockwood, Ives
Thresholds & Gasketing	National Guard, Pemco, Zero, Reese

2.2 MATERIALS:

Minimum standards are set forth in this section to decrease long term maintainance costs for the owner. ONLY PRODUCTS MEETING OR EXCEEDING THESE STANDARDS, CERTIFIED, AND IN WRITING WILL BE CONSIDERED:

A. Hinges:

1. Template screw hole locations
2. Minimum of 2 permanently lubricated non-detachable bearings
3. Equip with easily seated, non-rising pins
4. Sufficient size to allow 180-degree swing of door
5. Furnish hinges with five knuckles and flush concealed bearings
6. Provide hinge type as listed in schedule.
7. Furnish 3 hinges per leaf to 7 foot 6 inch height. Add one for each additional 30 inches in height or fraction thereof.
8. Tested and approved by BHMA for all applicable ANSI Standards for type, size, function and finish
9. UL10B listed for Fire
10. Doors which are 36” wide or smaller shall have 4 ½ x 4 ½ size hinges
11. All doors over 36” wide shall have a continuous hinge as specifies below. This must be pre-approved by owner before the hardware is purchased.
12. All hinges furnished shall have a life of installation warrantee.

B. Mortise Type Locks and Latches:

1. Tested and approved by BHMA for ANSI A156.13, Series 1000, Operational Grade 1, (Cycle Test) – A machine is used to rotate the lever, retract the latch and open the door. Minimum Grade 1 Mortise standard is 1,000,000 cycles. The lockset furnished must exceed grade 1 minimum by 4 million cycles verified by an independent, and recognized testing laboratory. (5 Million total cycles verified)
2. Extra-Heavy Duty, Security Grade 2 and be UL10C
3. ANSI/BHMA A156.13 Attack Resistance (Cylinder Face Impact Test): Cylinder face is hit with a 35lb impact ram, after which the lock must remain locked. The lockset furnished must show independent test lab. Datta showing it exceed the minimum standard and withstand at least 25 blows and still functions.
4. Fit ANSI A115.1 door preparation
5. Functions and design as indicated in the hardware groups
6. Solid, one-piece, 3/4-inch (19mm) throw, anti-friction latchbolt made of self-lubricating stainless steel
7. Deadbolt functions shall have 1 inch (25mm) throw bolt made of hardened stainless steel
8. Latchbolt and Deadbolt are to extend into the case a minimum of 3/8 inch (9.5mm) when fully extended
9. Auxiliary deadlatch to be made of one piece stainless steel, permanently lubricated
10. Provide sufficient curved strike lip to protect door trim
11. Lever handles must be of forged or cast brass, bronze or stainless steel construction and conform to ANSI A117.1. Levers that contain a hollow cavity are not acceptable
12. Lock shall have self-aligning, thru-bolted trim
13. Levers to operate a roller bearing spindle hub mechanism
14. Mortise cylinders of lock shall have a concealed internal setscrew for securing the cylinder to the lockset. The internal setscrew will be accessible only by removing the core, with the control key, from the cylinder body.
15. Spindle to be designed to prevent forced entry from attacking of lever
16. Provide locksets with 7-pin removable and interchangeable core cylinders
17. Each lever to have independent spring mechanism controlling it
18. Core face must be the same finish as the lockset
19. The Lockset being furnished must also make a multi-Function case to avoide future lock replacement for interior office applications. This lock shall be

able to changfe function without opening trhe lock case. Owner to designate locations for these locks.

20. Functions and design as indicated in the hardware groups

C. Exit Devices shall:

1. Tested and approved by BHMA for ANSI 156.3, Grade 1 (Cycle Test) Minimum Cycle test requirement 1 Millioin cycles: Exit Device furnished shall be independently cerified to have reached and passed the loaded and unloaded ANSI/BHMA force requirements and passed 10 Million cycle tests.

2. The Exit device head shall be one piece construction mad of of investment cast brass.
3. Provide a deadlocking latchbolt
4. Non-fire rated exit devices shall have cylinder dogging.
5. Touchpad shall be “T” style
6. Exposed components shall be of architectural metals and finishes.
7. The entire exit device ahall incorporate true architectural ANSI/BHMA uniform finish. (Ecample 603 finish shall be all solid stainless steel)
8. Lever design shall match lockset lever design
9. Provide strikes as required by application.
10. Fire exit devices to be listed for UL10C
11. Provide exit device with multipoint maintenance free rubber noise reduction bumpers
12. Furnish with single spring push bar operation
13. UL listed for Accident Hazard
14. Provide vandal resistant or breakaway trim
15. Vertical rod assemblies to be provide with the manufacturers solid stainless steel rods only.
16. Functions and design as indicated in the hardware groups

A. Surface Door Closers

1. Manufacturers; Surface Mounted:
   a. Best by dormakaba USA, Inc.
2. Rack and Pinion Aluminum Surface Closers (Heavy Duty – HD8000)
   a. Provide Full Rack and Pinion type closer constructed of R14 High Silicon Aluminum Alloy, or equal, to exceed the ANSI/BHMA A156.4 Grade 1 requirements.
   b. Provide closers tested and approved for UL10C for positive pressure; UL228 &CAN/ULC-S133.
   c. Provide closers that conform to ANSI/ICC A117.1 and ADA requirements for barrier-free accessibility.
   d. Closer shall be available with heavy-duty arms and knuckles/elbows
   e. Closer shall have maximum 2 7/16 inch case projection with non-ferrous cover.
      1) Closer cover to be:
         a) Plastic (default)
         b) Oversized Plastic
         c) Metal
         d) Lead Lined
      2) Closer cover finish to be:
         a) Painted
         b) Plated
         c) RAL Custom Color Powder Coated
   f. Provide closers with all-weather hydraulic fluid.

g. Provide closers with separate adjusting valves for closing and latching speeds, as well as advanced backcheck and delayed action.
h. Provide closers with Delayed Action and/or Advanced Backcheck where noted in hardware sets.
i. Provide adapter plates, shim spacers and blade stop spacers as required by frame and door conditions.
j. Mount closers on non-public side of door and stair side of stair doors, unless otherwise noted in hardware sets.
k. Closers shall be non-handed and multi-sized as noted in hardware sets. When specific sized closers are required provide:
   1) Size 1 through 6 to meet barrier- free ADA requirements - HD8016
   2) Size 5 through 6 - +50% power over size 6 to meet PT4C requirements - HD8056

D. Kickplates: Provide with four beveled edges, 10 inches high by width less 2 inches on single doors and 1 inch on pairs of doors. Furnish oval-head countersunk screws to match finish.

E. Key Operated Devices: All key operated devices shall be able to accept small format BEST interchangeable core PATD Cormax key system. The cost for the core and master key charges shall be included as part of the finished hardware costs for the project. There must be a core allotted for the permanent core submittal for keying. Exceptions are light switches, dispensers, show cases and other items as pre-approved by architect in advance of ordering these items.

F. Seals: All seals shall be finished to match adjacent frame color. Seals shall be furnished as listed in schedule. Material shall be UL listed for labeled openings.

G. Key Control: Provide one wall mounted key cabinet complete with hooks, index and tags. Lund or Telkee 2 tag system is acceptable. In addition provide one set of software for key management as produced by Best Access Systems.

H. Silencers: Furnish silencers on all interior frames, 3 for single doors, 2 for pairs. Omit where any type of seals occur.

2.3 FINISH:

A. Designations used in Schedule of Finish Hardware - 3.05, and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 including coordination with traditional U.S. finishes shown by certain manufacturers for their products

B. Powder coat door closers to match other hardware, unless otherwise noted.

C. Aluminum items shall be finished to match predominant adjacent material. Seals to coordinate with frame color.

2.4 KEYS AND KEYING:

A. Provide keyed brass construction cores and keys during the construction period. Construction control and operating keys and core shall not be part of the Owner's permanent keying system or furnished in the same keyway (or key section) as the Owner's permanent keying system. Permanent cores and keys (prepared according to the accepted keying schedule) will be furnished to the Owner, as part of this contract, for every cylinder on the project.

B. Provide sufficient cores to secure the building and 10 extra cores if required for interior lockup areas.

C. Cylinders, removable and interchangeable core system: Best PATD CORMAX 7-pin, Key System patented thru May 2027..

D. Permanent keys and cores: Stamped with the applicable key mark for identification. These visual key control marks or codes will not include the actual key cuts. Permanent keys will also be stamped "Do Not Duplicate."

E. All key operated devices shall be able to accept the Owners small format BEST interchangeable core key system. The cost for the core and master key chargews shall be included as part of the finished hardware costs for the project. There must be a core allotted for the permanent core submittal for keying. Exceptions are light switches, dispensers, show cases and other items as pre-approved in advance of ordering these items.

F. Transmit Grand Masterkeys, Masterkeys and other Security keys to Owner by Registered Mail, return receipt requested.

G. Furnish keys in the following quantities:

1. 1 each Grand Masterkeys
2. 4 each Masterkeys
3. 3 each Change keys each keyed core
4. 15 each Construction masterkeys
5. 25 each or as required -brass construction core for construction
6. 1 each Control keys

H. The Owner, or the Owner's agent, will install permanent cores and return the construction cores to the Hardware Supplier. Construction cores and keys remain the property of the Hardware Supplier.

I. Keying Schedule: Arrange for a keying meeting, and programming meeting with Architect Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying and programming complies with project requirements. Furnish 3 typed copies of keying and programming schedule to Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of conditions: Examine doors, frames, related items and conditions under which Work is to be performed and identify conditions detrimental to proper and or timely completion.

1. Do not proceed until unsatisfactory conditions have been corrected.

3.2 HARDWARE LOCATIONS:

A. Mount hardware units at heights indicated in the following publications except as specifically indicated or required to comply with the governing regulations.

1. Recommended Locations for Builder’s Hardware for Standard Steel Doors and Frames, by the Door and Hardware Institute (DHI).
2. NWWDA Industry Standard I.S.1.7, Hardware Locations for Wood Flush Doors.

3.3 INSTALLATION:

A. Install each hardware item per manufacturer's instructions and recommendations. Do not install surface mounted items until finishes have been completed on the substrate. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

B. The Installer must verify in writing that all hardware is installed per the manufacturer’s instructions prier to the architects final punch list. Any items found to not be in compliance with correct installation instructions shall be reported to the Architect prier to his final punch list. All incorrectly installed items shall be re-installed correctly at no added expense to the owner or the contractor.

C. Before Hardware installation verify the following: That the doors and frames are properly prepared to receive the specified hardware. Hollow metal frames shall be prepared for ANSI strike plates per A115.1-2 (4 7/8” High), “all” hinge preps will be mortised and or reinforced with a manufacturers recommended reinforcing material. All closer shall have reinforcement which shall be a minimum of 8 gauge. Hollow Metal Doors shall be properly reinforced with a minimum of 16 gauge material for either mortised or cylindrical lacks as specified by the owner. It is preferred that all hollow metal doors receiving door closers have 12 gauge reinforcement. Wood doors shall be “Factory” prepped to receive the scheduled hardware and comply with ANSI A115-W and fire rated wood doors be UL10C - TYPE A door with Hot seal build into the edges.

D. All openings with Access Control shall have frames and doors prepped with Electric Power Transfers (EPT) for long term access control reliability and maintainance.

E. Sex Bolts are mandatory for all exit device and closer installation.

F. Conform to local governing agency security ordinance.

G. ADA Standard: Conform to ANSI A117.1 for positioning requirements for disabled.

H. Installed hardware using the manufacturers fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use “Riv-Nuts” or similar products.

I. Thresholds shall be set in a continuious bed of Polyurethane or butle rubber Calk. Contractor to verify “Squeeze Out” befor it is trimmed off. This will ensure a water tight seal under and around each threshold.

3.4 FIELD QUALITY CONTROL AND FINAL ADJUSTMENT

A. Contractor/Installers, Field Services: After installation is complete, contractor shall inspect completed door openings on site to verify installation of hardware is complete and properly adjusted, in accordance with both the Contract Documents and final shop drawings.

1. Check and adjust closers to ensure proper operation.

a. Adjust closer to complete full closing cycle in less than 4 to 6 seconds without abrupt change of speed between "Sweep" and "Latch" speeds.
b. Adjust "Backcheck" according to manufacturer's instructions.

c. Set exterior doors closers to have 8.5 lbs maximum pressure to open, interior non-rated at 5 lbs, rated openings at 12 lbs

2. Check latchset, lockset, and exit devices are properly installed and adjusted to ensure proper operation.

a. Verify levers are free from binding.
b. Ensure latchbolts and dead bolts are engaged into strike and hardware is functioning.

3. Report findings, in writing, to architect and hardware supplier outlining corrective actions and recommendations.

3.5 SCHEDULE OF FINISH HARDWARE:

Manufacturer List

Code	Name
BES	Best Access Systems
BY	By Others
DCI	Door Controls International
IVE	H.B. Ives
LCN	LCN Commercial Division
NA	National Guard
OTHE	Others
SCH	Schlage Lock company
ST	Stanley
TR	Trimco
GLY	Glynn-Johnson
VON	Von Duprin
ZER	Zero International Inc.

Option List

Code	Description
C	Quick Connect Wiring System
18	CONCEALED WIRES - 18 AWG (8)
CE	CONC/WIRE-USE WITH 10,18,54,56,58,66 SUF
HT	HOSPITAL TIPS-HEAVY WEIGHT
CSK	COUNTER SINKING OF KICK and MOP PLATES
RQE	REQUEST TO EXIT
DA AVB	Del. Action & Adv. Variable Backcheck
ADHESIVE-KP	ADHESIVE APPLICATION- KICKPLATE
B4E-HEAVY-KP	BEVELED 4 EDGES - KICK PLATES

Finish List

Code	Description
626	Satin Chromium Plated
630	Satin Stainless Steel
689	Aluminum Painted
626AM	Satin Chrome - Antimicrobial Coating
US26D	Chromium Plated, Dull

- - - E N D - - -

SECTION 08 71 00
DOOR HARDWARE GROUPS

Abbreviation	Name
BES	Best Locking Systems
GLY	Glynn-Johnson Corp
IVE	H.B. Ives
LCN	Lcn Commercial Division
SCH	Schlage Lock Company
VON	Von Duprin
ZER	Zero International Inc

Hardware Group No. 01

For use on Door #(s):
MCR-100.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW HT 4.5 X 4.5		630	IVE
1	EA	ELECTRIC HINGE	5BB1HW HT 4.5 X 4.5 CON TW8	✓	630	IVE
1	EA	FAIL SECURE ELEC LOCK	L9092HDEU 17L CON 12/24 VDC	✓	626AM	SCH
1	EA	PERMANENT CORE	BEST CORMAX (KEY AS DIRECTED BY OWNER)		626	BES
1	EA	SURFACE CLOSER (W/ SPRING STOP, DELAY CLOSE & HOLD OPEN)	4041 DEL SHCUSH		689	LCN
1	EA	RAIN DRIP	142AA		AA	ZER
1	SET	GASKETING	429AA @ HEAD & JAMBS		AA	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	SADDLE THRESHOLD	1/2" HIGH X DEPTH AS REQ'D BY SILL DETAIL (THERMALLY BROKEN)		A	ZER
1	SET	WIRE HARNESSES	QTY/ LENGTH/ TYP AS REQ'D	✓		SCH
1	EA	CARD READER	RE. TELE-COMMUNICATION DWGS & SPEC SECTION 28 13 00			
1	EA	LOW VOLTAGE POWER	RE. TELE-COMMUNICATION DWGS & SPEC SECTION 28 13 00			
1	EA	DOOR POSITION SWITCH	RE. TELE-COMMUNICATION DWGS & SPEC SECTION 28 13 00			

FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY.
MECHANICAL KEY OVERRIDE.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED. TRIM REMAINS SECURE.

Hardware Group No. 02 - NOT USED

Hardware Group No. 03

For use on Door #(s):
MCR-116.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW HT 4.5 X 4.5	630	IVE
1	EA	STOREROOM W/DEADBOLT	L9480HD 17L L583-363 XL13-439	626AM	SCH
1	EA	PERMANENT CORE	BEST CORMAX (KEY AS DIRECTED BY OWNER)	626	BES
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	689	LCN
1	EA	RAIN DRIP	142AA	AA	ZER
1	SET	GASKETING	429AA @ HEAD & JAMBS	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	SADDLE THRESHOLD	1/2" HIGH X DEPTH AS REQ'D BY SILL DETAIL	A	ZER

Hardware Group No. 03.01

For use on Door #(s):
MCR-116.2

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HINGE	5BB1HW HT 4.5 X 4.5	630	IVE
1	EA	KEYED REMOVABLE MULLION	KR4954-STAB-MT54	689	VON
1	EA	PANIC HARDWARE	LD-98-EO-SNB	626	VON
1	EA	PANIC HARDWARE	LD-98-NL-SNB	626	VON
1	EA	SFIC MORTISE CYL.	80-132	626	SCH
1	EA	SFIC RIM CYLINDER	80-159	626	SCH
2	EA	PERMANENT CORE	BEST CORMAX (KEY AS DIRECTED BY OWNER)	626	BES
2	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	689	LCN
1	EA	RAIN DRIP	142AA	AA	ZER
1	SET	GASKETING	429AA @ HEAD & JAMBS	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
2	EA	DOOR SWEEP	39A	A	ZER
1	EA	SADDLE THRESHOLD	1/2" HIGH X DEPTH AS REQ'D BY SILL DETAIL	A	ZER

Hardware Group No. 04

For use on Door #(s):
MCR-102.1

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HINGE	5BB1HW HT 4.5 X 4.5	652	IVE
1	EA	CONST LATCHING BOLT	FB51P/61P AS REQ'D BY DOOR MATERIAL	630	IVE
1	EA	DUST PROOF STRIKE	DP1/DP2 AS REQ'D	626	IVE
1	EA	CLASSROOM LOCK	L9070HD 17L	626AM	SCH
1	EA	PERMANENT CORE	BEST CORMAX (KEY AS DIRECTED BY OWNER)	626	BES
1	EA	COORDINATOR	COR X FL X MB AS REQUIRED	628	IVE
2	EA	SURFACE CLOSER (W/ DELAY CLOSE & HOLD OPEN)	4041 DEL HW/PA X ST-1755	689	LCN
2	EA	KICK PLATE	8400 10" B-CS	630	IVE
2	EA	WALL STOP	WS406/407CCV	626	IVE
1	EA	GASKETING	488S @ HEAD & JAMBS	BK	ZER
1	EA	OVERLAPPING ASTRAGAL	44SP (PAINT TO MATCH DOOR COLOR)		ZER

Hardware Group No. 05

For use on Door #(s):
200-196.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW HT 4.5 X 4.5	652	IVE
1	EA	OFFICE W/SIM RETRACT	L9056HD 17L L583-363	626AM	SCH
1	EA	PERMANENT CORE	BEST CORMAX (KEY AS DIRECTED BY OWNER)	626	BES
1	EA	WALL STOP	WS406/407CCV	626	IVE
1	EA	GASKETING	488S @ HEAD & JAMBS	BK	ZER

Hardware Group No. 06

For use on Door #(s):
203-304D.1

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW HT 4.5 X 4.5	652	IVE
1	EA	CONST LATCHING BOLT	FB51P/61P AS REQ'D BY DOOR MATERIAL	630	IVE
1	EA	DUST PROOF STRIKE	DP1/DP2 AS REQ'D	626	IVE
1	EA	STOREROOM W/DEADBOLT	L9480HD 17L L583-363 XL13-439	626AM	SCH
1	EA	PERMANENT CORE	BEST CORMAX (KEY AS DIRECTED BY OWNER)	626	BES
1	EA	COORDINATOR	COR X FL X MB AS REQUIRED	628	IVE
2	EA	SURFACE CLOSER (W/ DELAY CLOSE & STOP ARM)	4041 DEL SCUSH X ST-2648	689	LCN
2	EA	KICK PLATE	8400 10" B-CS	630	IVE
1	EA	GASKETING	488S @ HEAD & JAMBS	BK	ZER
1	EA	OVERLAPPING ASTRAGAL	44SP (PAINT TO MATCH DOOR COLOR)		ZER

Hardware Group No. 07 - NOT USED

Hardware Group No. 08

For use on Door #(s):
MCR-106.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW HT 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080HD 17L	626AM	SCH
1	EA	PERMANENT CORE	BEST CORMAX (KEY AS DIRECTED BY OWNER)	626	BES
1	EA	SURFACE CLOSER (W/ DELAY CLOSE)	4041 DEL RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	626	IVE
1	EA	GASKETING	488S @ HEAD & JAMBS	BK	ZER

Hardware Group No. 09

For use on Door #(s):
MCR-107.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW HT 4.5 X 4.5	630	IVE
1	EA	STOREROOM LOCK	L9080HD 17L	626AM	SCH
1	EA	PERMANENT CORE	BEST CORMAX (KEY AS DIRECTED BY OWNER)	626	BES
1	EA	SURFACE CLOSER (W/ DELAY CLOSE & HOLD OPEN)	4041 DEL HW/PA	689	LCN
1	EA	KICK PLATE	8400 10" B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	626	IVE
1	EA	GASKETING	488S @ HEAD & JAMBS	BK	ZER

Hardware Group No. 10

For use on Door #(s):
200-196A.1 200-210.1 200-C501B.1 204-116B.1 205-230A.1 212-100F.1
232-202.1 239-100A.1 240-100B.1 248.020D.1 Q32-105B.1 MCR-104.1
MCR-105.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONTINUOUS HINGE	700	630	IVE
1	EA	STOREROOM W/DEADBOLT	L9480HD 17L L583-363 XL13-439	626AM	SCH
1	EA	PERMANENT CORE	BEST CORMAX (KEY AS DIRECTED BY OWNER)	626	BES
1	EA	FAIL SECURE ELECTRIC STRIKE	6216 FSE ✓	630	VON
1	EA	SURFACE CLOSER (W/ DELAY CLOSE & HOLD OPEN)	4041 DEL HW/PA	689	LCN
1	EA	KICK PLATE	8400 10" B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	626	IVE
1	EA	GASKETING	488S @ HEAD & JAMBS	BK	ZER
1	EA	CARD READER	RE. TELE-COMMUNICATION DWGS & SPEC SECTION 28 13 00		
1	EA	LOW VOLTAGE POWER	RE. TELE-COMMUNICATION DWGS & SPEC SECTION 28 13 00		
1	EA	DOOR POSITION SWITCH	RE. TELE-COMMUNICATION DWGS & SPEC SECTION 28 13 00		

FREE EGRESS AT ALL TIMES.
VALID CREDENTIAL MOMENTARILY RELEASES ELECTRIC STRIKE, ALLOWING ENTRY.
WHEN DEADBOLT ON LOCK IS THROWN; ELECTRIC STRIKE WILL NOT RELEASE.
DEADBOLT THROWN OR RETRACTED BY KEY OUTSIDE OR BY INSIDE THUMBTURN KEY OUTSIDE RETRACTS DEADBOLT AND LATCHBOLT, HOWEVER, OUTSIDE LEVER REMAINS LOCKED; XL13-439 OPTION ALLOWS KEY TO RETRACT DEADBOLT AND LATCHBOLT OVERRIDING THUMBTURN IF BEING HELD IN LOCKED POSITION
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED. TRIM REMAINS SECURE.
DOOR CONTACT MONITORS WHEN DOOR IS OPENED AND CLOSED.

Hardware Group No. 11

For use on Door #(s):

200-358J.1	200-413.1	200-C009A.1	200E-635.1	200E-E13H.1	200E-E122.1
200E-E201.1	200E-E341.1	201-001A.1	203.302.1	205-108B.1	205-307E.1
206-145A.1	206-213.1	206-366.1	207-132A.1	207-207A.1	207-307A.1
208.107.1	209-123A.1	209-203B.1	210-109.1	221-109.1	248.102G.1
248.202H.1	300-109A.1	Q01-106A.1	Q03-110.1	Q04.110.01	Q27.104.1
200-149.1	69-102B.1				

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONTINUOUS HINGE	700	630	IVE
1	EA	STOREROOM W/DEADBOLT	L9480HD 17L L583-363 XL13-439	626AM	SCH
1	EA	PERMANENT CORE	BEST CORMAX (KEY AS DIRECTED BY OWNER)	626	BES
1	EA	FAIL SECURE ELECTRIC STRIKE	6216 FSE ✓	630	VON
1	EA	SURFACE CLOSER (W/ SPRING STOP, DELAY CLOSE & HOLD OPEN)	4041 DEL SHCUSH	689	LCN
1	EA	KICK PLATE	8400 10" B-CS	630	IVE
1	EA	GASKETING	488S @ HEAD & JAMBS	BK	ZER
1	EA	CARD READER	RE. TELE-COMMUNICATION DWGS & SPEC SECTION 28 13 00		
1	EA	LOW VOLTAGE POWER	RE. TELE-COMMUNICATION DWGS & SPEC SECTION 28 13 00		
1	EA	DOOR POSITION SWITCH	RE. TELE-COMMUNICATION DWGS & SPEC SECTION 28 13 00		

FREE EGRESS AT ALL TIMES.
VALID CREDENTIAL MOMENTARILY RELEASES ELECTRIC STRIKE, ALLOWING ENTRY.
WHEN DEADBOLT ON LOCK IS THROWN; ELECTRIC STRIKE WILL NOT RELEASE.
DEADBOLT THROWN OR RETRACTED BY KEY OUTSIDE OR BY INSIDE THUMBTURN KEY OUTSIDE RETRACTS DEADBOLT AND LATCHBOLT, HOWEVER, OUTSIDE LEVER REMAINS LOCKED; XL13-439 OPTION ALLOWS KEY TO RETRACT DEADBOLT AND LATCHBOLT OVERRIDING THUMBTURN IF BEING HELD IN LOCKED POSITION
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED. TRIM REMAINS SECURE.
DOOR CONTACT MONITORS WHEN DOOR IS OPENED AND CLOSED.

Hardware Group No. 12

For use on Door #(s):
MCR-111.1 MCR-112.1 MCR-109.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONTINUOUS HINGE	700	630	IVE
1	EA	STOREROOM W/DEADBOLT	L9480HD 17L L583-363 XL13-439	626AM	SCH
1	EA	PERMANENT CORE	BEST CORMAX (KEY AS DIRECTED BY OWNER)	626	BES
1	EA	FAIL SECURE ELECTRIC STRIKE	6216 FSE ✓	630	VON
1	EA	SURFACE CLOSER (W/ SPRING STOP, DELAY CLOSE & HOLD OPEN)	4041 DEL SHCUSH	689	LCN
1	EA	KICK PLATE	8400 10" B-CS	630	IVE
1	EA	GASKETING	488S @ HEAD & JAMBS	BK	ZER
1	EA	SADDLE THRESHOLD	1/2" HIGH X DEPTH AS REQ'D BY SILL DETAIL (THERMALLY BROKEN)	A	ZER
1	EA	CARD READER	RE. TELE-COMMUNICATION DWGS & SPEC SECTION 28 13 00		
1	EA	LOW VOLTAGE POWER	RE. TELE-COMMUNICATION DWGS & SPEC SECTION 28 13 00		
1	EA	DOOR POSITION SWITCH	RE. TELE-COMMUNICATION DWGS & SPEC SECTION 28 13 00		

FREE EGRESS AT ALL TIMES.
VALID CREDENTIAL MOMENTARILY RELEASES ELECTRIC STRIKE, ALLOWING ENTRY.
WHEN DEADBOLT ON LOCK IS THROWN; ELECTRIC STRIKE WILL NOT RELEASE.
DEADBOLT THROWN OR RETRACTED BY KEY OUTSIDE OR BY INSIDE THUMBTURN KEY OUTSIDE RETRACTS DEADBOLT AND LATCHBOLT, HOWEVER, OUTSIDE LEVER REMAINS LOCKED; XL13-439 OPTION ALLOWS KEY TO RETRACT DEADBOLT AND LATCHBOLT OVERRIDING THUMBTURN IF BEING HELD IN LOCKED POSITION
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED. TRIM REMAINS SECURE.
DOOR CONTACT MONITORS WHEN DOOR IS OPENED AND CLOSED.

Hardware Group No. 13

For use on Door #(s):
MCR-111.2

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONTINUOUS HINGE	700		630	IVE
1	EA	CONTINUOUS HINGE W/ EPT PREP	700 EPT		630	IVE
1	EA	POWER TRANSFER	EPT10	✓	689	VON
1	EA	CONST LATCHING BOLT	FB51P/61P AS REQ'D BY DOOR MATERIAL		630	IVE
1	EA	DUST PROOF STRIKE	DP1/DP2 AS REQ'D		626	IVE
1	EA	FAIL SECURE ELEC LOCK	L9492HDEU 17L DM XL13-439 CON 12/24 VDC	✓	626AM	SCH
1	EA	PERMANENT CORE	BEST CORMAX (KEY AS DIRECTED BY OWNER)		626	BES
1	EA	COORDINATOR	COR X FL X MB AS REQUIRED		628	IVE
2	EA	SURFACE CLOSER (W/ DELAY CLOSE)	4041 DEL RW/PA X ST-1755		689	LCN
2	EA	KICK PLATE	8400 10" B-CS		630	IVE
2	EA	WALL STOP	WS406/407CCV		626	IVE
1	EA	GASKETING	488S @ HEAD & JAMBS		BK	ZER
1	EA	OVERLAPPING ASTRAGAL	44SP (PAINT TO MATCH DOOR COLOR)			ZER
1	SET	WIRE HARNESSES	QTY/ LENGTH/ TYP AS REQ'D	✓		SCH
1	EA	CARD READER	RE. TELE-COMMUNICATION DWGS & SPEC SECTION 28 13 00			
1	EA	LOW VOLTAGE POWER	RE. TELE-COMMUNICATION DWGS & SPEC SECTION 28 13 00			
2	EA	DOOR POSITION SWITCH	RE. TELE-COMMUNICATION DWGS & SPEC SECTION 28 13 00			

FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RELEASES OUTSIDE LEVER, ALLOWING ENTRY.
MECHANICAL KEY OVERRIDE.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED. TRIM REMAINS SECURE.

Hardware Group No. 14

For use on Door #(s):
MCR-108.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW HT 4.5 X 4.5	652	IVE
1	EA	PRIVACY (W/ OCC/VAC INDICATOR)	L9056HD 17A L583-363 L283-722	626AM	SCH
1	EA	PERMANENT CORE	BEST CORMAX (KEY AS DIRECTED BY OWNER)	626	BES
1	EA	SURFACE CLOSER	4040XP RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	626	IVE
1	EA	GASKETING	488S @ HEAD & JAMBS	BK	ZER

Hardware Group No. 15

For use on Door #(s):
MCR-103.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW HT 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	L9010 17L	626AM	SCH
1	EA	WALL STOP	WS406/407CCV	626	IVE
1	EA	GASKETING	488S @ HEAD & JAMBS	BK	ZER

Hardware Group No. AL-01

For use on Door #(s):
MCR-113.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONTINUOUS HINGE	112XY EPT (MATCH STOREFRONT FINISH)	CPC	IVE
1	EA	POWER TRANSFER	EPT10 ✓	695	VON
1	EA	ELEC PANIC HARDWARE	QEL-35A-NL-OP-388 24 VDC ✓	710	VON
1	EA	RIM CYLINDER	1E72	613	BES
1	EA	PERMANENT CORE	BEST CORMAX (KEY AS DIRECTED BY OWNER)	613	BES
1	EA	90 DEG OFFSET PULL	8190EZHD 10" O	643E/716	IVE
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	695	LCN
1	SET	CLOSER BRACKET(S)	AS REQ'D TO INSTALL CLOSER	695	LCN
1	SET	SEALS	BY ALUM DOOR/FRAME MFG		
1	EA	CARD READER	RE. TELE-COMMUNICATION DWGS & SPEC SECTION 28 13 00		
1	EA	LOW VOLTAGE POWER	RE. TELE-COMMUNICATION DWGS & SPEC SECTION 28 13 00		
1	EA	DOOR POSITION SWITCH	RE. TELE-COMMUNICATION DWGS & SPEC SECTION 28 13 00		

FREE EGRESS AT ALL TIMES.
AUTHORIZED CREDENTIAL MOMENTARILY RETRACTS LATCHBOLT, ALLOWING ENTRY.
MECHANICAL KEY OVERRIDE.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS LATCHED. TRIM REMAINS SECURE.

Hardware Group No. AL-02

For use on Door #(s):
MCR-114.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONTINUOUS HINGE	112XY (MATCH STOREFRONT FINISH)	CPC	IVE
1	EA	PUSH/PULL BAR	9190HD-10"-NO	643E/716	IVE
1	EA	SURFACE CLOSER (W/ SPRING STOP)	4040XP SCUSH	695	LCN
1	SET	CLOSER BRACKET(S)	AS REQ'D TO INSTALL CLOSER	695	LCN
1	SET	SEALS	BY ALUM DOOR/FRAME MFG		

Hardware Group No. EX-01

For use on Door #(s):
205-108.1 206-215.1 208.117.1 212-100A.1 248.102C.1 248.113.1
Q32-105A.1

Provide each SGL door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR

RELOCATED EXISTING DOOR AND HARDWARE AND FRAME.

Hardware Group No. OH-01

For use on Door #(s):
MCR-101.1

Provide each RU door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR

ALL HARDWARE PROVIDED BY OVERHEAD DOOR MANUFACTURER.

Door#	HwSet#
69-102B.1✓	11
200-149.1✓	11
200-196.1	05
200-196A.1✓	10
200-210.1✓	10
200-358J.1✓	11
200-413.1✓	11
200-C009A.1✓	11
200-C501B.1✓	10
200E-635.1✓	11
200E-E13H.1✓	11
200E-E122.1✓	11
200E-E201.1✓	11
200E-E341.1✓	11
201-001A.1✓	11
203-304D.1	06
203.302.1✓	11
204-116B.1✓	10
205-108.1	EX-01
205-108B.1✓	11
205-230A.1✓	10
205-307E.1✓	11
206-145A.1✓	11
206-213.1✓	11
206-215.1	EX-01
206-366.1✓	11
207-132A.1✓	11
207-207A.1✓	11
207-307A.1✓	11
208.107.1✓	11
208.117.1	EX-01
209-123A.1✓	11
209-203B.1✓	11
210-109.1✓	11
212-100A.1	EX-01
212-100F.1✓	10
221-109.1✓	11
232-202.1✓	10
239-100A.1✓	10
240-100B.1✓	10
248.020D.1✓	10
248.102C.1	EX-01
248.102G.1✓	11
248.113.1	EX-01
248.202H.1✓	11
255-106.1	

Door#	HwSet#
300-109A.1✓	11
MCR-100.1✓	01
MCR-101.1	OH-01
MCR-102.1	04
MCR-102.2	
MCR-103.1	15
MCR-103.2	
MCR-104.1✓	10
MCR-105.1✓	10
MCR-106.1	08
MCR-107.1	09
MCR-108.1	14
MCR-109.1✓	12
MCR-111.1✓	12
MCR-111.2✓	13
MCR-112.1✓	12
MCR-113.1✓	AL-01
MCR-114.1	AL-02
MCR-116.1	03
MCR-116.2	03.01
Q01-106A.1✓	11
Q03-110.1✓	11
Q04.110.01✓	11
Q27.104.1✓	11
Q32-105A.1	EX-01
Q32-105B.1✓	10

- - - E N D - - -

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass products.
2. Laminated glass.
3. Insulating glass.
4. Fire-rated glazing.
5. Glazing tapes.
6. Miscellaneous glazing materials.

1.2 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.

C. IBC: International Building Code.

D. Interspace: Space between lites of an insulating-glass unit.

1.3 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.

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1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

C. Delegated Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.

1. Blast analysis and design calculations when demonstrating blast resistance though analysis: Blast analysis and design calculations must be performed by a licensed professional engineer with a minimum of five years of professional experience in blast-resistant design. Exterior glazing must meet the blast resistant design requirements for Critical Facilities per Section 6.3 of the VA Physical Security and Resiliency Design Manual.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturers of fabricated glass units .

B. Product Certificates: For glass.

C. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

A. Fabricated-Glass Manufacturer Qualifications: A qualified manufacturer of fabricated glass units who is approved and certified by primary glass manufacturer.

B. Installer Qualifications: A qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors and who employs glazing technicians certified under the Architectural Glass and Metal Technician (AGMT) certification program.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

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1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

1.10 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Glass: Obtain tinted and coated glass from single source from single manufacturer.

B. Source Limitations for Glazing Accessories: For each product and installation method, obtain from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design glazing.

C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined in accordance with the IBC and ASTM E1300:

1. Design Wind Pressures: As indicated on Drawings .
   a. Wind Design Data: As indicated on Drawings.
   b. Basic Wind Speed: As indicated on the drawings .
   c. Importance Factor: 1.0 .
   d. Exposure Category: As indicated on Drawings. .
2. Design Snow Loads: As indicated on Drawings.
3. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
4. Thermal Loads: Design glazing to resist thermal stress breakage induced by differential temperature conditions and limited air circulation within individual glass lites and insulated glazing units.

D. Safety Glazing: Where safety glazing is indicated or required by code, provide glazing that complies with 16 CFR 1201, Category II.

E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6 mm thick .

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2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, in accordance with NFRC 100 and based on most current non-beta version of LBL's WINDOW computer program, expressed as Btu/sq. ft. x h x deg F.
5. SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on most current non-beta version of LBL's WINDOW computer program.
6. Visible Reflectance: Center-of-glazing values, in accordance with NFRC 300.

F. Blast Performance: To demonstrate blast resistance for windows, perform analysis using window glazing blast analysis and design software developed by the US Government, such as SBEDS-W or WINGARD PE, which are capable of predicting the glass, film, and laminate response when subjected to the blast loading environment. The dynamic analysis must use a glass probability of failure (POF) of 500 breaks per 1000. Glazing must be designed to achieve a glass Performance Condition 2 (i.e. glass may crack but must remain in the frame) in response to a design blast load of 13.5 psi peak pressure and 51 psi-msec impulse (as an equivalent triangular load). Alternatively, glaze assemblies may be certified through testing (Standard test Method for Glazing Systems Subject to Airblast Loadings ASTM F1642) against the specified design blast load. The tested assembly must be demonstrated to be sufficiently similar in glazing layup, mullions, frames, connections, and hardware to that being constructed for the project.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. NGA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Labeling: Where safety glazing is indicated or required by code, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the IGCC.

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D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than thickness indicated.

1. Minimum Glass Thickness for Exterior and Interior Lites: 6 mm .
2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AGC Glass Company North America, Inc.
   b. Cardinal Glass Industries, Inc.
   c. Guardian Glass LLC.
   d. Pilkington North America; NSG Group.
   e. Saint-Gobain Glass Corp.
   f. Vitro Architectural Glass.

B. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

C. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

D. Reflective- and Low-E-Coated Vision Glass: ASTM C1376.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Cardinal Glass Industries, Inc.
   b. Guardian Glass LLC.

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c. Pilkington North America; NSG Group.
d. Saint-Gobain Glass Corp.
e. Vitro Architectural Glass.

2.5 LAMINATED GLASS

A. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Kuraray America, Inc.
   b. Pilkington North America; NSG Group.
   c. Saflex; Eastman.
2. Construction: Laminate glass with polyvinyl butyral interlayer, ionoplast interlayer or cast-in-place and cured-transparent-resin interlayer to comply with interlayer manufacturer's written instructions.
3. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
4. Interlayer Color: Clear unless otherwise indicated.

2.6 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
2. Perimeter Spacer: Manufacturer's standard spacer material and construction .
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Saint-Gobain Glass Corp.
      2) Technoform Glass Insulation North America.
      3) Thermix; a brand of Ensinger USA.
3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.7 Fire-Rated Glazing: See Drawing MCR-AE-401, Glass Types, Type GL-4.

2.8 GLAZING TAPES

A. 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:

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1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. 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:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks:

1. EPDM with Shore A durometer hardness of 85, plus or minus 5.
2. Type recommended in writing by sealant or glass manufacturer.

D. Spacers:

1. Neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
2. Type recommended in writing by sealant or glass manufacturer.

E. Edge Blocks:

1. EPDM with Shore A durometer hardness per manufacturer's written instructions.
2. Type recommended in writing by sealant or glass manufacturer.

F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.10 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface

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conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
   a. Temperature Change: 120 deg F , ambient; 180 deg F , material surfaces .

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

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B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch- minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

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D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.6 CLEANING AND PROTECTION

A. Immediately after installation, remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

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D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.7 MONOLITHIC GLASS SCHEDULE

A. Clear Glass Type - GL-3 : Annealed float glass.

1. Minimum Thickness: 6 mm .
2. Safety glazing required.

3.8 LAMINATED GLASS SCHEDULE

A. Clear Laminated Glass Type - GL-2 : Two plies of fully tempered float glass.

1. Minimum Thickness of Each Glass Ply: 6 mm .
2. Interlayer Thickness: 0.060 inch .
3. Safety glazing required.

B. Fire-Rated Glass Type - GL-4: See Drawing Sheet MCR-AE-401, Glass Types.

3.9 INSULATING GLASS SCHEDULE

A. Low-E-Coated, Tinted Clear Insulating Glass Type - GL-1 :

1. Overall Unit Thickness: 1 inch .
2. Minimum Thickness of Each Glass Lite: 6 mm .
3. Outdoor Lite: Annealed or float glass.
4. Tint Color: Clear. .
5. Basis-of-Design: Exterior Viracon VE1-2M-HS/HS. See Drawings Sheet MCR-AE-01, Glass Types.
6. Safety glazing required.

3.10 INSULATING-LAMINATED-GLASS SCHEDULE

A. Low-E-Coated, Clear, Insulating Laminated Glass Type - GL-2 :

1. Overall Unit Thickness: 1 1/4 inch .
2. Minimum Thickness of Outdoor Lite: 6 mm .
3. Outdoor Lite: Tinted fully tempered float glass.
4. Tint Color: Clear. .
5. Interspace Content: Air .
6. Indoor Lite: Clear laminated glass with two plies of fully tempered float glass.
   a. Minimum Thickness of Each Glass Ply: 6 mm .
   b. Interlayer Thickness: 0.060 inch .
7. Low-E Coating: On fourth surface.

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8. Basis-of-Design: Exterior Viracon VE4-85. See Drawing Sheet MCR-AE-01, Glass Types.
9. Safety glazing required.

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SECTION 08 88 13 - FIRE-RATED GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-resistance-rated glazing.

1.2 DEFINITIONS

A. Fire-Protection-Rated Glazing: Glazing that prevents spread of fire and smoke and complies with requirements for rated openings; incapable of blocking radiant heat

B. Fire-Resistance-Rated Glazing: Glazing that prevents spread of fire and smoke and radiant heat and complies with requirements for rated walls and rated openings; capable of blocking radiant heat

C. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

D. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.

1.3 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of glass product; 12 inches square.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer .

B. Product Certificates: For each type of glass and glazing product.

C. Sample Warranties: For special warranties.

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1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the NGA's Certified Glass Installer Program.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install fire-resistant glazing until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature conditions at occupancy levels during remainder of construction period.

1.9 WARRANTY

A. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Tempered Glazing Units with Clear Intumescent Interlayer: Manufacturer agrees to replace units that deteriorate within specified warranty period. Deterioration of tempered glazing units with clear intumenscent interlayer is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning glass contrary to manufacturer's written instructions. Evidence of failure is air bubbles within units, or obstruction of vision by contamination or deterioration of intumescent interlayer.

1. Warranty Period: 10 years from date of Substantial Completion.

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PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Glass: For each glass type, obtain from single source from single manufacturer.

B. Glazing Accessories: For each product and installation method, obtain from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and impact loads (where applicable) without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; deterioration of glazing materials; or other defects in construction.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organization below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. NGA Publications: [**"Laminated Glazing Reference Manual" and**]"Glazing Manual."

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of [**the SGCC**] [**the SGCC or another certification agency acceptable to authorities having jurisdiction**] [**or**] [**manufacturer**]. Label shall indicate manufacturer's name, type of glass, glass thickness, and safety glazing standard with which glass complies.

2.4 GLASS PRODUCTS

A. Float Glass: ASTM C1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Low-Iron Float Glass: ASTM C1036, Type I, Quality-Q3, Class I (clear), with visible light transmission not less than 91 percent.

C. Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class I (clear) unless otherwise indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

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D. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

1. Construction: Laminate glass with polyvinyl butyral interlayer unless fire-protection or fire-resistance rating is based on another product.
2. Interlayer Thickness: Provide thickness as needed to comply with requirements.
3. Interlayer Color: Clear unless otherwise indicated.

2.5 FIRE-RESISTANCE-RATED GLAZING

A. General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-resistance ratings indicated, based on testing in accordance with ASTM E119 or UL 263.

B. Fire-Resistance-Rated Glazing Labeling: Permanently mark fire-resistance-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, that glazing is approved for use in walls, and fire-resistance rating in minutes.

C. Fire-Resistance-Rated Laminated Glass with Intumescent Interlayers: Laminated glass made from multiple plies of uncoated, [**clear**] [**low-iron**] float glass; with intumescent interlayers; complying with 16 CFR 1201, Category II.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Pilkington North America; NSG Group.
   b. SAFTI FIRST Fire Rated Glazing Solutions.
   c. Technical Glass Products; an Allegion brand.
   d. Vetrotech Saint-Gobain.

D. Fire-Resistance-Rated Tempered Glazing Units with Clear Intumescent Interlayer: Glazing units made from two or more lites of uncoated, fully tempered, [**clear**] [**low-iron**] float glass; with a perimeter edge seal enclosing a cavity filled with optically clear, intumescent polymer; complying with 16 CFR 1201, Category II.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. SAFTI FIRST Fire Rated Glazing Solutions.

2.6 GLAZING ACCESSORIES

A. Provide glazing gaskets, glazing sealants, glazing tapes, setting blocks, spacers, edge blocks, and other glazing accessories that are compatible with glazing products and each other and are approved by testing agencies that listed and labeled fire-resistant glazing

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products with which products are used for applications and fire-protection ratings indicated.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Perimeter Insulation for Fire-Resistance-Rated Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.8 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with manufacturing and installation tolerances, including those for size, squareness, and offsets at corners, and for compliance with minimum required face and edge clearances.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate fire side and protected side. Label or mark units as needed so that fire side and protected side are readily identifiable. Do not use materials that leave visible marks in the completed Work.

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3.3 GLAZING, GENERAL

A. Use methods approved by testing agencies that listed and labeled fire-resistant glazing products.

B. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials unless more stringent requirements are indicated, including those in referenced glazing publications.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch- minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.

I. Set glass lites with proper orientation so that coatings face fire side or protected side as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

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K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended in writing by gasket manufacturer.

3.4 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop, so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

D. Install gaskets so they protrude past face of glazing stops.

3.5 CLEANING AND PROTECTION

A. Immediately after installation, remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 08 88 13

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SECTION 08 90 00
LOUVERS AND VENTS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies fixed and operable wall louvers, door louvers and wall vents.

1.2 RELATED WORK:

A. Section 09 91 14, EXTERIOR PAINTING.

B. Section 23 31 00, HVAC DUCTS AND CASINGS.

1.3 SUBMITTALS:

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Each type of louver and vent, showing material, finish, and size of members.

1.4 APPLICABLE PUBLICATIONS:

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

B. The Master Painters Institute (MPI):

1. Approved Product List – Updated Monthly

C. ASTM International (ASTM):

1. A240/A240M-2020 Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
2. A653/A653M-2020 Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process
3. A1008/A1008M-2020 Steel, Sheet, Carbon, Cold Rolled, Structural, and High Strength Low-Alloy with Improved Formability
4. B209-2014 Aluminum and Aluminum Alloy, Sheet and Plate
5. B209M-2014 Aluminum and Aluminum Alloy, Sheet and Plate (Metric)
6. B221-2014 Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

7. B221M-2013 Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes (Metric)
8. D1187/D1187M-2018 Asphalt-Base Emulsions for Use as Protective Coatings for Metal

D. National Association of Architectural Metal Manufacturers (NAAMM):
1. AMP 500-2006 Metal Finishes Manual

E. National Fire Protection Association (NFPA):
1. 90A-2024 Installation of Air Conditioning and Ventilating Systems

F. American Architectural Manufacturers Association (AAMA):
1. 2605-2013 High Performance Organic Coatings on Architectural Extrusions and Panels

G. Air Movement and Control Association, Inc. (AMCA):
1. 500-L-2015 Testing Louvers

H. Department of Veterans Affairs
1. VA Physical Security Design Manual for Life Safety Protected Facilities January 2015
2. VA Physical Security Design Manual for Mission Critical Protected Facilities January 2015

I. Protective Design Center
1. PDC-TR-08 Single Degree of Freedom Structural Response Limits for Antiterrorism Design

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Aluminum, Extruded: ASTM B221M (B221).

B. Aluminum, Plate and Sheet: ASTM B209M (B209); alloy 3003 or 5005 with temper as required for forming.

C. Fasteners: Fasteners for securing louvers to adjoining construction, except as otherwise specified or indicated in construction documents, to be toggle or expansion bolts of size and type as required for each specific type of installation and service condition.
1. Where type, size, or spacing of fasteners is not shown or specified, submit shop drawings showing proposed fasteners, and method of installation.

2. Fasteners for louvers, louver frames, and wire guards to be of stainless steel with same finish as louvers.
3. Fasteners for louvers, louver frames and wire guards within mental health areas to be non-removable/tamper-proof type.

2.2 EXTERIOR WALL LOUVERS:

A. General:
1. Provide fixed type louvers of size and design shown.
2. Heads, sills and jamb sections are to have formed caulking slots or be designed to retain caulking. Head sections are to have exterior drip lip, and sill sections an integral water stop.
3. Furnish louvers with sill extension or separate sill as shown.
4. Frame is to be mechanically fastened or welded construction with welds dressed smooth and flush.

B. Aluminum Louvers:
1. General: Frames, blades, sills, and mullions (sliding interlocking type); 2 mm (0.078-inch) thick extruded 6063-T5 or - T52 aluminum. Blades to be drainable type and have reinforcing bosses.
2. Louvers, fixed: Make frame sizes 13 mm (1/2-inch) smaller than openings. Single louvers frames are not to exceed 1676 mm (66 inches) wide. When openings exceed 1676 mm (66 inches), provide twin louvers separated by mullion members.
3. Louvers are to withstand the effects or gravity loads and the following wind loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors.
   a. Wind load acting inward or outward of not less than 1436 Pa (30 lb. per sq. ft.).

2.3 CLOSURE ANGLES AND CLOSURE PLATES:

A. Fabricate from 2 mm (0.078-inch) thick stainless steel or aluminum.
B. Provide continuous closure angles and closure plates on inside head, jambs and sill of exterior wall louvers.
C. Secure angles and plates to louver frames with screws, and to masonry or concrete with fasteners as indicated in construction documents.

2.4 WIRE GUARDS:

A. Provide wire guards on outside of all exterior louvers.

B. Fabricate frames from 2 mm (0.078-inch) thick extruded or sheet aluminum or 1.5 mm (0.059-inch) thick stainless steel designed to retain wire mesh.

C. Wire mesh to be woven from not less than 1.6 mm (0.063-inch) diameter aluminum wire or 1.3 mm (0.05-inch) diameter stainless steel wire in 13 mm (1/2-inch) square mesh.

D. Miter corners and join by concealed corner clips or locks extending not less than 57 mm (2-1/4 inches) into rails and stiles. Equip wire guards over 1219 mm (4 feet) in height with a mid-rail constructed as specified for frame components.

E. Fasten frames to outside of louvers with aluminum or stainless steel devices of same finish as louvers designed to allow removal and replacement without damage to the wire guard or the louver.

2.5 FINISH:

A. Aluminum Louvers:

1. Louvers shall be factory prime coated.

B. Finish painting of exposed surfaces of shop primed louvers is specified in Section 09 91 14, EXTERIOR PAINTING.

2.6 PROTECTION:

A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with a heavy coat of bituminous coating (complete coverage), or by separating the contact surfaces with a performed synthetic rubber tape having pressure sensitive adhesive coating on one side.

B. Isolate the aluminum from plaster, concrete and masonry by coating aluminum with zinc-chromate primer.

C. Protect finished surfaces from damage during fabrication, erection, and after completion of the work. Strippable plastic coating on colored anodized or organic finishes is not approved.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Set work accurately, in alignment and where indicated in construction documents. Install plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.

B. Furnish setting drawings and instructions for installation of anchors and for the positioning of items having anchors to be built into masonry construction. Provide temporary bracing for such items until masonry is set.

C. Provide anchoring devices and fasteners as shown and as necessary for securing louvers to building construction as specified. Power actuated drive pins may be used, except for removal items and where members would be deformed or substrate damaged by their use.

D. Set wall louvers in masonry walls during progress of the work. If wall louvers are not delivered to job in time for installation in prepared openings, make provision for later installation. Set in cast-in-place concrete in prepared openings.

3.2 CLEANING AND ADJUSTING:

A. After installation, all exposed prefinished and plated items and items fabricated from stainless steel or aluminum are to be cleaned as recommended by the manufacturer and protected from damage until completion of the project.

B. All movable parts, including hardware, are to be cleaned and adjusted to operate as designed without binding or deformation of the members, so as to be centered in the opening of frame, and where applicable, to have all contact surfaces fit tight and even without forcing or warping the components.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful (as determined by COR), damaged units and replace with new units.

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SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing systems.
2. Suspension systems.

B. Related Requirements:

1. Division 05 Section "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; and roof rafters and ceiling joists.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Framing systems.
2. Suspension systems.
3. Grid suspension systems.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

1.4 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association,the Steel Framing Industry Association, orthe Steel Stud Manufacturers Association .

1.5 DELIVERY, STORAGE, AND HANDLING

A. Notify manufacturer of damaged materials received prior to installation.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

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C. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.

B. Horizontal Deflection: For composite wall assemblies, limited to 1/360 of the wall height based on horizontal loading of 10 lbf/sq. ft. .

C. Design framing systems in accordance with AISI S220, "North American Specification for the Design of Cold-Formed Steel Framing - Nonstructural Members," unless otherwise indicated.

D. Design Loads: As indicated on architectural Drawings or 5 lbf/sq. ft. minimum as required by the IBC.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C645 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C645 requirements for metal unless otherwise indicated
2. Protective Coating: Comply with ; ASTM A653, G40; or coating with equivalent corrosion resistance. Galvannealed products are unacceptable.

B. Studs and Track: ASTM C645 .

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. CEMCO; California Expanded Metal Products Co.
   b. ClarkDietrich.
   c. Marino\WARE.
   d. MBA Building Supplies.
   e. SCAFCO Steel Stud Company; Stone Group of Companies.
   f. Steel Construction Systems; Stone Group of Companies.
2. Minimum Base-Steel Thickness: As required by performance requirements for horizontal deflection .
3. Depth: As indicated on Drawings .

C. High-Strength Steel Studs and Tracks: Roll-formed with surface deformations to stiffen the framing members.

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1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. CEMCO; California Expanded Metal Products Co.
   b. ClarkDietrich.
   c. Marino\WARE.
   d. MBA Building Supplies.
   e. SCAFCO Steel Stud Company; Stone Group of Companies.
   f. Steel Network, Inc. (The).
2. Minimum Base-Steel Thickness: As required by horizontal deflection performance requirements .
3. Depth: As indicated on Drawings .

D. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing 2-inch minimum vertical movement.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) CEMCO; California Expanded Metal Products Co.
      2) ClarkDietrich.
      3) Marino\WARE.
      4) SCAFCO Steel Stud Company; Stone Group of Companies.
      5) Steel Construction Systems; Stone Group of Companies.
2. Single Long-Leg Track System: Top track with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
3. Double-Track System: Top outer tracks, inside track with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
4. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) CEMCO; California Expanded Metal Products Co.
      2) ClarkDietrich.
      3) Marino\WARE.
      4) MBA Building Supplies.
      5) SCAFCO Steel Stud Company; Stone Group of Companies.
      6) Steel Construction Systems; Stone Group of Companies.

E. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

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a. CEMCO; California Expanded Metal Products Co.
b. ClarkDietrich.
c. Fire Trak Corp.
d. Marino\WARE.
e. SCAFCO Steel Stud Company; Stone Group of Companies.
f. Steel Construction Systems; Stone Group of Companies.

F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. ClarkDietrich.
   b. Marino\WARE.
   c. MBA Building Supplies.
   d. SCAFCO Steel Stud Company; Stone Group of Companies.
   e. Steel Construction Systems; Stone Group of Companies.
2. Minimum Base-Steel Thickness: 0.0296 inch unless indicated otherwise .

G. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-steel thickness, with minimum 1/2-inch- wide flanges.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. ClarkDietrich.
   b. Marino\WARE.
   c. MBA Building Supplies.
   d. MRI Steel Framing, LLC.
   e. SCAFCO Steel Stud Company; Stone Group of Companies.
   f. Steel Construction Systems; Stone Group of Companies.
2. Depth: As indicated on Drawings .
3. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.

H. Hat-Shaped, Rigid Furring Channels:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. ClarkDietrich.
   b. Marino\WARE.
   c. MBA Building Supplies.
   d. MRI Steel Framing, LLC.
   e. SCAFCO Steel Stud Company; Stone Group of Companies.
   f. Steel Construction Systems; Stone Group of Companies.
2. Minimum Base-Steel Thickness: 0.0329 inch unless indicated otherwise .
3. Depth: As indicated on Drawings .

I. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

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a. ClarkDietrich.
b. Marino\WARE.
c. MBA Building Supplies.
d. MRI Steel Framing, LLC.
e. SCAFCO Steel Stud Company; Stone Group of Companies.
f. Steel Construction Systems; Stone Group of Companies.

2. Configuration: Asymmetrical or hat shaped.

J. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges.

1. Depth: As indicated on Drawings .
2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
3. Tie Wire: ASTM A641, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch- diameter wire.

K. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 3/4 inch, minimum uncoated-steel thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. ClarkDietrich.
b. Marino\WARE.
c. MBA Building Supplies.
d. MRI Steel Framing, LLC.
e. SCAFCO Steel Stud Company; Stone Group of Companies.
f. Steel Construction Systems; Stone Group of Companies.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A641, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch- diameter wire.

B. Hanger Attachments to Concrete:

1. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 AC193 AC58 or AC308 as appropriate for the substrate.
a. Uses: Securing hangers to structure.
b. Type: Torque-controlled, expansion anchor,torque-controlled, adhesive anchor or adhesive anchor.
c. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
d. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

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2. Power-Actuated Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Wire Hangers: ASTM A641, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

D. Flat Hangers: Steel sheet, 1 by 3/16 inch by length indicated .

E. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.0538 inch and minimum 1/2-inch- wide flanges.

1. Depth: As indicated on Drawings .

F. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 inch deep.
2. Steel Studs and Tracks:
   a. Minimum Base-Steel Thickness: 0.0329 inch.
   b. Depth: As indicated on Drawings .
3. High-Strength Steel Studs and Tracks:
   a. Minimum Base-Steel Thickness: As indicated on Drawings .
   b. Depth: As indicated on Drawings .
4. Hat-Shaped, Rigid Furring Channels: 7/8 inch deep.
   a. Minimum Base-Steel Thickness: 0.0329 inch .
5. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.
   a. Configuration: Asymmetricalor hat shaped.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide the following:

1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

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D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLATION OF FRAMING SYSTEMS

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
2. Multilayer Application: 16 inches o.c. unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
   a. Install two studs at each jamb unless otherwise indicated.
   b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
   c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

E. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

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F. Z-Shaped Furring Members:

1. Erect insulation, specified in Division 07 Section "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLATION OF SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hangers: 48 inches o.c.
2. Carrying Channels (Main Runners): 48 inches o.c.
3. Furring Channels (Furring Members): 16 inches o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards .
3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a

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manner that will not cause hangers to deteriorate or otherwise fail.

4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Seismic Bracing: Sway-brace suspension systems with hangers used for support .

3.6 FIELD QUALITY CONTROL

A. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 22 16

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SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board - GBX-1, GBM-1.
2. Tile backing panels - TBB-X.
3. Reveals - EDGE-X.

B. Related Requirements:

1. Division 07 Section "Acoustical Joint Sealants" for acoustical joint sealants installed in gypsum board assemblies.
2. Division 09 Section "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Gypsum board, Type X - GBX-1.
2. Mold-resistant gypsum board - GBM-1.
3. Glass-mat, water-resistant backing board - TBB-1.
4. Interior trim.
5. Joint treatment materials.
6. Acoustical sealant.

1.3 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

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C. Do not install panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Board, Type X - GBX-1, ASTM C1396.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Gypsum.
   b. Certainteed; SAINT-GOBAIN.
   c. Continental Building Products Inc.
   d. Georgia-Pacific Gypsum LLC.
   e. National Gypsum Company.
   f. PABCO Gypsum.
   g. USG Corporation.
2. Thickness: 5/8 inch.
3. Long Edges: Tapered .
4. Locations: All locations, including ceilings, except where GBM-1 and TBB-1 and called out.

B. Mold-Resistant Gypsum Board - GBM-1: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.

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1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Gypsum.
   b. Certainteed; SAINT-GOBAIN.
   c. Continental Building Products Inc.
   d. Georgia-Pacific Gypsum LLC.
   e. National Gypsum Company.
   f. PABCO Gypsum.
   g. USG Corporation.
2. Core: 5/8 inch , Type X.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
5. Locations: All wet areas not receiving tile, including ceilings.

2.4 TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Board - TBB-1: ASTM C1178, with manufacturer's standard edges.

1. Core: 5/8 inch , Type X.
2. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet .
2. Shapes:
   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.
   c. L-Bead: L-shaped; exposed long flange receives joint compound.
   d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
   e. Expansion (control) joint.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

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C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
   a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2.7 AUXILIARY MATERIALS

A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

D. Acoustical Sealant: As specified in Division 07 Section "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

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B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION AND FINISHING OF PANELS, GENERAL

A. Comply with ASTM C840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of

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acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Type X: Vertical surfaces unless otherwise indicated .
2. Mold-Resistant Type: As indicated on Drawings .
3. Glass-Mat Interior Type: As indicated on Drawings .

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
   a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel

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to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.

4. Fastening Methods: Fasten base layers and face layers separately to supports with screws .

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 INSTALLATION OF TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at low to moderate moisture areas indicated to receive tile . Install with 1/4-inch gap where panels abut other construction or penetrations.

B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLATION OF TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at locations indicated on Drawingsoraccording to ASTM C840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges .
3. L-Bead: Use where indicated on Drawings .
4. U-Bead: Use at exposed panel edges .

D. Aluminum Trim: Install in locations indicated on Drawings .

3.6 FINISHING OF GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints , rounded or beveled edges, and damaged surface areas.

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C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile Panels that are substrate for acoustical tile Where indicated on Drawings .
3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated .
   a. Primer and its application to surfaces are specified in Division 09 Section "Interior Painting."

E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

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SECTION 09 30 13 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Porcelain wall tile - TILE-1.
2. Metal Trim Devices - TD - 7, 8.
3. Setting Materials.
4. Grout - GT-1.

B. Related Requirements:

1. Division 07 Section 07 92 00 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
2. Section 09 29 00 "Gypsum Board" forand glass-mat, water-resistant backer board.

1.2 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. Face Size: Actual tile size, excluding spacer lugs.

C. Module Size: Actual tile size plus joint width indicated.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Verification:

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1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches square , but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.
3. Full-size units of each type of trim and accessory for each color and finish required.
4. Grout color samples.
5. Metal edge strips in 6-inch lengths.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

C. Product Certificates: For each type of product.

D. Product Test Reports: For tile-setting and -grouting products and certified porcelain tile.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
2. Grout: Furnish quantity of grout equal to 10 percent of amount installed for each type, composition, and color indicated.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.
2. Installer employs at least one installer for Project that has completed the Advanced Certification for Tile Installers (ACT) certification for installation of mud floors mud walls membranes gauged porcelain tile/gauged porcelain tile panels and slabs and large format tile.

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1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Tile: Obtain tile of each type from single source or producer.

1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.

1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

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B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

2.3 TILE PRODUCTS

A. Tile Types: TILE-1:

1. Manufacturers: Subject to compliance with requirements and interior design intent, provide basis-of-design product shown in Finish Legend or approved equal.

B. Porcelain Wall Tile Type : TILE-1:

1. Module Size: See Finish Legend .
2. Tile Color and Pattern: See Finish Legend .
3. Grout Color: See Finish Legend .
4. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
   a. Wainscot Cap for Thinset Mortar Installations: Surface bullnose, module size to match wall tile .
   b. Internal Corners: Field-butted square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.

C. Pocelain Floor Tile and Base Type - TILE-1:

1. Module Size: See Finish Legend.
2. Tile Color and Pattern: See Finish Legend.
3. Grout Color: See Finish Legend.

2.4 WATERPROOF/UNCOUPLING MEMBRANE

A. General: Manufacturer's standard product , selected from the following, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

1. Provide waterproof/uncoupling membrane under restroom floor tile and up the wall 4-inches.

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B. Basis-of-Design - MEMB-1: Schluter Systems .LP., 194 Pleasant Ridge Rd, Plattsburg, NY 12901-5841. Schluter Ditra 1/8" thick high-density polyethylene membrane with a grid structure of 1/2" x 1/2" and a polypropylene anchoring fleece laminated to the underside or approved equal.

1. Meets ANSI A118.10 for load-bearing, bonded waterproof membranes for thin-set ceramic tile.
2. Subject to compliance with requirements, alternative manufacturers and products will be considered.

2.5 SETTING MATERIALS

A. Improved Modified Dry-Set Mortar (Thinset): ANSI A118.15.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. ARDEX Americas; ARDEX S 28™ MICROTEC® Rapid-Set, Rapid-Dry, Super-Format Tile and Uncoupling Membrane Mortar .
   b. Custom Building Products; FlexBond® Premium Crack Prevention Thin-set Mortar .
   c. Laticrete International, Inc.; LATICRETE 254 Platinum .
2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.15.

2.6 GROUT MATERIALS

A. Water-Cleanable Epoxy Grout - GT-1 and GT-2: ANSI A118.3 , with a VOC content of 65 g/L or less.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. ARDEX Americas; ARDEX WA™ High Performance, 100% Solids Epoxy Grout and Adhesive .
   b. Custom Building Products; CEG-IG 100% Solids Industrial Grade Epoxy Grout .
   c. Laticrete International, Inc.; LATICRETE SPECTRALOCK® 2000 IG. Basis-of-Design - See Finish Legend.
   d. Mapei. Basis-of-Design - See Finish Legend.
   e. Parex USA, Inc.; Pro Epoxy .
   f. Sika Corporation; SikaTile 825 Epoxy Grout .
2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F, respectively, and certified by manufacturer for intended use.
3. Colors: See Finish Legend.

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2.7 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Edge Strips and Transition Devices - TD-7 and TD-8 .

1. Manufacturers: Subject to compliance with requirements and design intent, provide basis-of-design product shown in the Finish Legend or approved equal.
2. Locations: see Finish Legend and Room Finish Schedule for various applications.

C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.8 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
   a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
   b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

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3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION OF TILE

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
   a. Tile floors in wet areas.
   b. Tile floors consisting of tiles 8 by 8 inches or larger.
   c. Tile floors consisting of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping,

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fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

1. Porcelain Tile: 1/8-inch, unless indicated otherwise.

F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

H. Metal Edge Strips: Install at exposed edges of wall tile .

3.4 INSTALLATION OF TILE BACKING PANELS

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use modified dry-set mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.5 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

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1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

3.6 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.7 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Wall Installations, Wood or Metal Studs or Furring:

1. TCNA W245 or TCNA W248 : Thinset mortar on glass-mat, water-resistant gypsum backer board.
   a. Ceramic Tile Type: TILE-1 .
   b. Thinset Mortar: Improved modified dry-set mortar.
   c. Grout: Water-cleanable epoxy grout.

END OF SECTION 09 30 13

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SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for interior ceilings - ACT-1 and MSS-1.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.

C. Samples for Initial Selection: For components with factory-applied finishes.

D. Delegated-Design Submittal: For seismic restraints for ceiling systems.

1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension-system members.
2. Structural members to which suspension systems will be attached.
3. Method of attaching hangers to building structure.

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a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
5. Size and location of initial access modules for acoustical panels.
6. Items penetrating finished ceiling and ceiling-mounted items including the following:
   a. Lighting fixtures.
   b. Diffusers.
   c. Grilles.
   d. Speakers.
   e. Sprinklers.
   f. Access panels.
   g. Perimeter moldings.
7. Show operation of hinged and sliding components covered by or adjacent to acoustical panels.
8. Minimum Drawing Scale: 1/8 inch = 1 foot .

B. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency .

C. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials , from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

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B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Division 01 Section "Quality Requirements," to design seismic restraints for ceiling systems.

B. Seismic Performance: Suspended ceilings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 .

C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A according to ASTM E 1264.
2. Smoke-Developed Index: 50 or less.

D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL or from the listings of another qualified testing agency.

2.3 ACOUSTICAL PANELS - ACT-1

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:

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1. American Gypsum.
2. Armstrong Ceiling & Wall Solutions.
3. CertainTeed; SAINT-GOBAIN.
4. USG Corporation.

B. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

C. Basis-of-Design: Provide acoustic panels to match existing, adjacent panels in each location as shown on the drawings, including size, thickness, texture and surface appearance.

D. Color: White .

E. Light Reflectance (LR): Not less than 0.85 .

F. Ceiling Attenuation Class (CAC): Not less than 35 .

G. Noise Reduction Coefficient (NRC): Not less than 0.75 0.85 0.90 .

H. Articulation Class (AC): Not less than 170 .

I. Edge/Joint Detail: As indicated by manufacturer's designation .

J. Thickness: To match existing .

K. Modular Size: As indicated on Drawings .

L. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273, ASTM D 3274, or ASTM G 21 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 METAL SUSPENSION SYSTEM - MSS-1

A. Products: Subject to compliance with requirements, provide products by the following or approved equal:

1. Armstrong Ceiling & Wall Solutions; Size and style to match existing, adjacent suspension systems..

B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635 and designated by type, structural classification, and finish indicated.

1. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" according to ASTM C 635.

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2.5 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

B. Wire Hangers, Braces, and Ties: Provide wires as follows:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641, Class 1 zinc coating, soft temper.
2. Stainless-Steel Wire: ASTM A 580, Type 304, nonmagnetic.
3. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
4. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.135-inch-diameter wire.

C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized-steel sheet complying with ASTM A 653, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.

F. Hold-Down Clips: Manufacturer's standard hold-down.

G. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical panels in place during a seismic event.

H. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

I. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

2.6 METAL EDGE MOLDINGS AND TRIM - ACT-1 TRIM

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Armstrong Ceiling & Wall Solutions. Axiom Classic Straight #AX4STR, or approved equal.
2. Certainteed; SAINT-GOBAIN.
3. USG Corporation.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for

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edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member .

2.7 ACOUSTICAL SEALANT

A. Acoustical Sealant: As specified in Division 07 Section "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.

B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

A. Install acoustical panel ceilings according to ASTM C 636, seismic design requirements, and manufacturer's written instructions.

1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.

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B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

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1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.

1. Arrange directionally patterned acoustical panels as follows:
   a. As indicated on reflected ceiling plans.
2. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
3. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
4. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
5. Install seismic clips in areas indicated; space according to panel manufacturer's written instructions unless otherwise indicated.
6. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.
7. Protect lighting fixtures and air ducts according to requirements indicated for fire-resistance-rated assembly.

3.4 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet , non-cumulative.

B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet , non-cumulative.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

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B. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion, but no panels have been installed. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.

1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

C. Acoustical panel ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.6 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

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SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Thermoset-rubber base - RB-1.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

C. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials , from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

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1.6 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F , in spaces to receive resilient products during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F .

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. FloorScore Compliance: Resilient base and stair accessories shall comply with requirements of FloorScore certification.

2.2 THERMOSET-RUBBER BASE - RB-1

A. Basis-of-Design Product: See Finish Legend on Sheet 01-GI-013. Subject to compliance with requirements and design intent, substitutions will be considered or comparable product by one of the following:

1. Johnsonite; a Tarkett company.

B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

1. Style and Location:
   a. Style B, Cove - RB-1: Provide in areas with resilient floor coverings or exposed concrete..

C. Thickness: 0.125 inch.

D. Height: 4 inches .

E. Lengths: Coils in manufacturer's standard length .

F. Outside Corners: Preformed .

G. Inside Corners: Preformed .

H. Colors: See Finish Legend .

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2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. , and perform no fewer than three tests in each

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installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

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B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 09 65 13

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SECTION 09 65 36 - STATIC-CONTROL RESILIENT FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Static-dissipative resilient floor coverings - SDT-1.
2. Transition Device from Tile to concrete - TD-2.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1. Review methods and procedures related to static-control resilient flooring including, but not limited to, the following:
   a. Examination and preparation of substrates to receive static-control resilient flooring.
   b. Installation techniques required for specified products.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of static-control resilient flooring. Include floor-covering layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns.
2. Show locations of inscribed maintenance floor tiles in conductive, solid vinyl floor tile installation areas.
3. Show grounding locations of grounding strips and connections.

C. Samples for Verification: For each type of static-control resilient flooring and in each color, pattern, and texture required, of size indicated below:

1. Floor Tile: 6-by-9-inch units.
2. Transition Device: 12 inches long.

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D. Product Schedule: For static-control resilient flooring. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For static-control resilient flooring, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of static-control resilient flooring to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: 10 percent of each type, color, and pattern of floor tile installed.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in installation techniques required by manufacturer for specified static-control resilient flooring.

1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required for specified products.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store static-control resilient flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended in writing by manufacturer, but not less than 50 deg F or more than 90 deg F.

1. Floor Tile: Store on flat surfaces.

1.10 PROJECT CONDITIONS

A. Maintain ambient temperatures in spaces to receive static-control resilient flooring within range recommended by manufacturer, but not

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less than 70 deg F or more than 85 deg F , during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures in installation areas within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F .

C. Close spaces to traffic during static-control resilient flooring installation.

D. Close spaces to traffic for 48 hours after static-control resilient flooring installation.

E. Install static-control resilient flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 STATIC-DISSIPATIVE RESILIENT FLOOR COVERINGS - SDT-1

A. Basis-of-Design Product: See Finish Legend on Sheet 01-GI-013.

1. Substitutions: Reference Division 01 Section "Product Requirements."

B. Source Limitations: Obtain floor covering from single source from single manufacturer.

C. Physical Characteristics:

1. Composition: Homogenous Vinyl Tile.
2. Size: 12" x 12".
3. Thickness: 1/8 inch (3mm).

D. Performance Requirements:

1. Static Load Limit: 2500 psi, < 0.005-inch per ASTM F 970.
2. Fire Performance: Class 1 per ASTM E 648 - CRF.
3. Fire Spread: < 75 (Class II) per ASTM E-84.
4. Smoke Density: <.450 per ASTM 662-06.
5. Static Control Properties:
   a. Electrostatic Propensity: < 20 V per ANSI/ESD STM 97.2..
   b. Electrical Resistance: 2.5 x 10 (6) ohms per ANSI/ESD STM 7.1.
   c. Electrical Resistance and Voltage: per ANSI/ESD S20.20 - 2014.

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2.2 TRANSITION DEVICES - TD-2

A. Basis-of-Design Product: See Finish Legend on Sheet 01-GI-013.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified portland cement or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Static-Control Adhesive: Provided or approved by manufacturer; type that maintains electrical continuity of floor-covering system to ground connection.

C. Grounding Strips: Provided or approved by manufacturer; type and size that maintains electrical continuity of floor-covering system to ground connection.

D. Floor Polish: Provide protective, static-control liquid floor polish products recommended in writing by floor-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with installation or static-control characteristics of floor coverings.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates in accordance with manufacturer's written instructions to ensure successful installation of static-control resilient flooring and electrical continuity of floor-covering systems.

B. Concrete Substrates: Prepare in accordance with ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with floor-covering adhesives and that contain soap,

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wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
   a. Perform anhydrous calcium chloride test according to ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
   b. Perform relative-humidity test using in situ probes according to ASTM F2170. Proceed with installation only after substrates have maximum 75 percent relative-humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install static-control resilient flooring until it is same temperature as space where it is to be installed.

1. Move static-control resilient flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

E. Sweep and vacuum substrates to be covered by static-control resilient flooring immediately before installation.

3.3 INSTALLATION, GENERAL

A. Install static-control resilient flooring in accordance with manufacturer's written instructions.

B. Extend grounding strips beyond perimeter of static-control resilient floor-covering surfaces to ground connections.

1. For adhesively installed flooring, embed grounding strips in static-control adhesive.

C. Scribe, cut, and fit static-control resilient flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

D. Extend static-control resilient flooring into toe spaces, door reveals, closets, and similar openings. Extend static-control resilient flooring to center of door openings.

E. Install transition device between resilient flooring and concrete slab.

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F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on static-control resilient flooring as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Install static-control resilient flooring on covers for telephone and electrical ducts, and similar items in installation areas. Maintain overall continuity of color and pattern with pieces of static-control resilient flooring installed on covers. Tightly adhere static-control resilient flooring edges to substrates that abut covers and to cover perimeters.

H. Adhesive Installation: Adhere static-control resilient flooring to substrates using a full spread of static-control adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 INSTALLATION OF FLOOR TILE

A. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so floor tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half floor tile at perimeter.

1. Lay floor tiles square with room axis .

B. Match floor tiles for color and pattern by selecting floor tiles from cartons in same sequence as manufactured and packaged if so numbered. Discard broken, cracked, chipped, or deformed floor tiles.

C. In each space where conductive, solid vinyl floor tile is installed, install maintenance floor tile identifying conductive floor tile in locations approved by Architect.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to test electrical resistance of static-control resilient flooring for compliance with requirements.

1. Arrange for testing after the following:
   a. Static-control adhesives have fully cured.
   b. Static-control resilient flooring has stabilized to ambient conditions.
   c. Ground connections are completed.
2. Arrange for testing of static-control resilient flooring before and after performing floor polish procedures.

B. Static-control resilient flooring will be considered defective if it does not pass tests and inspections.

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C. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of static-control resilient flooring.

B. Perform the following operations immediately after completing static-control resilient flooring:

1. Remove static-control adhesive from exposed surfaces.
2. Remove dirt and blemishes from exposed surfaces.
3. Sweep and vacuum surfaces thoroughly.
4. Damp-mop surfaces to remove marks and soil.

C. Protect static-control resilient flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

1. If recommended in writing by manufacturer, apply protective static-control floor polish formulated to maintain or enhance floor covering's electrical properties. Before polishing, do the following:
   a. Ensure that static-control resilient flooring surfaces are free from soil, static-control adhesive, and surface blemishes.
   b. Verify that both floor polish and its application method are approved by manufacturer and that floor polish will not leave an insulating film that reduces static-control resilient flooring's effectiveness for static control.

D. Cover static-control resilient flooring and protect from rolling loads until Substantial Completion.

END OF SECTION 09 65 36

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SECTION 09 68 13 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Walk-off mat - WOM-1.
2. Transition devices - TD-1.

B. Related Requirements:

1. Section 09 65 13 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
   a. Review delivery, storage, and handling procedures.
   b. Review ambient conditions and ventilation procedures.
   c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Walk-off Mat: Full-size Sample.

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2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.

C. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 10 percent of amount installed for each type indicated.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Carpet and Rug Institute's CRI 104.

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1.10 FIELD CONDITIONS

A. Comply with the Carpet and Rug Institute's CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

A. Special Warranty for Walk-off Mat Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, the following:
   a. More than 10 percent edge raveling, snags, and runs.
   b. Dimensional instability.
   c. Excess static discharge.
   d. Loss of tuft-bind strength.
   e. Loss of face fiber.
   f. Delamination.
3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE - WOM-1

A. WALK-OFF MATT - WOM-1

1. Basis-of-Design Product: See Finish Legend on Sheet 01-GI-013 or approved equal.
2. Color: See Finish Legend.
3. Size: `24" x 24" x 1/2".
4. Installation: Staggered joints in long direction.

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2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

C. Metal Edge/Transition Strips - TD-1: Extruded aluminum strips. See Finish Legend or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. , and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
   a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
   b. Relative Humidity Test: Using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
   c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 PREPARATION

A. General: Comply with the Carpet and Rug Institute's CRI 104 and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with the Carpet and Rug Institute's CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer .

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns indicated on Drawings .

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

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H. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with the Carpet and Rug Institute's CRI 104, Section 13.7.

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

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SECTION 09 91 14 - EXTERIOR PAINTING (MPI STANDARDS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Surface preparation and application of paint systems on the following exterior substrates:
   a. Concrete masonry units (CMUs).
   b. Shop primed painted steel and iron items exposed to exterior per Division 5 sections.
      1) Exterior items to be galvanized and primed per Division 5 sections.

B. Related Requirements:

1. Section 05 12 00 "Structural Steel Framing" for shop priming of metal substrates.
2. Section 05 50 00 "Metal Fabrications" for shop priming metal fabrications.
3. Section 05 52 13 "Pipe and Tube Railings" for shop priming pipe and tube railings.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.

B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.

D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.

E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.

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F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include preparation requirements and application instructions.
2. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
3. Indicate VOC content.

B. Samples: For each type of topcoat product.

C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in the Exterior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Company.
2. PPG Paints.
3. Sherwin-Williams Company (The).

B. Products: Subject to compliance with requirements, provide one of the products listed in the Exterior Painting Schedule for the paint category indicated.

C. Source Limitations: Obtain paint from single source from single manufacturer.

2.2 PAINT PRODUCTS

A. MPI Standards: Provide products complying with MPI standards indicated and listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. VOC Content: For field applications, verify paints and coatings comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Nonflat Paints and Coatings: 50 g/L.
2. Dry-Fog Coatings: 150 g/L.
3. Primers, Sealers, and Undercoaters: 100 g/L.
4. Pretreatment Wash Primers: 420 g/L.
5. Zinc-Rich Industrial Maintenance Primers: 100 g/L.

D. Colors - PT-X: See Finish Legend. .

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PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Masonry (Clay and CMUs): 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

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1. SSPC-SP 3.

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 INSTALLATION

A. Apply paints in accordance with manufacturer's written instructions and recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint both sides and edges of hollow metal exterior doors and entire exposed surface of hollow metal exterior door frames.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in the Exterior Painting Schedule may be omitted on items that are factory primed or factory finished if compatible with intermediate and topcoat coatings and acceptable to intermediate and topcoat paint manufacturers.

B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.

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2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written instructions, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written instructions.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
3. Allow empty paint cans to dry before disposal.
4. Collect waste paint by type and deliver to recycling or collection facility.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. CMU Substrates:

1. Water-Based Light Industrial Coating System MPI EXT 4.2C:
   a. Prime Coat: Block filler, latex, interior/exterior , MPI #4.
      1) Sherwin Williams Procryl Primer.
   b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
   c. Semigloss Topcoat: Light industrial coating, exterior, water based, semigloss (MPI Gloss Level 5) , MPI #163.
      1) Sherwin Williams Multi-surface Acrylic Latex .

B. Steel and Iron Substrate:

1. Water-Based Light Industrial Coating System - MPI EXT 5.1N:
   a. Acrylic Prime Coat: Primer, rust inhibitive, water based MPI #107.

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1) Sherwin Williams Procryl Primer. Coordinate with steel shop fabricators.

b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.

c. Semigloss Topcoat: Light industrial coating, exterior, water based, semigloss (MPI Gloss Level 5) , MPI #163.

1) Sherwin Williams Multi-surface Acrylic Latex .

C. Galvanized-Metal Substrates:

1. Water-Based Light Industrial Coating System MPI EXT 5.3K:

a. Acrylic Prime Coat: Primer, galvanized, water based , MPI #134.

1) Sherwin Williams Procryl Primer. Coordinate with steel shop fabricators.

b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.

c. Semigloss Topcoat: Light industrial coating, exterior, water based, semigloss (MPI Gloss Level 5) , MPI #163.

1) Sherwin Williams Multi-surface Acrylic Latex .

END OF SECTION 09 91 14

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SECTION 09 91 24 - INTERIOR PAINTING (MPI STANDARDS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Concrete masonry units (CMUs).
2. Steel and iron.
3. Gypsum board.

B. Related Requirements:

1. Section 05 12 00 "Structural Steel Framing" for shop priming structural steel.
2. Section 05 50 00 "Metal Fabrications" for shop priming metal fabrications.
3. Section 05 52 13 "Pipe and Tube Railings" for shop priming pipe and tube railings.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.

B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.

D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.

E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.

F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.

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G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: Use same designations indicated on Drawings and in the Interior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials , from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

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1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures of less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co.
2. PPG Paints.
3. Sherwin-Williams Company (The).

B. Products: Subject to compliance with requirements, provide product listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. Colors - PT-X: See Finish Legend.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

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B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Masonry (Clay and CMUs): 12 percent.
2. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 3.

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the

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same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.3 INSTALLATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in occupied spaces:
   a. Uninsulated metal piping.
   b. Uninsulated plastic piping.
   c. Pipe hangers and supports.
   d. Metal conduit.
   e. Plastic conduit.
   f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
   g. Other items as directed by Architect.

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3.4 FIELD QUALITY CONTROL

A. Dry-Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry-film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry-film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry-film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. CMU Substrates:

1. High-Performance Architectural Latex System , MPI INT 4.2D :
   a. Block Filler: Latex, interior/exterior , MPI #4.
      1) Sherwin-Williams .
   b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
   c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 3) , MPI #139.
      1) Sherwin Williams Multi-Surface Acrylic Latex .

B. Steel Substrates:

1. High-Performance Architectural Latex System , MPI INT 5.1RR:
   a. Prime Coat: Primer, alkyd, quick dry, for metal , MPI #76.
      1) Sherwin-Williams Procryl Primer .
   b. Prime Coat: Shop primer specified in Section where substrate is specified.

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c. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
d. Topcoat: Latex, interior, high performance architectural, semigloss (MPI Gloss Level 5) , MPI #141.
1) Sherwin Williams Multi-Surface Acrylic Latex .

2. Water-Based Dry-Fall over Shop-Applied Quick-Drying Shop Primer SystemMPI INT 5.1CCC:
a. Prime Coat: Primer, quick dry, for shop application, MPI #275.
b. Topcoat: Dry fall, latex, flat , MPI #118.
1) Sherwin-Williams .

C. Gypsum Board Substrates:

1. Institutional Low-Odor/VOC Latex System , MPI INT 9.2M:
a. Prime Coat: Primer sealer, interior, institutional low odor/VOC , MPI #149.
1) Sherwin-Williams ProMar 200 Primer .
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC (MPI Gloss Level 3) , MPI #145.
1) Sherwin-Williams ProMar 200HD .
2) All areas except wet rooms, kitchens, restrooms, etc.

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SECTION 10 26 00 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Corner guards - CG-1.
2. Abuse-resistant wall coverings - WP-1-4.

B. Related Requirements:

1. Section 08 71 00 "Door Hardware" for metal and plastic protective trim units, according to BHMA A156.6, used for armor, edge guards, kick, mop, and push plates.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.

B. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:

1. Corner Guards: 12 inches long. Include example top caps.
2. Door -Edge Protectors: 12 inches long.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

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1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials , from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Corner-Guards: Provide 6 (six) total .
2. Abuse-Resistant Wall Coverings: Provide 10% of total wall area by length.
3. Mounting and Accessory Components: Amounts proportional to the quantities of extra materials. Package mounting and accessory components with each extra material.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
2. Keep plastic materials out of direct sunlight.
3. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
   a. Store corner-guard covers in a vertical position.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
   b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain wall- and door-protection products from single source from single manufacturer.

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2.2 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

2.3 CORNER GUARDS

A. Surface-Mounted, Metal Corner Guards - CG-1 : Fabricated as one piece from formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Activar Construction Products Group, Inc. - JL Industries.
   b. American Floor Products Company, Inc.
   c. Babcock-Davis.
   d. Balco; a CSW Industrials Company.
   e. Construction Specialties, Inc. Basis-of-Design: See Finish Legend on Sheet 01-GI-013.
   f. Inpro Corporation.
   g. Korogard Wall Protection Systems; a division of RJF International Corporation.
2. Material: Stainless-steel sheet, Type 304 .
   a. Thickness: Minimum 0.0625 inch .
   b. Finish: Directional satin, No. 4 .
3. Material: Extruded aluminum, minimum 0.0625 inch thick, with clear anodic finish at all white walls and black anodic finish at all walls with wood paneling and/or black/dark paint.
4. Material: Brass sheet, minimum 0.0500 inch thick, with buffed, smooth specular finish.
5. Wing Size: Nominal 1-1/2 by 1-1/2 inches .
6. Height: As indicated in drawings.
7. Corner Radius: 1/8 inch .
8. Mounting: Flat-head, countersunk screws through factory-drilled mounting holes .

2.4 ABUSE-RESISTANT WALL COVERINGS

A. Abuse-Resistant Sheet Wall Covering - WP-1-4 : Fabricated from semirigid, plastic sheet wall-covering material.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Construction Specialties, Inc.
   b. Formica Corporation. Basis-of-Design: See Finish Legend on Sheet 01-GI-013.
   c. Inpro Corporation.

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d. Korogard Wall Protection Systems; a division of RJF International Corporation. Basis-of-Design: See Finish Material & Color Schedule.
e. Pawling Corporation.
2. Size: 48" x 96".
3. Sheet Thickness: See Finish Legend .
4. Color and Texture: See Finish Legend .
5. Height: As indicated .
6. Trim and Joint Moldings: Extruded rigid plastic that matches wall-covering color.
7. Mounting: Adhesive.

2.5 FABRICATION

A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.

2.6 FINISHES

A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

1. For wall and door protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 PREPARATION

A. Complete finishing operations, including painting, before installing wall and door protection.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

B. Mounting Heights: Install wall and door protection in locations and at mounting heights indicated on Drawings.

C. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.

1. Provide anchoring devices and suitable locations to withstand imposed loads.
2. Where splices occur in horizontal runs of more than 20 feet, splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches apart.
3. Adjust end and top caps as required to ensure tight seams.

3.4 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

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SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories - TA-X.
2. Underlavatory guards.
3. Custodial accessories - TA-X.

1.2 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Private-use bathroom accessories.

B. Product Data Submittals: For each product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's special warranties.

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1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.6 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, visible silver spoilage defects.
2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Design accessories and fasteners to comply with the following requirements:

1. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

B. Basis-of-Design for all new Toilet Accessories: See Accessory Schedule on Sheet MCR-AE-601 or approved equal.

C. Toilet Tissue (Roll) Dispenser - TA-06 :

1. Description: Roll-in-reserve dispenser with hinged front secured with tumbler lockset .
2. Mounting: Recessed .
3. Operation: Noncontrol delivery with theft-resistant spindle .
4. Capacity: Designed for 4-1/2- or 5-inch- diameter tissue rolls.
5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin) .

D. Paper Towel (Folded) Dispenser - TA-14 :

1. Mounting: Surface mounted.
2. Minimum Capacity: 400 C-fold or 525 multifold towels .
3. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin) .
4. Lockset: Tumbler type.
5. Refill Indicator: Pierced slots at sides or front.

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E. Soap Dispenser - TA-10 and TA-11 :

1. Description: Designed for manual operation and dispensing soap in liquid or lotion form.
2. Mounting: As indicated on Drawings .
3. Capacity: 40 fl. oz. .
4. Materials: Stainless-steel,, ASTM A480 No. 4 finish (satin) .
5. Lockset: Tumbler type.
6. Refill Indicator: Window type.

F. Grab Bar - TA-01, TA-02, and TA-03 :

1. Mounting: Flanges with concealed fasteners.
2. Material: Stainless steel, 0.05 inch thick.
   a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin).
3. OD: 1-1/4 inches .
4. Configuration and Length: As indicated on Drawings .

G. Sanitary-Napkin Disposal Unit - TA-07 :

1. Mounting: Recessed .
2. Door or Cover: Self-closing, disposal-opening cover and hinged face panel with tumbler lockset.
3. Receptacle: Removable.
4. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin) .

H. Seat-Cover Dispenser TA-15 :

1. Mounting: Recessed .
2. Minimum Capacity: 500 seat covers.
3. Exposed Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin) .
4. Lockset: Tumbler type.

I. Mirror Unit - TA-12 :

1. Frame: Stainless steel angle, 0.05 inch thick .
   a. Corners: Welded and ground smooth.
2. Size: 24 x 36 .
3. Hangers: Manufacturer's standard rigid, tamper and theft resistant .

J. Hook - TA-53 :

1. Description: Single-prong unit .
2. Mounting: Concealed .
3. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin) .

2.3 UNDERLAVATORY GUARDS

A. Underlavatory Guard :

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1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Buckaroos, Inc.
   b. Plumberex Specialty Products, Inc.
   c. Truebro; IPS Corporation.
2. Description: Insulating pipe covering for supply and drain piping assemblies that prevents direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: Antimicrobial, molded plastic, white.

2.4 CUSTODIAL ACCESSORIES

A. Custodial Mop and Broom Holder - TA-51 :

1. Description: 36" stainless steel (#4 satin finish) mop and broom holder with top shelf, four double hooks and three spring-loaded, rubber hat, cam-type mop/broom holders and a towel bar .
2. Length: As indicated on Drawings .
3. Hooks: As indicated on Drawings .
4. Mop/Broom Holders: As indicated on Drawings , spring-loaded, rubber hat, cam type.
5. Material and Finish: Stainless steel, ASTM A480 No. 4 finish (satin).
   a. Shelf: Not less than nominal 0.05-inch- thick stainless steel.
   b. Rod: Approximately 1/4-inch- diameter stainless steel.

2.5 MATERIALS

A. Stainless Steel: ASTM A240 or ASTM A666, Type 304, 0.031-inch- minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B19, flat products; ASTM B16, rods, shapes, forgings, and flat products with finished edges; or ASTM B30, castings.

C. Steel Sheet: ASTM A1008, Designation CS (cold rolled, commercial steel), 0.036-inch- minimum nominal thickness.

D. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.

E. Chrome Plating: ASTM B456, Service Condition Number SC 2 (moderate service).

F. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

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2.6 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

1. Remove temporary labels and protective coatings.

B. Grab Bars: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Clean and polish exposed surfaces in accordance with manufacturer's written instructions.

END OF SECTION 10 28 00

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SECTION 10 44 13
FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 DESCRIPTION

This section covers recessed, semi-recessed, and surface mounted fire extinguisher cabinets and accessories.

1.2 RELATED WORK

A. Section 10 44 19, FIRE EXTINGUISHERS

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data: Fire extinguisher cabinet including installation instruction and rough opening required. Submit fire extinguisher cabinet in conjunction with the new fire extinguishers required by 10 44 19.

C. Shop Drawings: Provide shop drawings for cabinet and signage.

D. List of Installation Locations: Submit a coordinated list of all proposed cabinet installation locations. For each location, indicate:

1. The existing wall type and total wall thickness.
2. The minimum required trim projection for that location.

1.4 APPLICATION PUBLICATIONS

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

B. American Society of Testing and Materials (ASTM):

D4802-15.....Poly (Methyl Methacrylate) Acrylic Plastic Sheet

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHER CABINET

A. All Cabinets shall be sized to meet the extinguisher sizes required by Section 10 44 19 FIRE EXTINGUISHERS. Cabinet sizes shall vary in accordance with the extinguisher sizes required by Section 10 44 19 FIRE EXTINGUISHERS. The Contractor shall determine and provide the minimum projection necessary at each semi-recessed cabinet location based on the existing wall thickness and construction type. The

contractor shall provided fire rated cabinets for any cabinets placed within fire rated walls.

B. Clean Agent Cabinets Cabinets: Provide semi-recessed cabinets fire extinguisher cabinets for within 75 feet of all Telecommunication Rooms and Telecommunication Enclosures, within Data Center Room 111, and within Entrance Rooms A100 and B 100. For TR and TE extinguisher quantities: Refer to drawing 00-FP-001 FIRE PROTECTION GENERAL NOTES, DIAGRAM, AND LEGEND, and drawing MCR-FP-100 FIRE BARRIER AND EXTINGUISHER PLAN – MCR. The cabinets shall be sized to accommodate AMEREX Fire Extinguishers: 15.5 lb Nominal Extinguisher Capacity, 2A:10B:C, Halotron, or similar. Basis of design is the Larsen's 2712-RL for locations that can accommodate a 6" rough opening depth and Larsen's 2712-RM for locations that can only accommodate a 4" rough opening depth.

C. Multipurpose Dry-Chemical Type Cabinets: Provide semi-recessed cabinets fire extinguisher cabinets for Corridor 115 in the new Main Computer Room Building. See MCR-FP-100 FIRE BARRIER AND EXTINGUISHER PLAN – MCR for placement. The cabinets shall be sized to accommodate AMEREX Model B500 Fire Extinguisher: 5 lb Nominal Extinguisher Capacity, 2A:10B:C, or similar. Basis of design is Larsen's 2409-6R.

D. Utility Yard Type (High-Flow Purple K) Cabinets: Provide a heavy-duty, outdoor-rated fire extinguisher cabinet designed for surface mounting and continuous exposure to exterior conditions. The cabinet shall include weather-resistive gasketing around the door perimeter, a stainless steel handle, full-length stainless steel piano hinge, dual roller-ball catches with safety lock, and a sloped roof to facilitate drainage. The cabinet shall be constructed of Type 316 stainless steel, with all exposed surfaces finished smooth and corrosion-resistant. Exterior signage shall include a white "FIRE EXTINGUISHER" decal and a red "PULL FIRMLY TO OPEN" decal. Basis of Design is Safety One Model HDOC-20-SS Heavy-Duty Outdoor Fire Extinguisher Cabinet, or equal.

E. Provide flag type fire extinguisher signage for every new fire extinguisher location. See 00-FP-002 for fire extinguisher signage requirements.

2.2 FABRICATION

A. Form body of cabinet from 0.9 mm (0.0359 inch) thick sheet steel. Provide flat trim for fully recessed cabinets. Provide rolled edges for semi-recessed cabinets.

B. Fabricate door and trim from 1.2 mm (0.0478 inch) thick sheet steel with all face joints fully welded and ground smooth.

1. Glaze doors with 6 mm (1/4 inch) thick ASTM D4802, clear acrylic sheet, Category B-1, Finish 1. Provide full panel glazing.
2. Design doors to open 180 degrees.
3. Provide continuous hinge, pull handle, and adjustable roller catch.
4. Provide die cut lettering, vertical orientation, with color red “FIRE EXTINGUISHER”.

C. Fabricate Signage: Provide flag type fire extinguisher signage for every new fire extinguisher location. Sign type shall be 9" high x 9" wide, acrylic plaque with aluminum bracket for flag mounting. Graphic process shall be direct digital print on second surface or silk-screened. Text and symbol shall be white. Background shall be red. Typography shall be Helvetica bold. Refer to VA Signage Design Manual, PG 18-10, Sign IN-01.31 for layout of signage.

2.3 FINISH

A. Finish interior of cabinet body with baked-on semigloss white enamel.

B. Finish door, frame with manufacturer's standard baked-on prime coat suitable for field painting.

C. Exterior mounted cabinets shall Type 316 stainless steel, with all exposed surfaces finished smooth and corrosion-resistant.

PART 3 - EXECUTION

A. Install fire extinguisher cabinets in prepared openings and secure in accordance with manufacturer's instructions.

B. Install cabinet so that the extinguisher height meets the requirements of NFPA 10 and ADA. Note: If any fire extinguisher cabinet projects more than 4 inches into a circulation path, the bottom edge of the cabinet shall be mounted no higher than 27 inches above the finished floor, in accordance with ADA Standards for Accessible Design, Section 307 – Protruding Objects.

C. Install signage at with a minimum mounting height to the bottom of the sign of 80". Mount centered above fire extinguisher cabinet.

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SECTION 10 44 19
FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Location, installation and testing shall be in accordance with NFPA 10 and design documents.

1.2 RELATED WORK

A. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Section 10 44 13, FIRE PROTECTION CABINETS.

1.3 DESIGN CRITERIA

A. Design Basis Information: Provide materials, equipment, installation, inspection, and testing of the portable fire extinguishers in accordance with the requirements of NFPA 10.

1.4 SUBMITTALS

A. Submit as one package in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. As the Government review is for technical adequacy only, the installer remains responsible for correcting any conflicts with other trades and building construction that arise during installation. Partial submittals will not be accepted. Material submittals shall be approved prior to the purchase or delivery to the job site. Suitably bind submittals in notebooks or binders and provide an index referencing the appropriate specification section. In addition to the hard copies, provide submittal items in Paragraphs 1.4(A)1 through 1.4(A)5 electronically in pdf format on a compact disc or as directed by the COR. Submittals shall include, but not be limited to, the following:

1. Qualifications:
   a. Provide a copy of the installing state contractor’s license.
   c. Provide documentation showing that the installer has been actively and successfully engaged in the installation of commercial automatic sprinkler systems for the past ten years.
3. Manufacturer’s Data Sheets: Provide data sheets for all materials and equipment proposed for use on the system. Include listing information and installation instructions in data sheets. Where data sheets describe items in addition to those proposed to be used for the system, clearly identify the proposed items on the sheet.

1.5 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

1.6 APPLICABLE PUBLICATIONS

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

B. National Fire Protection Association (NFPA):

10-2022.....Portable Fire Extinguishers

75-2020.....Fire Protection of Information Technology Equipment

101-2021.....Life Safety Code

170-2021.....Fire Safety and Emergency Symbols

C. Underwriters Laboratories, Inc. (UL):

Fire Protection Equipment Directory

D. Factory Mutual Engineering Corporation (FM):

Approval Guide

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Multipurpose Dry-Chemical Type: UL-rated 2-A:10-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container. Basis of design is AMEREX Model B500 Fire Extinguisher: 5 lb Nominal Extinguisher Capacity, 2A:10B:C, or similar.

B. Clean agent type: UL-rated 2-A:10-B:C, with halocarbon type agents in steel container. Basis of design is AMEREX Fire Extinguisher: 15.5 lb Extinguisher Capacity, 2A:10B:C, Halotron, or similar.

C. Utility Yard Type (High-Flow Purple K): UL-rated 40:B, Nominal 20-lb capacity, high flow, with potassium bicarbonate-based dry chemical agent, in a corrosion in a corrosion-resistant steel cylinder, equipped with high-flow valve and discharge hose assembly. Extinguisher shall discharge at a rate of not less than 1 lb of agent per second. Basis of Design: AMEREX 794, Nominal 20 lb capacity Purple K Fast Flow Z Series Fire Extinguisher, or equivalent.

2.2 MOUNTING BRACKETS

A. Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or black baked-enamel finish.
B. See SECTION 10 44 13 FIRE EXTINGUISHER CABINETS for fire extinguisher cabinet requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with NFPA 10.
   1. Install extinguishers within extinguisher cabinets if indicated.
   2. If no cabinet is indicated, install extinguisher with the Manufacturer provided mounting bracket.
B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated and in accordance with manufacturer recommendations.

3.2 INSPECTION AND TEST

A. Examine fire extinguishers for proper charging and tagging.
B. Remove and replace damaged, defective, or undercharged fire extinguishers.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

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SECTION 11 13 19 - STATIONARY LOADING DOCK EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Recessed loading dock levelers - DOCK-1 with integral dock bumpers - DOCK-1B.

B. Related Requirements:

1. Section 05 50 00 "Metal Fabrications" for curb angles at edges of recessed pits and loading dock platform edge channels.
2. Section 08 33 23 "Overhead Coiling Doors" for coiling overhead doors electrically interlocked to dock levelers.

1.3 DEFINITIONS

A. Operating Range: Maximum amount of travel above and below the loading dock level.

B. Working Range: Recommended amount of travel above and below the loading dock level for which loading and unloading operations can take place.

1.4 COORDINATION

A. Coordinate size and location of loading dock equipment indicated to be attached to or recessed into concrete or masonry, and furnish anchoring devices with templates, diagrams, and instructions for their installation

B. Coordinate installation of cast-in-place items. Furnish setting drawings and templates.

C. Electrical System Roughing-in: Coordinate layout and installation of loading dock equipment with connections to power supplies and interlocked equipment.

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1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1. Inspect and discuss electrical roughing-in, equipment bases, and other preparatory work specified elsewhere.
2. Review sequence of operation for each type of loading dock equipment.
3. Review coordination of interlocked equipment specified in this Section and elsewhere.
4. Review required testing, inspecting, and certifying procedures.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for stationary loading dock equipment.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For stationary loading dock equipment.

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of anchors and each field connection.
3. Include diagrams for power, signal, and control wiring.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each dock leveler, for tests performed by manufacturer and witnessed by a qualified testing agency.

1. Indicate compliance of dock levelers with requirements in MH 30.1 for determining rated capacity based on comprehensive testing within last two years of current products.
2. Submittal Form: According to MH 30.1.

C. Sample Warranty: For manufacturer's special warranty.

1.8 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For stationary loading dock equipment to include in operation and maintenance manuals.

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1.9 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1. Maintenance Proximity: Not more than one hours' normal travel time from Installer's place of business to Project site.

1.10 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of construction contiguous with stationary loading dock equipment, including recessed pit dimensions, slopes of driveways and heights of loading docks, by field measurements before fabrication.

1.11 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace dock levelers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including cracked or broken structural support members, load-bearing welds, and front and rear hinges.
   b. Faulty operation of operators, control system, or hardware.
   c. Deck plate failures including cracked plate or permanent deformation in excess of 1/4 inch between deck supports.
   d. Hydraulic system failures including failure of hydraulic seals and cylinders.
2. Warranty Period for Structural Assembly: 10 years from date of Substantial Completion.
3. Warranty Period for Hydraulic System: Five years from date of Substantial Completion.
4. Warranty shall be for unlimited usage of leveler for the specified rated capacity over the term of the warranty.

PART 2 - PRODUCTS

2.1 RECESSED LOADING DOCK LEVELERS - DOCK-1

A. General: Recessed, hinged-lip-type dock levelers designed for permanent installation in concrete pits preformed in the edge of loading platform; of type, function, operation, capacity, size, and construction indicated; and complete with controls, safety devices, and accessories required.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Blue Giant Equipment Corporation.

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b. Kelley; Entrematic; ASSA ABLOY. Basis-of-Design: Model HK-640.
c. McGuire; Systems, LLC.
d. Pioneer Dock Equipment.
e. Rite-Hite Holding Corporation.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Standard: Comply with MH 30.1 , except for structural testing to establish rated capacity.

D. Rated Capacity: Capable of supporting total gross load of 40,000 lb without permanent deflection or distortion.

E. Platform: Not less than 1/4- inch- thick, nonskid steel plate.

1. Platform Width: 72 inches
2. Platform Length:63inches .
3. Frame: Manufacturer's standard .
4. Toe Guards: Equip open sides of dock leveler over range indicated with steel toe guards.
   a. Toe-Guard Range: Entire upper operating range.

F. Hinged Lip: Not less than 1/2- inch- thick, nonskid steel plate, 16 inches long.

1. Hinge: Full-width, piano-type hinge with heavy-wall hinge tube and grease fittings, with gussets on lip and ramp for support.
2. Safety Barrier Lip: Designed to protect material-handling equipment from an accidental fall from loading platform edge of the dock leveler when the leveler is not in use.

G. Function: Dock levelers shall compensate for differences in height between truck bed and loading platform.

1. Vertical Travel: Operating range above platform level of sufficient height to enable lip to extend and clear truck bed before contact with the following minimum working range:
   a. Above Adjoining Platform: 12 inches .
   b. Below Adjoining Platform: 12 inches .
2. Automatic Vertical Compensation: Floating travel of ramp with lip extended and resting on truck bed shall compensate automatically for upward or downward movement of truck bed during loading and unloading.
3. Lip Operation: Manufacturer's standard mechanism, which automatically extends and supports hinged lip on ramp edge with lip resting on truck bed over dock leveler's working range, allows lip to yield under impact of incoming truck and automatically retracts lip when truck departs.
   a. Length of Lip Extension: Not less than 16 inches measured from ramp edge.

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4. Automatic Ramp Return: Automatic return of unloaded ramp, from raised or lowered positions to stored position, level with platform, as truck departs.
5. Interlock: Leveler does not operate while overhead door is in closed position, leveler night lock is engaged and truck restraint is not engaged .

H. Hydraulic Operating System: Electric control from a remote-control station; fully hydraulic operation. Electric-powered hydraulic raising and hydraulic lowering of ramp. Equip leveler with a packaged unit including a unitized, totally enclosed, nonventilated electric motor, pump, manifold reservoir, and valve assembly of proper size, type, and operation for capacity of leveler indicated. Include means for lowering ramp below platform level with lip retracted behind dock bumpers. Provide a hydraulic velocity fuse connected to main hydraulic cylinder to limit loaded ramp's free fall to not more than 3 inches.

1. Remote-Control Station with Emergency Stop: Multibutton control station with an UP button of the constant-pressure type and an emergency STOP button of the momentary-contact type, enclosed in NEMA ICS 6, Type 4 box. Ramp raises by depressing and holding UP button; ramp lowers at a controlled rate by releasing UP button. Ramp movement stops, regardless of position of ramp or lip, by depressing STOP button. Normal operation resumes by engaging a manual reset button or by pulling out STOP button.
   a. Master Panel: Control panel with integral fused disconnecting means for operating dock leveler, dock door, and truck restraints.
2. Independent Lip Operation: Electric-powered hydraulic raising and hydraulic lowering of lip, controlled independent of raising and lowering of ramp.

I. Construction: Fabricate dock-leveler frame, platform supports, and lip supports from structural- or formed-steel shapes. Weld platform and hinged lip to supports. Fabricate entire assembly to withstand deformation during both operating and stored phases of service. Chamfer lip edge to minimize obstructing wheels of material-handling vehicles.

1. Cross-Traffic Support: Manufacturer's standard method of supporting ramp at platform level in stored position with lip retracted. Provide a means to release supports to allow ramp to descend below platform level.
2. Maintenance Strut: Integral strut to positively support ramp in up position during maintenance of dock leveler.

J. Integral Molded-Rubber Dock Bumpers: Fabricated from [**4-**] [**6-**] <**Insert dimension>** inch- thick, heavy molded-rubber compound reinforced with nylon, rayon, or polyester cord; with Shore A durometer hardness of 80, plus or minus 5, when tested according to ASTM D2240. Provide two dock bumpers for each recessed dock leveler, attached to face of loading dock with expansion bolts.

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K. Integral Laminated-Tread Dock Bumpers - DOCK-1B: Fabricated from 4-1/2-inch- thick, multiple, uniformly thick plies cut from fabric-reinforced rubber tires. Laminate plies under pressure on not less than two 3/4-inch- diameter, steel supporting rods that are welded at one end to 1/4-inch- thick, structural-steel end angle and secured with a nut and angle at the other end. Fabricate angles with predrilled anchor holes and sized to provide not less than 1 inch of tread plies extending beyond the face of closure angles.

L. Materials:

1. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
2. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from steel plate complying with ASTM A572/A572M, Grade 55.
3. Steel Tubing: ASTM A500/A500M, cold formed.
4. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

M. Dock-Leveler Finish: Manufacturer's standard prime-paint or baked-on factory finish .

1. Toe Guards: Baked-on factory finish.

N. Accessories:

1. Side and rear weatherseals.
2. Foam insulation under dock-leveler platform.
3. Abrasive skid-resistant surface.

2.2 FINISH REQUIREMENTS

A. Finish loading dock equipment after assembly and testing.

B. Hot-Dip Galvanizing: Comply with the following:

1. ASTM A123/A123M for iron and steel loading dock equipment.
2. ASTM A153/A153M or ASTM F2329/F2329M for iron and steel hardware for loading dock equipment.

C. Spray Zinc Metallizing: ASTM B833.

D. Electrodeposited Zinc Coatings: ASTM B633.

E. Steel Prime Paint Finish: Clean, pretreat, and apply manufacturer's standard primer.

F. Baked-on Factory Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.

1. Color: To be selected by Contracting Officer from manufacturer's standard colors..

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2. Toe Guards: Paint to comply with ANSI Z535.1.

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 the Work.

B. Examine roughing-in for electrical systems for loading dock equipment to verify actual locations of connections before equipment installation.

C. Examine walls and floors of pits for suitable conditions where recessed loading dock equipment is to be installed. Pits shall be plumb and square and properly sloped for drainage from back to front of loading dock.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean recessed pits of debris.

3.3 INSTALLATION, GENERAL

A. Install loading dock equipment as required for a complete installation.

1. Rough-in electrical connections.

3.4 INSTALLATION OF RECESSED LOADING DOCK LEVELERS

A. Attach dock levelers securely to loading dock platform, flush with adjacent loading dock surfaces and square to recessed pit.

3.5 ADJUSTING

A. Adjust loading dock equipment to function smoothly and safely, and lubricate as recommended by manufacturer.

B. Test dock levelers for vertical travel and adjust to maintain operating range indicated.

C. After completing installation of exposed, factory-finished loading dock equipment, inspect exposed finishes and repair damaged finishes.

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3.6 MAINTENANCE SERVICE

A. Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of loading dock equipment Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper loading dock equipment operation at rated speed and capacity. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain loading dock equipment.

END OF SECTION 11 13 19

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SECTION 12 36 23.13 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad countertops - CNTR-3.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: For plastic-laminate-clad countertops.

1. Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.
2. Show locations and sizes of cutouts and holes for items installed in plastic-laminate-clad countertops.

C. Samples: Plastic laminates in each type, color, pattern, and surface finish required in manufacturer's standard size.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer fabricator.

B. Product Certificates: For the following:

1. Composite wood products.
2. High-pressure decorative laminate.
3. Chemical-resistant, high-pressure decorative laminate.
4. Adhesives.

C. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

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1. Countertops shall be fabricated and installed per Architectural Woodwork Institute guidelines.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver countertops only after casework and supports on which they will be installed have been completed in installation areas.

B. Store countertops in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

C. Keep surfaces of countertops covered with protective covering during handling and installation.

1.6 FIELD CONDITIONS

A. Environmental Limitations with Humidity Control: Do not deliver or install countertops until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

B. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Established Dimensions: Where countertops are indicated to fit to other construction, establish dimensions for areas where countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-clad countertops indicated for construction, finishes, installation, and other requirements.

1. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

B. Grade: Premium .

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C. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS .

1. Basis-of-Design Product: Subject to compliance with requirements, provide one of the following or a VA approved equal product by one of the following:
   a. Formica Corporation.
   b. Laminart LLC.
   c. Nevamar Company, LLC.
   d. Wilsonart LLC.

D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Color/Pattern: See Finish Legend.

E. Edge Treatment: 3.0-mm PVC edging .

F. Core Material: MDF .

G. Core Material at Sinks: MDF made with exterior glue or exterior-grade plywood .

H. Core Thickness: 3/4 inch .

1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.

I. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of countertop and quality grade specified unless otherwise indicated.

1. MDF: Medium-density fiberboard, ANSI A208.2, Grade 130 .

2.3 ACCESSORIES

A. Wire-Management Grommets: Circular, molded-plastic grommets and matching plastic caps with slot for wire passage.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

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a. Doug Mockett & Company, Inc.
2. Outside Diameter: 2 inches .
3. Color: To be selected from manufacturer's full range. ,

2.4 MISCELLANEOUS MATERIALS

A. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement .

1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.5 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets. Ease edges to radius indicated for the following:

1. Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.

C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times countertop fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended, and check measurements of assemblies against field measurements before disassembling for shipment.

D. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately, and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of cutouts by saturating with varnish.

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PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.

B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing.

3.2 INSTALLATION

A. Grade: Install countertops to comply with same grade as item to be installed.

B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.

1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately, and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
2. Seal edges of cutouts by saturating with varnish.

C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

1. Secure field joints in countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten in accordance with manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

D. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Countertop Installation: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops level and true in line. Use concealed shims as required to maintain not more than a 1/8-inch-in-96-inches variation from a straight, level plane.
2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
3. Seal joints between countertop and backsplash, if any, and joints where countertop and backsplash abut walls with mildew-resistant

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silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects. Where not possible to repair, replace countertops. Adjust joinery for uniform appearance.

B. Clean countertops on exposed and semiexposed surfaces.

C. Protection: Provide Kraft paper or other suitable covering over countertop surfaces, taped to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

END OF SECTION 12 36 23.13

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SECTION 13 05 41
SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Provide seismic restraint in accordance with the requirements of this section in order to maintain the integrity of nonstructural components of the building so that they remain safe and functional in case of seismic event.

B. The design of seismic restraints of non-structural components to resist seismic load shall be based on Seismic Design parameters indicated below in accordance with VA H-18-8 in conjunction with ASCE 7, as specified in H-18-8 Section 4.0, for existing building retrofit projects. Specific requirements for Critical and Essential facilities are covered in Section 4.0 of H-18-8, including applying Ip = 1.5 for all nonstructural components in Critical facilities.

1. International Building Code 2021 Edition
2. American Society of Civil Engineers Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7)
3. Facility Occupancy Category per VA H-18-8: Critical Facility
4. Site Class: C
5. Building Risk Category: IV
6. Mapped MCER 0.2 s period Spectral Response Acceleration Parameter (Ss): 0.314 g
7. Mapped MCER 1.0 s period Spectral Response Acceleration Parameter (S1): 0.077 g
8. Short period Spectral Response Acceleration Parameter (Sds): 0.272 g
9. Short period Spectral Response Acceleration Parameter (Sd1): 0.077 g
10. Building Seismic Design Category: C
11. Component Importance Factor (Ip): 1.5
12. Component Response Modification Factor (Rp): Varies, per ASCE 7-16 Chapter 13
13. Component Overstrength Factor: Varies, per ASCE 7-16 Chapter 13

C. Definitions: Non-structural building components are components or systems that are not part of the building's structural system whether inside or outside, above or below grade. Non-structural components of buildings include but are not limited to (Refer to VA H-18-8 and ASCE 7 for additional examples):
   1. Architectural Elements: Facades that are not part of the structural system and its shear resistant elements, cornices and other architectural projects and parapets that do not function structurally, glazing, nonbearing partitions, suspended ceilings, cabinets, bookshelves, medical equipment, and storage racks.
   2. Electrical Elements: Power systems, lighting systems, switchgear and switchboards, auxiliary engine-generator sets, motor control centers, selector and controller panels, fire protection and alarm systems, special life support systems, and telephone and communication systems.
   3. Mechanical Elements: Heating, ventilating, and air-conditioning systems, plumbing systems, and facility fuel systems.
   4. Fire Protection Elements: Sprinkler systems.

1.2 RELATED WORK

A. Related specifications include but are not limited to those shown below. Coordinate all work with the applicable specification for that work.
B. Section 05 50 00, METAL FABRICATIONS
C. Section 09 51 13, ACOUSTIC PANEL CEILINGS
D. Section 22 11 00, FACILITY WATER DISTRIBUTION
E. Section 22 13 00, FACILITY SANITARY AND VENT PIPING
F. Section 22 14 00, FACILITY STORM DRAINAGE
G. Section 23 10 00, FACILITY FUEL SYSTEMS
H. Section 23 21 13, HYDRONIC PIPING
I. Section 23 31 00, HVAC DUCTS AND CASINGS
J. Section 26 51 00, INTERIOR LIGHTING

1.3 QUALITY CONTROL

A. Shop-Drawing Preparation:

1. Non-structural seismic restraint systems shop drawings and delegated design calculations shall be prepared by a professional structural engineer with a minimum of 5 years' experience in the design and detailing of seismic force restraints. The professional structural engineer shall be registered in the state where the project is located and submit qualifications with list of projects illustrating compliance with the experience requirement of this section.
2. Submit design tables and information used for the design-force levels, stamped and signed by a professional structural engineer registered in the State where project is located.

B. Coordination:
1. Do not install seismic restraints until seismic restraint submittals are approved by the COR.
2. Coordinate trapezes or other multi-pipe hanger systems prior to submission of shop drawings for review.

C. Seismic Certification:
1. In structures assigned to Seismic Design Category C, D, E, or Fpermanent equipment and components are to have Special Seismic Certification in accordance with requirements of section 13.2.2 of ASCE 7 except for equipment and components that are considered inherently rugged as listed in Section 4.2.2 of VA H18-8, and shall comply with section 13.2.6 of ASCE 7.

1.4 SUBMITTALS

A. Submit a complete and coordinated set of bracing and signed and sealed anchorage drawings and calculations for all non-structural elements requiring seismic restraint by the delegated professional structural engineer mentioned in Section 1.3.A.1 for review prior to installation including:
1. Description, layout, and location of all items to be anchored or braced with anchorage or brace points noted and dimensioned.

2. Details of all anchorage and bracing at large scale with all members, parts brackets shown, together with all connections, bolts, welds etc. clearly identified and specified. Details shall be coordinated with all project conditions and trades prior to shop drawing submission for review.
3. Complete calculations including but not limited to seismic design criteria, computer model input and output, seismic design forces and capacities, design tables and information used for all proprietary design elements such as post installed anchors, stamped and signed by a professional structural engineer specified in section 1.3 A.1.
4. For all post installed anchorages submit the appropriate International Code Council Engineering Service (ICC-ES) evaluation reports, California's Office of Statewide Health Planning and Development(OSHPD) pre-approvals, or lab test reports verifying compliance with OSHPD Interpretation of Regulations 28-6.
5. Delegated professional structural engineer qualifications.

B. Submit for review prior to installation, the following for seismic protection of piping in addition to items noted in Section 1.4.A:
1. Single-line piping diagrams on a floor-by-floor basis. Show all suspended piping for a given floor on the same plain.
2. Type of pipe (Copper, steel, cast iron, insulated, non-insulated, etc.).
3. Pipe contents.
4. Structural framing for the seismic and gravity support and the main superstructure for which the bracing and or anchorage is attached.
5. Location of all gravity load pipe supports and spacing requirements.
6. Numerical value of gravity load reactions.
7. Location of all seismic bracing.
8. Numerical value of applied seismic brace loads.
9. Type of connection (Vertical support, vertical support with seismic brace etc.).

10. Seismic brace reaction type (tension or compression): Details illustrating all support and bracing components, methods of connections, and specific anchors to be used.

C. Submit for review prior to installation, the following items for seismic protection of suspended ductwork and suspended electrical and communication cables, in addition to items noted in Section 1.4.A:
   1. Details illustrating all support and bracing components, methods of connection, and specific anchors to be used.
   2. Numerical value of applied gravity and seismic loads and seismic loads acting on support and bracing components.
   3. Maximum spacing of hangers and bracing.

1.5 APPLICABLE PUBLICATIONS

A. The Publications listed below (including amendments, addenda revisions, supplements and errata) form a part of this specification to the extent referenced. The publications are referenced in text by basic designation only.

B. American Concrete Institute (ACI):
   1. 355.2-19 Qualification for Post-Installed Mechanical Anchors in Concrete and Commentary

C. American Institute of Steel Construction (AISC):
   1. Load and Resistance Factor Design, Volume 1, Second Edition

D. ASTM International (ASTM):
   1. A36/A36M-19 Standard Specification for Carbon Structural Steel
   2. A53/A53M-18 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
   3. A307-14e1 Standard Specification for Carbon Steel Bolts and Studs; 60,000 PSI Tensile Strength.
   4. A325-14 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
   5. A325M-14 Standard Specification for High-Strength Bolts for Structural Steel Joints [Metric]
   6. A490-14a Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
   7. A490M-14a Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints [Metric]

8. A500/A500M-18 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
9. A501/A501M-14 Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
10. A615/A615M-20 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
11. A992/A992M-15 Standard Specification for Steel for Structural Shapes for Use in Building Framing
12. A996/A996M-16 Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
13. E488-18 Standard Test Methods for Strength of Anchors in Concrete Elements

E. American Society of Civil Engineers: (ASCE 7) Latest Edition.
   1. ASCE 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures
   2. ASCE 41 Seismic Rehabilitation of Existing Buildings

F. National Fire Protection Association (NFPA):
   1. 13-2021 Standard for the Installation of Sprinkler Systems.

G. National Uniform Seismic Installation Guidelines (NUSIG)

H. International Code Council (ICC):
   1. IBC-2021 International Building Code

I. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
   1. Seismic Restraint Manual - Guidelines for Mechanical Systems, 2008 Edition and Addendum

J. US Department of Veterans Affairs (VA):
   1. H-18-8-2021 Seismic Design Requirements

1.6 REGULATORY REQUIREMENT

A. IBC as shown in Section 1.1 B of this specification.

B. Exceptions: The omission of seismic restraints shall be allowed only in accordance with VA H-18-8 and ASCE 7.

C. For fire sprinkler systems, refer to NFPA requirements and Division 21 specifications.

PART 2 - PRODUCTS

2.1 STEEL:

A. Structural Steel: ASTM A36, A36M, or A992.

B. Structural Tubing: ASTM A500, Grade B.

C. Structural Tubing: ASTM A501.

D. Steel Pipe: ASTM A53/A53M, Grade B.

E. Bolts & Nuts: ASTM A307, A325, A325M, A490, or A490M.

PART 3 - EXECUTION

3.1 CONSTRUCTION, GENERAL

A. Provide equipment supports and anchoring devices to withstand the seismic design forces, so that when seismic design forces are applied, the equipment cannot displace, overturn, or become inoperable.

B. Provide anchorages in conformance with recommendations of the equipment manufacturer and as shown on approved shop drawings and calculations.

C. Construct seismic restraints and anchorage to allow for thermal expansion.

D. Testing Before Final Inspection:

1. Test 10-percent of anchors in masonry and concrete per ASTM E488, and ACI 355.2 to determine that they meet the required load capacity. If any anchor fails to meet the required load, test the next 20 consecutive anchors, which are required to have zero failure, before resuming the 10-percent testing frequency.
2. Before scheduling Final Inspection, submit a report on this testing indicating the number and location of testing, and what anchor-loads were obtained.
3. Construct seismic restraints and anchorages to not interfere with other trades or damage existing or in-situ elements of the constructed building.

3.2 EQUIPMENT RESTRAINT AND BRACING

A. All mechanical and other equipment not supported with isolators external to the unit shall be securely anchored to the structure. Such equipment shall be properly supported to resist a horizontal force of 50 percent of the weight of the equipment furnished.

B. All mechanical and other equipment mounted on vibration isolators shall be provided with seismic restraints capable of resisting a horizontal force of 100 percent of the weight of the equipment furnished.

3.3 MECHANICAL DUCTWORK AND PIPING, ELECTRICAL BUSWAYS, CONDUITS, AND CABLE TRAYS, AND TELECOMMUNICATION WIRES AND CABLE TRAYS

A. Support and brace the following item(s) to resist directional forces (lateral, longitudinal and vertical).

1. Mechanical ductwork and piping.
2. Electrical busways, conduits, and cable trays.
3. Telecommunications wires and cable trays.

B. Provide supports and anchoring so that, upon application of seismic forces, piping remains fully connected as operable systems which will not displace sufficiently to damage adjacent or connecting equipment, or building members.

C. Piping Connections: Provide flexible connections where pipes connect to equipment. Make the connections capable of accommodating relative differential movements between the pipe and equipment under conditions of earthquake shaking.

3.4 PARTITIONS

A. In buildings with flexible structural frames, anchor partitions to only structural element, such as a floor slab, and separate such partition by a physical gap from all other structural elements.

B. Properly anchor masonry walls to the structure for restraint, so as to carry lateral loads imposed due to earthquake along with their own weight and other lateral forces.

3.5 CEILINGS AND LIGHTING FIXTURES

A. At intervals required to meet the seismic demand forces, laterally brace suspended ceilings against lateral and vertical movements, and provide with a physical separation at the walls.

B. Independently support and laterally brace all lighting fixtures. Refer to applicable portion of lighting specification, Section 26 51 00, INTERIOR LIGHTING.

3.6 FACADES AND GLAZING

A. Do not install concrete masonry unit filler walls in a manner that can restrain the lateral deflection of the building frame. Provide a gap with adequately sized resilient filler to separate the structural frame from the non-structural filler wall.

B. Tie brick veneers to a separate wall that is independent of the steel frame as shown on construction drawings to ensure strength against applicable seismic forces at the project location.

C. Install attachments to structure for all façade materials as shown on construction drawings to ensure strength against applicable seismic forces at the project location.

3.7 STORAGE RACKS, CABINETS, AND BOOKCASES

A. Install storage racks to withstand earthquake forces and anchored to the floor or laterally braced from the top to the structural elements.

B. Anchor medical supply cabinets to the floor or walls and equip them with properly engaged, lockable latches.

C. Anchor filing cabinets that are more than 2 drawers high to the floor or walls, and equip all drawers with properly engaged, lockable latches.

D. Anchor bookcases that are more than 30 inches high to the floor or walls, and equip any doors with properly engaged, lockable latches.

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