U.S. Army Corps of Engineers
New York District

SPECIFICATIONS

Lincoln Hall
Renovation & Modernization
United States Military Academy
West Point, NY
March 1, 2023

Revised RTA Submission

Volume 2 of 3:
Specifications

JACOBS / EWING COLE A Joint Venture

Contract #: W912DS-19-C-0031

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SECTION 00 00 00

SEALS PAGE
06/15

PART 1 SUMMARY

1.1 SEALS AND SIGNATURES

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed Professional Architect.

Profession Architecture.

License No. VA 0401015587.

Expiration Date: 02/29/2024.

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed Professional Engineer.

Profession Structural.

License No. VA 031804.

Expiration Date: 01/31/2024.

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed Professional Certified Interior Designer.

Profession Interior Design.

License No. VA 0412000817.

Expiration Date: 10/31/2023.

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed Professional Engineer.

Profession Fire Protection.

License No. VA 030373.

Expiration Date: 02/28/2025.

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed Professional Engineer.

Profession Mechanical.

License No. VA 033845.

Expiration Date: 01/31/2025.

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed Professional Engineer.

Profession Electrical.

License No. VA 0402047869.

Expiration Date: 06/30/2023.

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed Professional Registered Communications Distribution Designer.

Profession Telecom.

License No. BICSI ID#112947.

Expiration Date: 12/31/2024.

03/01/2023

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed Professional Engineer.

Profession Civil.

License No. NY 076240-1.

Expiration Date: 06/30/2025.

03/01/2023

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed Professional Architect.

Profession Landscape Architecture.

License No. NY 001981.

Expiration Date: 10/31/2025.

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SECTION 02 41 00

DEMOLITION AND DECONSTRUCTION
05/10

PART 1 GENERAL

1.1 REFERENCES

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

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE (AHRI)

AHRI Guideline K	(2009) Guideline for Containers for Recovered Non-Flammable Fluorocarbon Refrigerants

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP A10.6	(2006) Safety & Health Program Requirements for Demolition Operations - American National Standard for Construction and Demolition Operations

CARPET AND RUG INSTITUTE (CRI)

CRI 104	(2015) Carpet Installation Standard for Comnmercial Carpet
CRI 105	(2015) Carpet Installation Standard for Residential Carpet

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2014) Safety and Health Requirements Manual

U.S. DEFENSE LOGISTICS AGENCY (DLA)

DLA 4145.25	(Jun 2000; Reaffirmed Oct 2010) Storage and Handling of Liquefied and Gaseous Compressed Gases and Their Full and Empty Cylinders http://www.aviation.dla.mil/UserWeb/aviationengineerir

U.S. DEPARTMENT OF DEFENSE (DOD)

DOD 4000.25-1-M	(2006) MILSTRIP - Military Standard Requisitioning and Issue Procedures
MIL-STD-129	(2014; Rev R; Change 1 2018; Change 2 2019) Military Marking for Shipment and Storage

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

40 CFR 61	National Emission Standards for Hazardous Air Pollutants
40 CFR 82	Protection of Stratospheric Ozone
49 CFR 173.301	Shipment of Compressed Gases in Cylinders and Spherical Pressure Vessels

1.2 PROJECT DESCRIPTION

1.2.1 Definitions

1.2.1.1 Demolition

Demolition is the process of wrecking or taking out any load-supporting structural member of a facility together with any related handling and disposal operations.

1.2.1.2 Deconstruction

Deconstruction is the process of taking apart a facility with the primary goal of preserving the value of all useful building materials.

1.2.1.3 Demolition Plan

Demolition Plan is the planned steps and processes for managing demolition activities and identifying the required sequencing activities and disposal mechanisms.

1.2.1.4 Deconstruction Plan

Deconstruction Plan is the planned steps and processes for dismantling all or portions of a structure or assembly, to include managing sequencing activities, storage, re-installation activities, salvage and disposal mechanisms.

1.2.2 Demolition/Deconstruction Plan

Prepare a Demolition Plan and Deconstruction Plan and submit proposed demolition and deconstruction, and removal procedures for approval before work is started. Include in the plan procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services, a detailed description of methods and equipment to be used for each operation and of the sequence of operations. Coordinate with Waste Management Plan in accordance with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL. Provide procedures for safe conduct of the work in accordance with EM 385-1-1. Plan shall be approved by Contracting Officer prior to work beginning.

1.2.3 General Requirements

Do not begin demolition or deconstruction until authorization is received from the Contracting Officer. Remove rubbish and debris from the project site; do not allow accumulations inside or outside the buildings. The work includes demolition, deconstruction, and removal of resulting rubbish and debris. Remove rubbish and debris from Government property daily, unless

otherwise directed. Store materials that cannot be removed daily in areas specified by the Contracting Officer. In the interest of occupational safety and health, perform the work in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections.

1.3 ITEMS TO REMAIN IN PLACE

Take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government. Repair or replace damaged items as approved by the Contracting Officer. Coordinate the work of this section with all other work indicated. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal or deconstruction, or demolition work performed under this contract. Do not overload structural elements pavements to remain. Provide new supports and reinforcement for existing construction weakened by demolition, deconstruction, or removal work. Repairs, reinforcement, or structural replacement require approval by the Contracting Officer prior to performing such work.

1.3.1 Existing Construction Limits and Protection

Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction. Provide temporary shoring and bracing for support of building components to prevent settlement or other movement. Provide protective measures to control accumulation and migration of dust and dirt in all work areas. Remove snow, dust, dirt, and debris from work areas daily.

1.3.2 Weather Protection

For portions of the building to remain, protect building interior and materials and equipment from the weather at all times. Where removal of existing roofing is necessary to accomplish work, have materials and workmen ready to provide adequate and temporary covering of exposed areas.

1.3.3 Utility Service

Maintain existing utilities indicated to stay in service and protect against damage during demolition and deconstruction operations. Prior to start of work, utilities serving each area of alteration or removal will be shut off by the Government and disconnected and sealed by the Contractor.

1.3.4 Facilities

Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities. Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, must remain standing without additional bracing, shoring, or lateral support until demolished or deconstructed, unless directed otherwise by the Contracting Officer. Ensure that no elements determined to be unstable are left unsupported and place and secure bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract.

1.4 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted. Where burning is permitted, adhere to federal, state, and local regulations.

1.5 AVAILABILITY OF WORK AREAS

Areas in which the work is to be accomplished will be available in accordance with the following schedule:

Schedule	
Area	Date
_____	_____

1.6 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Demolition Plan; S, RO
Deconstruction Plan; S, RO
Existing Conditions

Scaled And Dimensioned Drawings Of All Major Existing To Remain Architectural And Structural Elements

SD-07 Certificates

Notification; G, RO

1.7 QUALITY ASSURANCE

Submit timely notification of demolition deconstruction and renovation projects to Federal, State, regional, and local authorities in accordance with 40 CFR 61, Subpart M. Notify the Regional Office of the United States Environmental Protection Agency (USEPA), local air pollution control district/agency, and the Contracting Officer in writing 10 working days prior to the commencement of work in accordance with 40 CFR 61, Subpart M. Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," conform to the safety requirements contained in ASSP A10.6. Comply with the Environmental Protection Agency requirements specified. Use of explosives will not be permitted.

1.7.1 Dust and Debris Control

Prevent the spread of dust and debris to occupied portions of the building and avoid the creation of a nuisance or hazard in the surrounding area.

Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution. Sweep pavements as often as necessary to control the spread of debris.

1.8 PROTECTION

1.8.1 Traffic Control Signs

a. Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights. Anchor barricades in a manner to prevent displacement by wind. Notify the Contracting Officer prior to beginning such work.

1.8.2 Protection of Personnel

Before, during and after the demolition and deconstruction work continuously evaluate the condition of the structure being demolished and deconstructed and take immediate action to protect all personnel working in and around the project site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.9 RELOCATIONS

Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Repair or replace items to be relocated which are damaged by the Contractor with new undamaged items as approved by the Contracting Officer.

1.10 EXISTING CONDITIONS

1.10.1 Survey Prior to Demolition

Before beginning any demolition or deconstruction work, survey the site and examine the drawings and specifications to determine the extent of the work. Record existing conditions in the presence of the Contracting Officer showing the condition of structures and other facilities adjacent to areas of alteration or removal. Photographs sized 4 inch will be acceptable as a record of existing conditions. Include in the record the elevation of the top of foundation walls, finish floor elevations, possible conflicting electrical conduits, plumbing lines, alarms systems, the location and extent of existing cracks and other damage and description of surface conditions that exist prior to before starting work. It is the Contractor's responsibility to verify and document all required outages which will be required during the course of work, and to note these outages on the record document. Submit survey results.

1.10.2 Field Measurements

After completion of demolition and before proceeding with the work, each contractor and sub-contractor must verify in field all dimensions and elevational data for all existing to remain building components. Contractor must provide scaled and dimensioned drawings of all major existing to remain architectural and structural elements, such as: interior and exterior columns, existing to remain interior and exterior walls, existing doors and window rough openings, floor to ceiling heights on all floors, overall building dimensions, parapets, stairs and elevator

penthouse dimensions, all existing to remain stairs and ramps and submit to the government as a "For Information Only" Submittal.

PART 2 PRODUCTS

2.1 FILL MATERIAL

a. Comply with excavating, backfilling, and compacting procedures for soils used as backfill material to fill basements, voids, depressions or excavations resulting from demolition or deconstruction of structures.

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

3.1.1 Structures

a. Interior walls, and partitions, shall be removed as indicated. Remove sidewalks, curbs, gutters and street light bases as indicated.

b. Demolish and Deconstruct structures in a systematic manner. Demolish and Deconstruct masonry walls in small sections.

c. Locate demolition and deconstruction equipment throughout the structure and remove materials so as to not impose excessive loads to supporting walls, floors, or framing.

3.1.2 Utilities and Related Equipment

3.1.2.1 General Requirements

Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Contracting Officer. Do not interrupt existing utilities serving facilities occupied and used by the Government except when approved in writing and then only after temporary utility services have been approved and provided. Do not begin demolition or deconstruction work until all utility disconnections have been made. Shut off and cap utilities for future use, as indicated.

3.1.2.2 Disconnecting Existing Utilities

Remove existing utilities , as indicated and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer. When utility lines are encountered but are not indicated on the drawings, notify the Contracting Officer prior to further work in that area. Remove meters and related equipment and deliver to a location in accordance with instructions of the Contracting Officer.

3.1.3 Chain Link Fencing

Remove chain link fencing, gates and other related salvaged items scheduled for removal and transport to designated areas. Remove gates as whole units. Cut chain link fabric to 25 foot lengths and store in rolls off the ground.

3.1.4 Paving and Slabs

Remove sawcut concrete and asphaltic concrete paving and slabs including aggregate base as indicated. Provide neat sawcuts at limits of removal as indicated. Pavement and slabs not to be used in this project shall be removed from the Installation at Contractor's expense.

3.1.5 Roofing Material

Remove existing roof system and associated components in their entirety down to existing roof slab. Remove built-up roofing to effect the connections with new flashing or roofing. Remove gravel surfacing from existing roofing felts for a minimum distance of 18 inches back from the cut. Remove roofing system and insulation without damaging the roof slab. Sequence work to minimize building exposure between demolition or deconstruction and new roof materials installation.

3.1.5.1 Temporary Roofing

Install temporary roofing and flashing over roof slab to maintain a watertight condition throughout the course of the work. Remove temporary work prior to installation of permanent roof system materials unless approved otherwise by the Contracting Officer. Make provisions for worker safety during demolition, deconstruction, and installation of new materials as described in paragraphs entitled "Statements" and "Regulatory and Safety Requirements."

3.1.5.2 Reroofing

When removing the existing roofing system from the roof slab, remove only as much roofing as can be recovered by the end of the work day, unless approved otherwise by the Contracting Officer. Do not attempt to open the roof covering system in threatening weather. Reseal all openings prior to suspension of work the same day.

3.1.6 Masonry

Sawcut and remove masonry so as to prevent damage to surfaces to remain and to facilitate the installation of new work. Where new masonry adjoins existing, the new work shall abut or tie into the existing construction as indicated. Provide square, straight edges and corners where existing masonry adjoins new work and other locations..

3.1.7 Concrete

At openings in concrete slabs, x-ray slabs with GPR equipment and locate reinforcement. Core drill corners prior to saw cutting. DO NOT OVER CUT OPENINGS.

Saw concrete along straight lines to a depth of a minimum 2 inch. Make each cut in slabs perpendicular to the face and in alignment with the cut in the opposite face. Break out the remainder of the concrete provided that the broken area is concealed in the finished work, and the remaining concrete is sound. At locations where the broken face cannot be concealed, grind smooth or saw cut entirely through the concrete.

3.1.8 Miscellaneous Metal

Salvage shop-fabricated items such as access doors and frames, steel

gratings, metal ladders, wire mesh partitions, metal railings, metal windows and similar items as whole units. Salvage light-gage and cold-formed metal framing, such as steel studs, steel trusses, metal gutters, roofing and siding, metal toilet partitions, toilet accessories and similar items. Scrap metal shall become the Contractor's property. Recycle scrap metal as part of demolition and deconstruction operations. Provide separate containers to collect scrap metal and transport to a scrap metal collection or recycling facility, in accordance with the Waste Management Plan.

3.1.9 Carpentry

Salvage for recycle lumber, millwork items, and finished boards, and sort by type and size. Recycle salvaged wood except stained, painted, or treated wood. Remove windows, doors, frames, and cabinets, and similar items as whole units, complete with trim and accessories. Do not remove hardware attached to units, except for door closers. Salvage hardware attached to units. Brace the open end of door frames to prevent damage.

3.1.10 Carpet

Remove existing carpet for reclamation in accordance with manufacturer recommendations and as follows. Remove used carpet in large pieces, roll tightly, and pack neatly in a container. Remove adhesive according to recommendations of the Carpet and Rug Institute (CRI). Adhesive removal solvents shall comply with CRI 104/CRI 105. Recycle removed carpet cushion.

3.1.11 Acoustic Ceiling Tile

Remove, neatly stack, and recycle acoustic ceiling tiles. Recycling may be available with manufacturer. Otherwise, priority shall be given to a local recycling organization. Recycling is not required if the tiles contain or may have been exposed to asbestos material.

3.1.12 Patching

Where removals leave holes and damaged surfaces exposed in the finished work, patch and repair these holes and damaged surfaces to match adjacent finished surfaces, using on-site materials when available. Where new work is to be applied to existing surfaces, perform removals and patching in a manner to produce surfaces suitable for receiving new work. Finished surfaces of patched area shall be flush with the adjacent existing surface and shall match the existing adjacent surface as closely as possible as to texture and finish. Patching shall be as specified and indicated, and shall include:

a. Concrete and Masonry: Completely fill holes and depressions, caused by previous physical damage or left as a result of removals in existing masonry walls to remain, with an approved masonry patching material, applied in accordance with the manufacturer's printed instructions.

b. Where existing partitions have been removed leaving damaged or missing resilient tile flooring, patch to match the existing floor tile.

c. Patch acoustic lay-in ceiling where partitions have been removed. The transition between the different ceiling heights shall be effected by continuing the higher ceiling level over to the first runner on the lower ceiling and closing the vertical opening with a painted sheet

metal strip.

3.1.13 Air Conditioning Equipment

Remove air conditioning, refrigeration, and other equipment containing refrigerants without releasing chlorofluorocarbon refrigerants to the atmosphere in accordance with the Clean Air Act Amendment of 1990. Recover all refrigerants prior to removing air conditioning, refrigeration, and other equipment containing refrigerants and dispose of in accordance with the paragraph entitled "Disposal of Ozone Depleting Substance (ODS)." Turn in salvaged Class I ODS refrigerants as specified in paragraph, "Salvaged Materials and Equipment."

3.1.14 Locksets on Swinging Doors

Remove all locksets from all swinging doors indicated to be removed and disposed of. Deliver the locksets and related items to a designated location for receipt by the Contracting Officer after removal.

3.1.15 Mechanical Equipment and Fixtures

Disconnect mechanical hardware at the nearest connection to existing services to remain, unless otherwise noted. Disconnect mechanical equipment and fixtures at fittings. Remove service valves attached to the unit. Salvage each item of equipment and fixtures as a whole unit; listed, indexed, tagged, and stored. Salvage each unit with its normal operating auxiliary equipment. Transport salvaged equipment and fixtures, including motors and machines, to a designated storage area as directed by the Contracting Officer. Do not remove equipment until approved. Do not offer low-efficiency equipment for reuse.

3.1.15.1 Preparation for Storage

Remove water, dirt, dust, and foreign matter from units; tanks, piping and fixtures shall be drained; interiors, if previously used to store flammable, explosive, or other dangerous liquids, shall be steam cleaned. Seal openings with caps, plates, or plugs. Secure motors attached by flexible connections to the unit. Change lubricating systems with the proper oil or grease.

3.1.15.2 Piping

Disconnect piping at unions, flanges and valves, and fittings as required to reduce the pipe into straight lengths for practical storage. Store salvaged piping according to size and type. If the piping that remains can become pressurized due to upstream valve failure, end caps, blind flanges, or other types of plugs or fittings with a pressure gage and bleed valve shall be attached to the open end of the pipe to ensure positive leak control. Carefully dismantle piping that previously contained gas, gasoline, oil, or other dangerous fluids, with precautions taken to prevent injury to persons and property. Store piping outdoors until all fumes and residues are removed. Box prefabricated supports, hangers, plates, valves, and specialty items according to size and type. Wrap sprinkler heads individually in plastic bags before boxing. Classify piping not designated for salvage, or not reusable, as scrap metal.

3.1.15.3 Ducts

Classify removed duct work as scrap metal.

3.1.15.4 Fixtures, Motors and Machines

Remove and salvage fixtures, motors and machines associated with plumbing, heating, air conditioning, refrigeration, and other mechanical system installations. Salvage, box and store auxiliary units and accessories with the main motor and machines. Tag salvaged items for identification, storage, and protection from damage. Classify broken, damaged, or otherwise unserviceable units and not caused to be broken, damaged, or otherwise unserviceable as debris to be disposed of by the Contractor. Salvage and crush porcelain plumbing fixtures unsuitable for reuse.

3.1.16 Electrical Equipment and Fixtures

Salvage motors, motor controllers, and operating and control equipment that are attached to the driven equipment. Salvage wiring systems and components. Box loose items and tag for identification. Disconnect primary, secondary, control, communication, and signal circuits at the point of attachment to their distribution system.

3.1.16.1 Fixtures

Remove and salvage electrical fixtures. Salvage unprotected glassware from the fixture and salvage separately. Salvage incandescent, mercury-vapor, and fluorescent lamps and fluorescent ballasts manufactured prior to 1978, boxed and tagged for identification, and protected from breakage.

3.1.16.2 Electrical Devices

Remove and salvage switches, switchgear, transformers, conductors including wire and nonmetallic sheathed and flexible armored cable, regulators, meters, instruments, plates, circuit breakers, panelboards, outlet boxes, and similar items. Box and tag these items for identification according to type and size.

3.1.16.3 Wiring Ducts or Troughs

Remove and salvage wiring ducts or troughs. Dismantle plug-in ducts and wiring troughs into unit lengths. Remove plug-in or disconnecting devices from the busway and store separately.

3.1.16.4 Conduit and Miscellaneous Items

Salvage conduit except where embedded in concrete or masonry. Consider corroded, bent, or damaged conduit as scrap metal. Sort straight and undamaged lengths of conduit according to size and type. Classify supports, knobs, tubes, cleats, and straps as debris to be removed and disposed.

3.2 CONCURRENT EARTH-MOVING OPERATIONS

Do not begin excavation, filling, and other earth-moving operations that are sequential to demolition or deconstruction work in areas occupied by structures to be demolished or deconstructed until all demolition and deconstruction in the area has been completed and debris removed. Fill holes, open basements and other hazardous openings.

3.3 DISPOSITION OF MATERIAL

3.3.1 Title to Materials

Except for salvaged items specified in related Sections, and for materials or equipment scheduled for salvage, all materials and equipment removed and not reused or salvaged, shall become the property of the Contractor and shall be removed from Government property. Title to materials resulting from demolition and deconstruction, and materials and equipment to be removed, is vested in the Contractor upon approval by the Contracting Officer of the Contractor's demolition, deconstruction, and removal procedures, and authorization by the Contracting Officer to begin demolition and deconstruction. The Government will not be responsible for the condition or loss of, or damage to, such property after contract award. Showing for sale or selling materials and equipment on site is prohibited.

3.3.2 Reuse of Materials and Equipment

Remove and store materials and equipment listed in the Demolition Plan to be reused or relocated to prevent damage, and reinstall as the work progresses. Coordinate the re-use of materials and equipment with the re-use requirements in accordance with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL. Capture re-use of materials in the diversion calculations for the project.

3.3.3 Salvaged Materials and Equipment

Remove materials and equipment that are listed in the Demolition Plan to be removed by the Contractor and that are to remain the property of the Government, and deliver to a storage site, as directed within 2 miles of the work site.

a. Salvage items and material to the maximum extent possible.

b. Store all materials salvaged for the Contractor as approved by the Contracting Officer and remove from Government property before completion of the contract. Coordinate the salvaged materials with tracking requirements in accordance with Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL. Capture salvaged materials in the diversion calculations for the project.

c. Remove salvaged items to remain the property of the Government in a manner to prevent damage, and packed or crated to protect the items from damage while in storage or during shipment. Items damaged during removal or storage must be repaired or replaced to match existing items. Properly identify the contents of containers.

d. Remove historical items in a manner to prevent damage. Deliver the following historical items to the Government for disposition: Corner stones, contents of corner stones, and document boxes wherever located on the site.

e. Remove and capture all Class I ODS refrigerants in accordance with the Clean Air Act Amendment of 1990, by shipping the refrigerant container to the Defense Logistics Agency at the following address:

Defense Depot Richmond VA (DDRV)
SW0400

Cylinder Operations
8000 Jefferson Davis Highway
Richmond, VA 23297-5900

3.3.4 Disposal of Ozone Depleting Substance (ODS)

Class I and Class II ODS are defined in Section, 602(a) and (b), of The Clean Air Act. Prevent discharge of Class I and Class II ODS to the atmosphere. Place recovered ODS in cylinders meeting AHRI Guideline K suitable for the type ODS (filled to no more than 80 percent capacity) and provide appropriate labeling. Recovered ODS shall be removed from Government property and disposed of in accordance with 40 CFR 82.

3.3.4.1 Special Instructions

No more than one type of ODS is permitted in each container. A warning/hazardous label shall be applied to the containers in accordance with Department of Transportation regulations. All cylinders including but not limited to fire extinguishers, spheres, or canisters containing an ODS shall have a tag with the following information:

a. Activity name and unit identification code

b. Activity point of contact and phone number

c. Type of ODS and pounds of ODS contained

d. Date of shipment

e. National stock number (for information, call (804) 279-4525).

3.3.5 Transportation Guidance

Ship all ODS containers in accordance with MIL-STD-129, DLA 4145.25 (also referenced one of the following: Army Regulation 700-68, Naval Supply Instruction 4440.128C, Marine Corps Order 10330.2C, and Air Force Regulation 67-12), 49 CFR 173.301, and DOD 4000.25-1-M.

3.3.6 Unsalvageable and Non-Recyclable Material

Dispose of unsalvageable and non-recyclable noncombustible material in the disposal area located off the project site.. Dispose of unsalvageable and non-recyclable combustible material in the sanitary fill area located off the site.

3.4 CLEANUP

Remove debris and rubbish from basement and similar excavations. Remove and transport the debris in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

3.5 DISPOSAL OF REMOVED MATERIALS

3.5.1 Regulation of Removed Materials

Dispose of debris, rubbish, scrap, and other nonsalvageable materials resulting from removal operations with all applicable federal, state and local regulations as contractually specified in the Waste Management Plan. Storage of removed materials on the project site is prohibited.

3.5.2 Burning on Government Property

Burning of materials removed from demolished and deconstructed structures will not be permitted on Government property .

3.5.3 Removal from Government Property

Transport waste materials removed from demolished and deconstructed structures, except waste soil, from Government property for legal disposal. Dispose of waste soil as directed.

3.6 REUSE OF SALVAGED ITEMS

Recondition salvaged materials and equipment designated for reuse before installation. Replace items damaged during removal and salvage operations or restore them as necessary to usable condition.

-- End of Section --

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SECTION 02 82 00

ASBESTOS REMEDIATION
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PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY OF 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 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. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2014) Safety and Health Requirements Manual

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 1926.51	Sanitation
29 CFR 1926.59	Hazard Communication
29 CFR 1926.103	Respiratory Protection
29 CFR 1926.200	Accident Prevention Signs and Tags
29 CFR 1926.1101	Asbestos
40 CFR 61	National Emission Standards for Hazardous Air Pollutants
40 CFR 61-SUBPART A	General Provisions
40 CFR 61-SUBPART M	National Emission Standard for Asbestos
40 CFR 763	Asbestos
42 CFR 84	Approval of Respiratory Protective Devices
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

U.S. NAVAL FACILITIES ENGINEERING COMMAND (NAVFAC)

ND OPNAVINST 5100.23	(2005; Rev G) Navy Occupational Safety and Health (NAVOSH) Program Manual

UNDERWRITERS LABORATORIES (UL)

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

1.2 DEFINITIONS

1.2.1 ACM

Asbestos Containing Materials.

1.2.2 Amended Water

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

1.2.3 Area Sampling

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.

1.2.4 Asbestos

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.

1.2.5 Asbestos Control Area

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.

1.2.6 Asbestos Fibers

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.

1.2.7 Asbestos Permissible Exposure Limit

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.

1.2.8 Authorized Person

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

1.2.9 Background

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.

1.2.10 Competent Person (CP)

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 or supervisor, or its equivalent.

1.2.11 Contractor

The Contractor is that individual, or entity under contract to perform the herein listed work.

1.2.12 Disposal Bag

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.

1.2.13 Disturbance

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.

1.2.14 Encapsulation

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

1.2.15 Encapsulants

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.

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

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

c. Penetrating Encapsulant (used to penetrate the asbestos containing material encapsulating all asbestos fibers and preventing fiber release due to routine mechanical damage)

d. Lock-Down Encapsulant (used to seal off or "lock-down" minute asbestos

fibers left on surfaces from which asbestos containing material has been removed).

1.2.16 Friable Asbestos Material

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.

1.2.17 Government Consultant (GC)

That qualified person employed directly by the Government to monitor, sample, inspect the work or in some other way advise the Contracting Officer. The GC is normally a private consultant, but can be an employee of the Government.

1.2.18 HEPA Filter Equipment

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.

1.2.19 Model Accreditation Plan (MAP)

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

1.2.20 Negative Pressure Enclosure (NPE)

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

1.2.21 NESHAP

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

1.2.22 Nonfriable Asbestos Material

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.

1.2.23 Permissible Exposure Limits (PELs)

1.2.23.1 PEL-Time Weighted Average(TWA)

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).

1.2.23.2 PEL-Excursion Limit

An airborne concentration of asbestos not in excess of 1.0 f/cc of air as

averaged over a sampling period of 30 minutes.

1.2.24 Personal Sampling

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.

1.2.25 Private Qualified Person (PQP)

That qualified person hired by the Contractor to perform the herein listed tasks.

1.2.26 Qualified Person (QP)

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, Contractor/Supervisor Abatement Worker, 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 QP must be qualified to perform visual inspections as indicated in ASTM E1368.

1.2.27 TEM

Refers to Transmission Electron Microscopy.

1.2.28 Time Weighted Average (TWA)

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

1.2.29 Wetting Agent

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.

1.2.30 Worker

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; accreditation, if required by the OSHA Class of work to be performed or by the state where the work is to be performed.

1.3 REQUIREMENTS

1.3.1 Description of Work

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 removal of the materials listed in Table 3 in this section, which is governed by 40 CFR 763 . Under normal conditions non-friable or chemically bound materials containing asbestos would not be considered hazardous; however, this material may release airborne asbestos fibers during demolition and removal and therefore must be handled in accordance with the removal and disposal procedures as specified herein. Provide negative pressure enclosure techniques as outlined in this specification. The work area will be evacuated during the asbestos abatement work. A competent person must supervise asbestos removal work as specified herein.

1.3.2 Unexpected Discovery of Asbestos

Notify the Contracting Officer if any previously untested building components suspected to contain asbestos are impacted by the work.

1.3.3 Medical Requirements

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

1.3.3.1 Medical Examinations

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."

1.3.3.2 Medical Records

Maintain complete and accurate records of employees' medical examinations, medical records, and exposure data for a period of 30 years after termination of employment and make records of the required medical examinations and exposure data available for inspection and copying to: The Assistant Secretary of Labor for Occupational Safety and Health (OSHA), or authorized representatives of them, and an employee's physician upon the request of the employee or former employee.

1.3.4 Employee Training

Submit certificates, prior to the start of work but after the main abatement submittal, signed by each employee indicating that the employee has received training in the proper handling of materials and wastes that contain asbestos in accordance with 40 CFR 763; understands the health implications and risks involved, including the illnesses possible from exposure to airborne asbestos fibers; understands the use and limits of the respiratory equipment to be used; and understands the results of monitoring of airborne quantities of asbestos as related to health and respiratory equipment as indicated in 29 CFR 1926.1101 on an initial and annual basis. Organize certificates by individual worker, not grouped by type of certification. Post appropriate evidence of compliance with the training requirements of 40 CFR 763. 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 Contracting Officer. Furnish each employee with respirator training and fit testing administered by the PQP as required by 29 CFR 1926.1101 and 29 CFR 1926.103. Fully cover engineering and other hazard control techniques and procedures.

1.3.5 Permits, Licenses, or Notifications

Prior to the start of work, obtain necessary permits and licenses 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 Contracting Officer in writing 10 working days prior to commencement of work in accordance with 40 CFR 61-SUBPART M. Notify the Contracting Officer and other appropriate Government agencies in writing 20 working days prior to the start of asbestos work as indicated in applicable laws, ordinances, criteria, rules, and regulations. Submit copies of all Notifications to the Contracting Officer.

1.3.6 Environment, Safety and Health Compliance

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 regarding handling, storing, transporting, and disposing of asbestos waste materials. Comply with the applicable requirements of the current issue of EM 385-1-1, 29 CFR 1926.1101, 40 CFR 61-SUBPART A, 40 CFR 61-SUBPART M, 40 CFR 763 and ND OPNAVINST 5100.23. 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 requirement as defined by the Government apply. The following laws, ordinances, criteria, rules and regulations regarding removal, handling, storing, transporting and disposing of asbestos materials apply:

a. EM 385-1-1

b. 29 CFR 1926.1101

c. 40 CFR 61, Subpart M and 40 CFR 763.

1.3.7 Respiratory Protection Program

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

1.3.7.1 Respirator Program Records

Submit records of the respirator program as required by 29 CFR 1926.103, and 29 CFR 1926.1101.

1.3.7.2 Respirator Fit Testing

The Contractor's PQP must conduct a qualitative or quantitative fit test conforming to 29 CFR 1926.103 for each worker required to wear a respirator, and any authorized visitors who enter a regulated area where respirators are required to be worn. A respirator fit test must be performed prior to initially wearing a respirator and every 12 months thereafter. If physical changes develop that will affect the fit, a new fit test must be performed. Functional fit checks must be performed each time a respirator is put on and in accordance with the manufacturer's recommendation.

1.3.7.3 Respirator Selection and Use Requirements

Provide respirators, and ensure that they are used as required by 29 CFR 1926.1101 and in accordance with CGA G-7 and the manufacturer's recommendations. Respirators must be approved by the National Institute for Occupational Safety and Health NIOSH, under the provisions of 42 CFR 84, for use in environments containing airborne asbestos fibers. For air-purifying respirators, the particulate filter must be high-efficiency particulate air (HEPA)/(N-,R-,P-100). The initial respirator selection and the decisions regarding the upgrading or downgrading of respirator type must be made by the Contractor's Designated IH based on the measured or anticipated airborne asbestos fiber concentrations to be encountered.

1.3.8 Asbestos Hazard Control Supervisor

The Contractor must be represented on site by a supervisor, trained using the model Contractor accreditation plan as indicated in the Federal statutes for all portions of the herein listed work.

1.3.9 Hazard Communication

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.

1.3.10 Asbestos Hazard Abatement Plan

Submit 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 in the removal of materials containing asbestos. The plan, not to be combined with other hazard abatement plans, must be prepared, signed, and sealed by the PQP. Provide a Table of Contents for each abatement submittal, which follows the sequence of requirements in the contract. The plan must include but not be limited to the precise personal protective equipment to be used including, but not limited to, respiratory protection, type of whole-body protection, the location of asbestos control areas including clean and dirty areas, buffer zones, showers, storage areas, change rooms, removal method, interface of trades involved in the construction, sequencing of asbestos related work, disposal plan, type of wetting agent and asbestos sealer to be used, locations of local exhaust equipment, planned air monitoring strategies, and a detailed description of the method to be employed in order to control environmental pollution. The plan must also include (both fire and medical emergency) response plans and an Activity Hazard Analyses (AHAs) in accordance with EM 385-1-1. The Asbestos Hazard Abatement Plan must be approved in writing prior to starting any asbestos work. The

Contractor, Asbestos Hazard Control Supervisor,, CP and PQP must meet with the Contracting Officer prior to beginning work, to discuss in detail the Asbestos Hazard Abatement Plan, including work procedures and safety precautions. Once approved by the Contracting Officer, the plan will be enforced as if an addition to the specification. Any changes required in the specification as a result of the plan must be identified specifically in the plan to allow for free discussion and approval by the Contracting Officer prior to starting work.

1.3.11 Testing Laboratory

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 selected holds the appropriate State license and permits and certification 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.

1.3.12 Landfill Approval

Submit written evidence that the landfill is approved for asbestos disposal by the U.S. Environmental Protection Agency, Region 3, Air Enforcement Section (38W12), and local regulatory agencies. Within three working days after delivery, submit detailed delivery tickets, prepared, signed, and dated by an agent of the landfill, certifying the amount 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.

1.3.13 Transporter Certification

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.

1.3.14 Medical Certification

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.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office

that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Amended Water; G

Safety Data Sheets (SDS) for All Materials; G

Encapsulants; G

Respirators; G

Local Exhaust Equipment; G

Pressure Differential Automatic Recording Instrument; G

Vacuums; G

SD-06 Test Reports

Air Sampling Results; G

Pressure Differential Recordings for Local Exhaust System; G

Clearance Sampling; G

Asbestos Disposal Quantity Report; G

SD-07 Certificates

Employee Training; G

Notifications; G

Respiratory Protection Program; G

Asbestos Hazard Abatement Plan; G

Testing Laboratory; G

Landfill Approval; G

Delivery Tickets; G

Waste Shipment Records; G

Transporter Certification; G

Medical Certification; G

Private Qualified Person Documentation; G

Designated Competent Person; G

Worker's License; G

Contractor's License; G

Federal, State or Local Citations on Previous Projects; G

Encapsulants; G

Equipment Used to Contain Airborne Asbestos Fibers; G

Water Filtration Equipment; G

Vacuums; G

Ventilation Systems; G

SD-11 Closeout Submittals

Permits and Licenses; G

Notifications; G

Respirator Program Records; G

Rental Equipment; G

1.5 QUALITY ASSURANCE

1.5.1 Private Qualified Person Documentation

Submit the name, address, and telephone number of the Private Qualified Person (PQP) selected to prepare the Asbestos Hazard Abatement Plan, direct monitoring and training, and documented evidence that the PQP has successfully completed training in and is accredited and where required is certified as, a Building Inspector, Contractor/Supervisor Abatement Worker, and Asbestos Project Designer as described by 40 CFR 763 and has successfully completed the National Institute of Occupational Safety and Health (NIOSH) 582 course "Sampling and Evaluating Airborne Asbestos Dust" or equivalent.. The PQP and the asbestos contractor must not have an employee/employer relationship or financial relationship which could constitute a conflict of interest. The PQP must be a first tier subcontractor.

1.5.2 Designated Competent Person Documentation

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, . The Designated Competent Person must be on-site at all times when asbestos abatement activities are underway.Submit training certification of a current Asbestos Contractor's and Supervisor's License. Submit evidence that the Designated Competent Person has a minimum of 2 years of on-the-job asbestos abatement experience relevant to OSHA designated competent person requirements. The Designated Competent Person must be a first tier subcontractor.

1.5.3 Worker's License

Submit documentation that workers meet the requirements of 29 CFR 1926.1101, 40 CFR 61-SUBPART M.

1.5.4 Contractor's License

Submit a copy of the asbestos contractor's license issued by the State of New York. Submit the following certification along with the license: "I certify that the personnel I am responsible for during the course of this project fully understand the contents of 29 CFR 1926.1101, 40 CFR 61-SUBPART MEM 385-1-1, and the Federal, State and local requirements for those asbestos abatement activities that they will be involved in." This certification statement must be signed by the Company's President or Chief Executive.

1.5.5 Air Sampling Results

Complete fiber counting and provide results to the PQP for review within 16 hours of the "time off" of the sample pump. Notify the Contracting Officer immediately of any airborne levels of asbestos fibers in excess of the acceptable limits. Submit sampling results to the Contracting Officer and the affected Contractor employees where required by law within three working days, signed by the testing laboratory employee performing air sampling, the employee that analyzed the sample, and the PQP. Notify the Contractor and the Contracting Officer immediately of any variance in the pressure differential which could cause adjacent unsealed areas to have asbestos fiber concentrations in excess of 0.01 fibers per cubic centimeter or background whichever is higher. In no circumstance must levels exceed 0.1 fibers per cubic centimeter.

1.5.6 Pressure Differential Recordings for Local Exhaust System

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 work day to the PQP for review and to the Contracting Officer within 24-hours from the end of each work day.

1.5.7 Federal, State or Local Citations on Previous Projects

Submit a statement, signed by an officer of the company, containing a record of any citations issued by Federal, State or local regulatory agencies relating to asbestos activities within the last 5 years (including projects, dates, and resolutions); 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.

1.5.8 Preconstruction Conference

Conduct a safety preconstruction conference to discuss the details of the Asbestos Hazard Abatement Plan, Accident Prevention Plan (APP) including the AHAs required in specification Section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS. The safety preconstruction conference must include the

Contractor and their Designated Competent Person, Designated IH and Project Supervisor and the Contracting Officer. Deficiencies in the APP will be discussed. Onsite work must not begin until the APP has been accepted.

1.6 SECURITY

Security must be provided for each regulated area. A log book must be kept documenting entry into and out of the regulated area. Entry into regulated areas must only be by personnel authorized by the Contractor and the Contracting Officer. Personnel authorized to enter regulated areas must be trained, medically evaluated, and wear the required personal protective equipment.

1.7 EQUIPMENT

1.7.1 Rental Equipment

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.

PART 2 PRODUCTS

2.1 ENCAPSULANTS

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.

2.1.1 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
Fire Resistance - Negligible affect on fire resistance rating over 3-hour test (Tested with fireproofing over encapsulant applied directly to steel member)	ASTM E119
Bond Strength: 100 pounds of force/foot	ASTM E736/E736M
(Tests compatibility with cementitious and fibrous fireproofing)	

2.2 DUCT TAPE

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

2.3 DISPOSAL CONTAINERS

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:

a. Disposal Bags

b. Fiberboard Drums

c. Cardboard Boxes

2.4 SHEET PLASTIC

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 or frosted and conform to ASTM D4397, except as specified below

2.4.1 Flame Resistant

Where a potential for fire exists, flame-resistant sheets must be provided. Film must be frosted and must conform to the requirements of NFPA 701.

2.4.2 Reinforced

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.

2.5 MASTIC REMOVING SOLVENT

Mastic removing solvent 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.

2.6 LEAK-TIGHT WRAPPING

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.

2.7 VIEWING INSPECTION WINDOW

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.

2.8 WETTING AGENTS

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.

PART 3 EXECUTION

3.1 EQUIPMENT

Provide the Contracting Officer or the Contracting Officer's Representative, with at least three complete sets of personal protective equipment as required for entry to and inspection of the asbestos control area. Provide equivalent training to the Contracting Officer or a designated representative as provided to Contractor 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.

The Contracting Officer will provide respiratory protection for Government personnel.

3.1.1 Air Monitoring Equipment

The Contractor's PQP must 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.

3.1.2 Respirators

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

3.1.2.1 Respirators for Handling Asbestos

Provide personnel engaged in pre-cleaning, cleanup, handling, encapsulation removal and 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.

3.1.3 Exterior Whole Body Protection

3.1.3.1 Outer Protective Clothing

Provide personnel exposed to asbestos with disposable "non-breathable," 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.

3.1.3.2 Personal Decontamination Unit

Provide a temporary, negative pressure unit with a separate decontamination locker room and clean locker room with a shower that complies with 29 CFR 1926.51(f)(4)(ii) through (V) in between for personnel required to wear whole body protective clothing. Keep street clothing and street shoes in the clean locker. HEPA vacuum and remove asbestos contaminated disposable protective clothing while still wearing respirators at the boundary of the asbestos work area and seal in impermeable bags or containers for disposal. Do not wear work clothing between home and work. Locate showers between the decontamination locker room and the clean locker room and require that all employees shower before changing into street clothes. Collect used shower water and filter with approved water filtration equipment to remove asbestos contamination. Wastewater filters must be installed in series with the first stage pore size 20 microns and the second stage pore size of 5 microns. Dispose of filters and residue as asbestos waste. Discharge clean water to the sanitary system. Dispose of asbestos contaminated work clothing as asbestos contaminated waste. Keep the floor of the decontamination unit's clean room dry and clean at all times. Proper housekeeping and hygiene requirements must be maintained. Provide soap and towels for showering, washing and drying. Cloth towels provided must be disposed of as ACM waste or must be laundered in accordance with 29 CFR 1926.1101. Physically attach the decontamination units to the asbestos control area. Construct both a personnel decontamination unit and an equipment decontamination unit onto and integral with each asbestos control area.

3.1.3.3 Eye Protection

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.

3.1.4 Regulated Areas

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.

3.1.5 Load-out Unit

Provide a temporary load-out unit that is adjacent and connected to the regulated area. Attach the load-out unit in a leak-tight manner to each regulated area.

3.1.6 Warning Signs and Labels

Provide bilingual warning signs printed in English and Spanish 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. 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

3.1.6.1 Warning Sign

Provide vertical format conforming to 29 CFR 1926.200, and 29 CFR 1926.1101 minimum 20 by 14 inches displaying the following legend in the lower panel:

Legend	Notation
DANGER	one inch Sans Serif Gothic or Block
ASBESTOS	one inch Sans Serif Gothic or Block
MAY CAUSE CANCER	one inch Sans Serif Gothic or Block
CAUSES DAMAGE TO LUNGS	1/4 inch Sans Serif Gothic or Block
AUTHORIZED PERSONNEL ONLY	1/4 inch Sans Serif Gothic or Block
WEAR RESPIRATORY PROTECTION AND PROTECTIVE CLOTHING IN THIS AREA	1/4 inch Sans Serif Gothic or Block

Spacing between lines must be at least equal to the height of the upper of any two lines.

3.1.6.2 Warning Labels

Provide labels conforming to 29 CFR 1926.1101 of sufficient size to be clearly legible, displaying the following legend:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST AVOID CREATING DUST

3.1.7 Local Exhaust System

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 and remote from any public access or ventilation system intakes.

3.1.8 Tools

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.

3.1.9 Rental Equipment

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.

3.1.10 Single Stage Decontamination Area

A decontamination area (equipment room/area) must be provided for Class I work involving less than 25 feet or 10 square feet of TSI or surfacing ACM, and for Class II and Class III asbestos work operations where exposures exceed the PELs or where there is no negative exposure assessment. The equipment room or area must be adjacent to the regulated area for the decontamination of employees, material, and their equipment which could be contaminated with asbestos. The area must be covered by an impermeable drop cloth on the floor or horizontal working surface. The

area must be of sufficient size to accommodate cleaning of equipment and removing personal protective equipment without spreading contamination beyond the area.

3.1.11 Decontamination Area Exit Procedures

Ensure that the following procedures are followed:

a. Before leaving the regulated area, remove all gross contamination and debris from work clothing using a HEPA vacuum.

b. Employees must remove their protective clothing in the equipment room and deposit the clothing in labeled impermeable bags or containers for disposal or laundering.

c. Employees must not remove their respirators until showering.

d. Employees must shower prior to entering the clean room. If a shower has not been located between the equipment room and the clean room or the work is performed outdoors, ensure that employees engaged in Class I asbestos jobs: a) Remove asbestos contamination from their work suits in the equipment room or decontamination area using a HEPA vacuum before proceeding to a shower that is not adjacent to the work area; or b) Remove their contaminated work suits in the equipment room, without cleaning worksuits, and proceed to a shower that is not adjacent to the work area.

3.2 WORK PROCEDURE

Perform asbestos related work in accordance with 29 CFR 1926.1101, 40 CFR 61-SUBPART M, and as specified herein. Use wet removal procedures followed by 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 cosmeticsis permitted in the asbestos work or control areas. Personnel of other trades not engaged in the removal 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. Shut down the building heating, ventilating, and air conditioning system, cap the openings to the system, 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 wet removal is performed and provide temporary electrical service with verifiable ground fault circuit interrupter (GFCI) protection prior to the use of any water and encapsulant. All electrical work must be performed by a licensed electrician. Stop abatement work in the regulated area immediately when the airborne total fiber concentration: (1) equals or exceeds 0.01 f/cc, or the pre-abatement concentration, whichever is greater, outside the regulated area; or (2) equals or exceeds 1.0 f/cc inside the regulated area. Correct the condition to the satisfaction of the Contracting Officer, including visual inspection and air sampling. Work must resume only upon notification by the Contracting Officer. Corrective actions must be documented. If an asbestos fiber release or spill occurs outside of the asbestos control area, stop work immediately, correct the condition to the satisfaction of the Contracting Officer including clearance sampling, prior to resumption of work.

3.2.1 Building Ventilation System and Critical Barriers

Building ventilation system supply and return air 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 and 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 and covered with 2 layers of polyethylene. 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.

3.2.2 Protection of Existing Work to Remain

Perform work without damage or contamination of adjacent work. Where such work is damaged or contaminated as verified by the Contracting Officer using visual inspection or sample analysis, it must be restored to its original condition or decontaminated by the Contractor at no expense to the Government as deemed appropriate by the Contracting Officer. 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 PQP work may proceed at the discretion of the Contracting Officer.

3.2.3 Furnishings

Furniture and equipment will be removed from the area of work by the Government before asbestos work begins.

3.2.4 Precleaning

Wet wipe and HEPA vacuum all surfaces potentially contaminated with asbestos prior to establishment of an enclosure.

3.2.5 Asbestos Control Area Requirements

3.2.5.1 Negative Pressure Enclosure

Removal of asbestos-containing material require the use of a negative pressure enclosure. Block and seal openings in areas where the release of airborne asbestos fibers can be expected. Establish an asbestos negative pressure enclosure with the use of curtains, portable partitions, or other enclosures in order to prevent the escape of asbestos fibers from the contaminated asbestos work area. Negative pressure enclosure development must include protective covering of uncontaminated walls, and ceilings with a continuous membrane of two layers of minimum 6-mil plastic sheet sealed with tape to prevent water or other damage. Provide two layers of 6-mil plastic sheet over floors and extend a minimum of 12 inches up walls. Seal all joints with tape. Provide local exhaust system in the asbestos control area. Openings will be allowed in enclosures of asbestos

control areas for personnel and equipment entry and exit, the supply and exhaust of air for the local exhaust system and the removal of properly containerized asbestos containing materials. Replace local exhaust system filters as required to maintain the efficiency of the system.

3.2.5.2 Regulated Area for Class II Removal

Removal of asbestos containing fire doors, are Class II removal activities. 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 area except local exhaust. A detached decontamination system may be used. Third-party IH shall conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work area and abatement Contractor shall conduct personal samples of each worker engaged in the work. If the airborne fiber concentration of the designated limits at any time exceeds background or 0.01 fibers per cubic centimeter, whichever is greater, stop work immediately and correct the situation.

3.2.6 Removal Procedures

Wet asbestos material with a fine spray of amended water during removal, cutting, or other handling so as to reduce the emission of airborne fibers. Remove material and immediately place in 6 mil plastic disposal bags. Remove asbestos containing material in a gradual manner, with continuous application of the amended water or wetting agent in such a manner that no asbestos material is disturbed prior to being adequately wetted. Where unusual circumstances prohibit the use of 6 mil plastic bags, submit an alternate proposal for containment of asbestos fibers to the Contracting Officer for approval. For example, in the case where both piping and insulation are to be removed, the Contractor may elect to wet the insulation, wrap the pipes and insulation in plastic and remove the pipe by sections. Containerize asbestos containing material while wet. Do not allow asbestos material to accumulate or become dry. Lower and otherwise handle asbestos containing material as indicated in 40 CFR 61-SUBPART M.

3.2.6.1 Sealing Contaminated Items Designated for Disposal

Remove contaminated architectural, mechanical, and electrical appurtenances such as venetian blinds, full-height partitions, carpeting, duct work, pipes and fittings, radiators, light fixtures, conduit, panels, and other contaminated items designated for removal by completely coating the items with an asbestos lock-down encapsulant at the demolition site before removing the items from the asbestos control area. These items need not be vacuumed. The asbestos lock-down encapsulant must be tinted a contrasting color and spray-applied by airless method. Thoroughness of sealing operation must be visually gauged by the extent of colored coating on exposed surfaces. Lock-down encapsulants must comply with the performance requirements specified herein.

3.2.7 Methods of Compliance

3.2.7.1 Mandated Practices

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:

a. Vacuum cleaners equipped with HEPA filters.

b. 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.

c. Prompt clean-up and disposal.

d. Inspection and repair of polyethylene.

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

3.2.7.2 Control Methods

Use the following control methods:

a. Local exhaust ventilation equipped with HEPA filter;

b. Enclosure or isolation of processes producing asbestos dust;

c. 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.

3.2.7.3 Unacceptable Practices

The following work practices must not be used:

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

b. 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.

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

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

3.2.8 Class I Work Procedures

In addition to requirements of paragraphs MANDATED PRACTICES and CONTROL METHODS, the following engineering controls and work practices must be used:

a. A Competent Person must supervise the installation and operation of the control methods.

b. For jobs involving the removal of more than 25 feet or 10 square feet of TSI or surfacing material, place critical barriers over all openings to the regulated area.

c. HVAC systems must be isolated in the regulated area by sealing with a double layer of plastic or air-tight rigid covers.

d. Impermeable dropcloths (6 mil or greater thickness) must be placed on surfaces beneath all removal activity.

e. Where a negative exposure assessment has not been provided or where exposure monitoring shows the PEL was exceeded, the regulated area must be ventilated with a HEPA unit and employees must use PPE.

3.2.9 Specific Control Methods for Class I Work

Use Class I work procedures, control methods and removal methods for the following ACM:

a. Spray Applied Fireproofing (vermiculite)

b. Plaster and Textured Ceilings and Walls

3.2.9.1 Negative Pressure Enclosure (NPE) System

The system must provide at least four air changes per hour inside the containment. The local exhaust unit equipment must be operated 24-hours per day until the containment is removed. The NPE must be smoke tested for leaks at the beginning of each shift and be sufficient to maintain a minimum pressure differential of minus 0.02 inch of water column relative to adjacent, unsealed areas. Pressure differential must be monitored continuously, 24-hours per day, with an automatic manometric recording instrument and Records must be provided daily on the same day collected to the Contracting Officer. The Contracting Officer must be notified immediately if the pressure differential falls below the prescribed minimum. The building ventilation system must not be used as the local exhaust system for the regulated area. The NPE must terminate outdoors unless an alternate arrangement is allowed by the Contracting Officer. All filters used must be new at the beginning of the project and must be periodically changed as necessary and disposed of as ACM waste.

3.2.9.2 Mini-Enclosure

Mini-containment (small walk-in enclosure) to accommodate no more than two persons, may be used 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.

3.2.9.3 Class I Removal Method

Class I ACM must be removed using a control method described above. Prepare work area as previously specified. Establish designated limits for the asbestos regulated work area with the use of red barrier tape, critical barriers, signs, and maintain all other requirements for asbestos control area. Spread one layer of 6-mil seamless plastic sheeting on the floor below the work area. Remove ACM plaster ceilings or walls using mechanical means and adequately wet methods and immediately place into 6-mil thickness disposal bag. Make every effort to keep the material from falling to the floor of the work area. Continue wet cleaning until surfaces are free of visible debris. Remove ACM textured ceiling finish using a scraper and wet methods and immediately place into 6-mil thickness disposal bag. Floors are considered contaminated from fallen textured ceiling finish. Clean up debris on floor and dispose of carpet as asbestos contaminated material. After removal of the material use a wire brush to clean the exposed ceiling to remove residual material. Continue

wet cleaning until surfaces are free of visible debris. Bag all asbestos debris which has fallen to the floor as asbestos-containing debris. Place all debris in plastic disposal bags of 6-mil minimum thickness. Once the material is in the disposal bag, apply additional water as needed to achieve "adequately wet" conditions for NESHAP compliance. Place bagged asbestos waste under negative pressure with the use of a HEPA vacuum, goose neck and duck tape to seal the bag, wash to remove any visible contamination and place into a second 6-mil minimum thickness disposal bag. Containerize asbestos containing waste while wet. Lower and otherwise handle asbestos containing materials as indicated in 40 CFR 61-SUBPART M. Conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work area and conduct personal samples of each worker engaged in the work. If the quantity of airborne asbestos fibers monitored at the breathing zone of the workers or the designated limits at any time exceeds background or 0.01 fibers per cubic centimeter, whichever is greater, stop work, and immediately correct the situation.

3.2.10 Class II Work Procedures

In addition to the requirements of paragraphs MANDATED PRACTICES and CONTROL METHODS, the following engineering controls and work practices must be used:

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.

3.2.11 Specific Control Methods for Class II Work

3.2.11.1 Suspect Fire Doors

Establish designated limits for the asbestos regulated work area with the use of red barrier tape, critical barriers, signs, and maintain all other requirements for asbestos control area except local exhaust. A detached decontamination system may be used. Spread 6-mil plastic sheeting on the ground beneath the work area and around the perimeter of the work area extending out in all directions. Remove door intact from hinges and wrap with 6-mil plastic sheeting. Inspect the interior areas of the door to determine if ACM is present. If ACM is not present the door may be disposed of as general construction debris. If ACM is present place whole door in enclosed container for disposal. Conduct area monitoring of airborne fibers during the work shift at the designated limits of the asbestos work area and conduct personal samples of each worker engaged in the work. If the airborne fiber concentration of the workers or designated limits at any time exceeds background or 0.01 fibers per cubic centimeter, whichever is greater, stop work immediately and correct the situation.

3.2.12 Air Sampling

Perform sampling of airborne concentrations of asbestos fibers in accordance with 29 CFR 1926.1101, the Contractor's air monitoring plan and as specified herein. Sampling performed in accordance with 29 CFR 1926.1101 must be performed by the PQP. Sampling performed for

environmental and quality control reasons must be performed by the PQP. Unless otherwise specified, use NIOSH Method 7400 for sampling and analysis. Monitoring may be duplicated by the Government at the discretion of the Contracting Officer. If the air sampling results obtained by the Government differ from those results obtained by the Contractor, the Government will determine which results predominate. Results of breathing zone samples must be posted at the job site and made available to the Contracting Officer. Submit all documentation regarding initial exposure assessments, negative exposure assessments, and air-monitoring results.

3.2.12.1 Sampling Prior to Asbestos Work

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

3.2.12.2 Sampling During Asbestos Work

Typically the abatement contractor is responsible for their own OHSA personal sampling. The PQP must provide personal and area sampling as indicated in 29 CFR 1926.1101 and governing environmental regulations. Breathing zone samples must be taken for at least 25 percent of the workers in each shift, or a minimum of two, whichever is greater. Air sample fiber counting must be completed and results provided within 24-hours (breathing zone samples), and 48 hours (environmental/clearance monitoring) after completion of a sampling period. In addition, provided the same type of work is being performed, provide area sampling at least once every work shift close to the work inside the enclosure, outside the clean room entrance to the enclosure, and at the exhaust opening of the local exhaust system. If sampling outside the enclosure shows airborne levels have exceeded background or 0.01 fibers per cubic centimeter, whichever is greater, stop all work, correct the condition(s) causing the increase, and notify the Contracting Officer immediately. Where alternate methods are used, perform personal and area air sampling at locations and frequencies that will accurately characterize the evolving airborne asbestos levels. The written results must be signed by testing laboratory analyst, testing laboratory principal and the Contractor's PQP. The air sampling results must be documented on a Contractor's daily air monitoring log.

3.2.12.3 Final Clearance Requirements, NIOSH PCM Method

For PCM sampling and analysis using NIOSH NMAM Method 7400, the fiber concentration inside the abated regulated area, for each airborne sample, must be less than 0.01 f/cc. The abatement inside the regulated area is considered complete when every PCM final clearance sample is below the clearance limit. If any sample result is greater than 0.01 total f/cc, the asbestos fiber concentration (asbestos f/cc) must be confirmed from that same filter using NIOSH NMAM Method 7402 (TEM) at Contractor's expense. If any confirmation sample result is greater than 0.01 asbestos f/cc, abatement is incomplete and cleaning must be repeated at the Contractor's expense. Upon completion of any required recleaning, resampling with results to meet the above clearance criteria must be done at the Contractor's expense.

3.2.12.4 Air Clearance Failure

If clearance sampling results fail to meet the final clearance requirements, pay all costs associated with the required recleaning, resampling, and analysis, until final clearance requirements are met.

3.2.13 Lock-Down

Prior to removal of plastic barriers and after pre-clearance clean up of gross contamination, the PQP or GC must conduct a visual inspection of all areas affected by the removal in accordance with ASTM E1368. Inspect for any visible fibers. The exposed areaincludes but is not limited to plastic barriers, furnishings and articles to be discarded as well as dirty change room, air locks for bag removal and decontamination chambers.

3.2.14 Site Inspection

While performing asbestos engineering control work, the Contractor must be subject to on-site inspection by the Contracting Officer who may be assisted by or represented by safety or industrial hygiene personnel. If the work is found to be in violation of this specification, the Contracting Officer or his representative 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.

3.3 CLEAN-UP AND DISPOSAL

3.3.1 Housekeeping

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 work-site, and final clean-up is completed, the Contracting Officer 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 Contracting Officer 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 Contracting Officer must agree that the area is safe in writing before unrestricted entry will be permitted. The Government must have the option to perform monitoring to determine if the areas are safe before entry is permitted.

3.3.2 Title to Materials

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.

3.3.3 Disposal of Asbestos

3.3.3.1 Procedure for Disposal

Coordinate all waste disposal manifests with the Contracting Officer and West Point Environmental. Collect asbestos waste, contaminated waste water 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). Wastes within the containers must be adequately wet in accordance with 40 CFR 61-SUBPART M. Affix a warning and Department of Transportation (DOT) label to each container including the bags or use at least 6 mils 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. 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 Government 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 Contracting Officer or his authorized representative. Comply with 40 CFR 61-SUBPART M, State, regional, and local standards for hauling and disposal. 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.

3.3.3.2 Asbestos Disposal Quantity Report

Direct the PQP to record and report, to the Contracting Officer, 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 linear feet or square feet as described initially in this specification and in cubic feet for the amount of asbestos containing material released for disposal.

-- End of Section --

SECTION 02 83 00

LEAD REMEDIATION
11/18

PART 1 GENERAL

Refer to Hazardous Materials survey report attached at the end of this section which was prepared by the Oak Group Inc. under a separate contract.

1.1 REFERENCES

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

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

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

ASTM INTERNATIONAL (ASTM)

ASTM E1613	(2012) Standard Test Method for Determination of Lead by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), or Graphite Furnace Atomic Absorption Spectrometry (GFAAS) Techniques
ASTM E1644	(2017) Standard Practice for Hot Plate Digestion of Dust Wipe Samples for the Determination of Lead
ASTM E1792	(2020) Standard Specification for Wipe Sampling Materials for Lead in Surface Dust

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

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

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2014) Safety and Health Requirements Manual

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 1910.1025	Lead

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
29 CFR 1926.1126	Chromium
29 CFR 1926.1127	Cadmium
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
40 CFR 745	Lead-Based Paint Poisoning Prevention in Certain Residential Structures
49 CFR 172	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR 178	Specifications for Packagings

U.S. NAVAL FACILITIES ENGINEERING COMMAND (NAVFAC)

ND OPNAVINST 5100.23	(2005; Rev G) Navy Occupational Safety and Health (NAVOSH) Program Manual

UNDERWRITERS LABORATORIES (UL)

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

1.2 DEFINITIONS

1.2.1 Abatement

Measures defined in 40 CFR 745, Section 223, designed to permanently eliminate lead-based paint hazards.

1.2.2 Action Level

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; to an airborne concentration of cadmium of 2.5 micrograms per cubic meter of air averaged over an 8-hour period; to an airborne concentration of chromium (VI) of 2.5 micrograms per cubic meter of air averaged over an 8-hour period.

1.2.3 Area Sampling

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

1.2.4 Cadmium Permissible Exposure Limit (PEL)

Five micrograms per cubic meter of air as an 8-hour time weighted average as determined by 29 CFR 1926.1127. If an employee is exposed for more than 8-hours in a work day, determine the PEL by the following formula:

PEL (micrograms/cubic meter of air) = 40/No. hrs worked per day

1.2.5 Certified Industrial Hygienist (CIH)

As used in this section refers to a person retained by the Contractor who is certified as an industrial hygienist and who is trained in the recognition and control of lead, cadmium and chromium hazards in accordance with current federal, State, and local regulations. CIH must be certified for comprehensive practice by the American Board of Industrial Hygiene. The Certified Industrial Hygienist must be independent of the Contractor and must have no employee or employer relationship which could constitute a conflict of interest.

1.2.6 Chromium Permissible Exposure Limit (PEL)

Five micrograms per cubic meter of air as an 8-hour time weighted average as determined by 29 CFR 1926.1126. If an employee is exposed for more than 8-hours in a work day, determine the PEL by the following formula:

PEL (micrograms/cubic meter of air) = 40/No. hrs worked per day

1.2.7 Competent Person (CP)

As used in this section, refers to a person employed by the Contractor who is trained in the recognition and control of lead, cadmium and chromium hazards in accordance with current federal, State, and local regulations and has the authority to take prompt corrective actions to control the lead, cadmium and chromium hazard. The Contractor may provide more than one CP as required to supervise and monitor the work. The CP must be a Certified Industrial Hygienist (CIH) certified by the American Board of Industrial Hygiene or a Certified Safety Professional (CSP) certified by the Board of Certified Safety Professionals.

1.2.8 Contaminated Room

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

1.2.9 Deleading

Activities conducted by a person who offers to eliminate lead-based paint or lead-based paint hazards or paints containing cadmium/chromium or to plan such activities in commercial buildings, bridges or other structures.

1.2.10 Eight-Hour Time Weighted Average (TWA)

Airborne concentration of lead, cadmium, chromium to which an employee is exposed, averaged over an 8-hour workday as indicated in 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127.

1.2.11 High Efficiency Particulate Air (HEPA) Filter Equipment

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

1.2.12 Lead

Metallic lead, inorganic lead compounds, and organic lead soaps. Excludes other forms of organic lead compounds. The use of the term Lead in this section also refers to paints which contain detectable concentrations of Cadmium and Chromium. For the purposes of the section lead-based paint (LBP) and paint with lead (PWL) also contains cadmium and chromium.

1.2.13 Lead-Based Paint (LBP)

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

1.2.14 Lead-Based Paint Activities

Any activities to support demolition which may produce airbourne concentrations of lead above the PEL.

1.2.15 Lead-Based Paint Hazards

Paint-lead hazard, dust-lead hazard or soil-lead hazard as identified in 40 CFR 745, Section 65. Any condition that causes exposure to lead from lead-contaminated dust, lead-contaminated soil, lead-based paint that is

deteriorated or present in accessible surfaces, friction surfaces, or impact surfaces that would result in adverse human health effects.

1.2.16 Lead, Cadmium, Chromium Control Area

A system of control methods to prevent the spread of lead, cadmium, chromium 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.

1.2.17 Lead Permissible Exposure Limit (PEL)

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 work day, determine the PEL by the following formula:

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

1.2.18 Material Containing Lead/Paint with Lead (MCL/PWL)

Any material, including paint, which contains lead as determined by the testing laboratory using a valid test method. The requirements of this section does 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 (usually 0.01 percent). An X-Ray Fluorescence (XRF) instrument is not considered a valid test method for low levels of lead (below 1.0 milligrams per centimeter squared) but can be used to identify levels of lead greater than 1.0 milligrams per centimeter squared.

1.2.19 Personal Sampling

Sampling of airborne lead, cadmium, chromium concentrations within the breathing zone of an employee to determine the 8-hour time weighted average concentration in accordance with 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127. 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.

1.2.20 Physical Boundary

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

1.3 DESCRIPTION

Construction activities impacting PWL or material containing lead, cadmium, chromium which are covered by this specification include the demolition or removal of material containing lead, cadmium, and chromium. 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 the hazard abatement activities.

1.3.1 Protection of Existing Areas To Remain

Project work including, but not limited to, lead, cadmium, chromium hazard abatement work, 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.

1.3.2 Coordination with Other Work

Coordinate with work being performed in adjacent areas to ensure there are no exposure issues. Explain coordination procedures in the Lead, Cadmium, Chromium Compliance Plan and describe how the Contractor will prevent lead, cadmium and chromium exposure to other contractors and Government personnel performing work unrelated to lead, cadmium and chromium activities.

1.3.3 Sampling and Analysis

Submit a log of the analytical results from sampling conducted during the abatement. Keep the log of results current with project activities and brief the results to the Contracting Officer as analytical results are reported.

1.3.3.1 Air Sampling and Analysis

Perform area and personnel monitoring in accordance with OSHA standard 29 CFR 1910.1025 and 29 CFR 1926.33 if air sample results exceed the PEL of 50 ug/m, then it is recommended to collect clearance dust wipe samples.

1.3.3.2 Dust Wipe Materials, Sampling and Analysis

Sampling must conform to ASTM E1792. Analysis must conform to ASTM E1613 or ASTM E1644.

1.3.3.3 Clearance Monitoring

a. Collect dust wipe samples inside the lead, cadmium and chromium hazard control area after the final visual inspection in the quantities and at the locations specified.

    (1) Floors <40.
    (2) Interior Window Sills <250.
    (3) Window Troughs <400.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Competent Person Qualifications; G

Training Certification; G

Medical Examinations; G

Lead, Cadmium, Chromium Waste Management Plan; G

Licenses, Permits and Notifications; G

Lead, Cadmium, Chromium Compliance Plan; G

Initial Sample Results; G

Written Evidence of TSD Approval; G

SD-03 Product Data

Respirators; G

Vacuum Filters; G

Negative Air Pressure System; G

Materials and Equipment; G

Expendable Supplies; G

Local Exhaust Equipment; G

Pressure Differential Automatic Recording Instrument; G

Pressure Differential Log; G

SD-06 Test Reports

Sampling and Analysis; G

Sampling Results; G

Pressure Differential Recordings For Local Exhaust System; G

SD-07 Certificates

Testing Laboratory; G

Third Party Consultant Qualifications; G

Notification of the Commencement of LBP Hazard Abatement; G

Clearance Certification; G

SD-11 Closeout Submittals

Hazardous Waste Manifest; G

Turn-In Documents or Weight Tickets; G

1.5 QUALITY ASSURANCE

1.5.1 Qualifications

1.5.1.1 Competent Person (CP)

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), Chromium standard (29 CFR 1926.1126), Cadmium standard (29 CFR 1926.1127) which shows ability to assess occupational and environmental exposure to lead, cadmium, chromium; experience with the use of respirators, personal protective equipment and other exposure reduction methods to protect employee health. Demonstrate a minimum of 3 years experience implementing OSHA's Lead in Construction standard (29 CFR 1926.62), Chromium standard (29 CFR 1926.1126), and Cadmium standard (29 CFR 1926.1127). Submit proper documentation that the CP is trained in accordance with federal, State and local laws..

1.5.1.2 Training Certification

Submit a certificate for each worker and supervisor if required, signed and dated by the accredited training provider, stating that the employee has received the required lead, cadmium and chromium training specified in 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127 40 CFR 745 and is certified to perform or supervise deleading, lead removal or demolition activities.

1.5.1.3 Testing Laboratory

Submit the name, address, and telephone number of the testing laboratory selected to perform the air wipe analysis, testing, and reporting of airborne concentrations of lead, cadmium and chromium. 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.

1.5.1.4 Third Party Consultant Qualifications

Submit the name, address and telephone number of the third party consultant selected to perform the wipe sampling for determining concentrations of lead, cadmium and chromium in dust. Submit proper documentation that the consultant is trained and certified as an inspector technician or inspector/risk assessor by the USEPA authorized State (or local) certification and accreditation program.

1.5.1.5 Certified Risk Assessor

The Certified Risk Assessor must be certified pursuant to 40 CFR 745, Section 226 and be responsible to perform the clearance sampling, clearance sample data evaluation and summarize clearance sampling results in a section of the abatement report. The risk assessor must sign the abatement report to indicate clearance requirements for the contract have been met.

1.5.2 Requirements

1.5.2.1 Competent Person (CP) Responsibilities (if needed for any containments)

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

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

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

d. Perform (or oversee performance of) air sampling. 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, cadmium, chromium control area, take clearance wipe samples if necessary; review clearance sample results and make recommendations for further cleaning.

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

i. The CP must be certified pursuant to 40 CFR 745, Section 226 and is responsible for development and implementation of the occupant protection plan, the abatement report and supervise lead, cadmium and chromium hazard abatement work activities.

1.5.2.2 Lead, Cadmium, Chromium Compliance Plan

Submit a detailed job-specific plan of the work procedures to be used in the disturbance of lead, cadmium and chromium, LBP/PWL or MCL. Include in the plan a sketch showing the location, size, and details of lead, cadmium, chromium 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, cadmium, chromium is emitted. Include in the plan, eating, drinking, smoking, hygiene facilities and sanitary procedures, interface of trades, sequencing of lead, cadmium, chromium related work, collected waste water and dust containing lead, cadmium, chromium and debris, air sampling, respirators, personal protective equipment, and a detailed description of the method of containment of the operation to ensure that lead, cadmium, chromium is not released outside of the lead, cadmium, chromium 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 multicontractor worksites to inform affected employees and to clarify

responsibilities to control exposures.

1.5.2.3 Medical Examinations (needed only if abatement occurs)

Submit pre-work blood lead levels and post-work blood lead levels for all workers performing lead, cadmium, chromium activities during the execution of the work. Initial medical surveillance as required by 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127 must be made available to all employees exposed to lead, cadmium, chromium 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, cadmium and chromium in excess of the action level for more than 30 days a year or as required by 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127. Adequate records must show that employees meet the medical surveillance requirements of 29 CFR 1926.33, 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127 and 29 CFR 1926.103. Provide medical surveillance to all personnel exposed to lead, cadmium, chromium as indicated in 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127. Maintain complete and accurate medical records of employees for the duration of employment plus 30 years.

1.5.2.4 Training (contingent on the need for abatement)

Train each employee performing work that disturbs lead, cadmium, chromium, 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, 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127, 40 CFR 745 and local regulations where appropriate.

1.5.2.5 Respiratory Protection Program

a. Provide each employee required to wear a respirator a respirator fit test at the time of initial fitting and at least annually thereafter as required by 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127.

b. Establish and implement a respiratory protection program as required by 29 CFR 1926.103, 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127 and 29 CFR 1926.55.

1.5.2.6 Hazard Communication Program

Establish and implement a Hazard Communication Program as required by 29 CFR 1926.59.

1.5.2.7 Lead, Cadmium, Chromium Waste Management

The Lead, Cadmium, Chromium Waste Management Plan must comply with applicable requirements of federal, State, and local hazardous waste regulations and address:

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

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

c. 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 State (in accordance with NY) and local hazardous waste permit applications permits manifests and USEPA Identification numbers.

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

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

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

g. 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.

h. Include any process that may alter or treat waste rendering a hazardous waste non hazardous.

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

1.5.2.8 Environmental, Safety and Health Compliance

In addition to the detailed requirements of this specification, comply with laws, ordinances, rules, and regulations of federal, State, and local authorities regarding lead, cadmium and chromium. Comply with the applicable requirements of the current issue of 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127, EM 385-1-1, ND OPNAVINST 5100.23. Submit matters regarding interpretation of standards to the Contracting Officer for resolution before starting work. Where specification requirements and the referenced documents vary, the most stringent requirements apply. The following local and State laws, ordinances, criteria, rules and regulations regarding removing, handling, storing, transporting, and disposing of lead, cadmium and chromium-contaminated materials apply:

a. New York Regulations. NYCRR Title X, Part 67

Licensing and certification in the state of New York is required.

1.5.3 Pressure Differential Recordings for Local Exhaust System (for abatement)

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, cadmium, chromium control area is removed. Submit pressure differential recordings for each work day to the PQP or GC for review and to the Contracting Officer within 24-hours from the end of each work day.

1.5.4 Licenses, Permits and Notifications (if abatement occurs)

Certify and submit in writing to the Regional Office of the EPA, state's environmental protection agency responsible for lead hazard abatement activities, DOH, and the Contracting Officer at least 10 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 are included in the contract price.

1.5.5 Occupant Protection Plan

The certified project designer must develop and implement an Occupant Protection Plan describing the measures and management procedures to be taken during lead, cadmium and chromium hazard abatement activities to protect the building occupants/building facilities and the outside environment from exposure to any lead, cadmium and chromium contamination while lead, cadmium and chromium hazard abatement activities are performed.

1.5.6 Pre-Construction Conference

Along with the CP, meet with the Contracting Officer to discuss in detail the Lead, Cadmium, Chromium Waste Management Plan and the Lead, Cadmium, Chromium Compliance Plan, including procedures and precautions for the work.

1.6 EQUIPMENT (if abatement occurs)

1.6.1 Respirators

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, cadmium and chromium dust, fume and mist. Respirators must comply with the requirements of 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127.

1.6.2 Special Protective Clothing

Personnel exposed to lead, cadmium, chromiumcontaminated dust must wear proper disposable protective whole body clothing, head covering, gloves, eye, and foot coverings as required by 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127. Furnish proper disposable plastic or rubber gloves to protect hands. Reduce the level of protection only after obtaining approval from the CP.

1.6.3 Rental Equipment Notification

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.

1.6.4 Vacuum Filters

UL 586 labeled HEPA filters.

1.6.5 Equipment for Government Personnel

Furnish the Contracting Officer with 3 complete sets of personal protective equipment (PPE) daily, as required herein, for entry into and inspection of the lead, cadmium and chromium removal work within the lead, cadmium and chromium controlled 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 Government will provide respiratory protection for the Contracting Officer.

1.6.6 Abrasive Removal Equipment

The use of powered machine for vibrating, sanding, grinding, or abrasive

blasting is prohibited unless equipped with local exhaust ventilation systems equipped with high efficiency particulate air (HEPA) filters.

1.6.7 Negative Air Pressure System

1.6.7.1 Minimum Requirements

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:

a. 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.

b. 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.

c. 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.

d. 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.

e. 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.

f. 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.

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

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

1.6.7.2 Auxiliary Generator

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.

1.6.8 Vacuum Systems

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.

1.6.9 Heat Blower Guns

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.

1.7 PROJECT/SITE CONDITIONS

1.7.1 Protection of Existing Work to Remain

Perform work without damage or contamination of adjacent areas. Where existing work is damaged or contaminated, restore work to its original condition or better as determined by the Contracting Officer.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

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) for material brought onsite to perform the work.

2.1.1 Expendable Supplies

Submit a description of the expendable supplies required.

2.1.1.1 Polyethylene Bags

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.

2.1.1.2 Polyethylene Leak-tight Wrapping

Wrapping used to wrap lead, cadmium, chromium 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.

2.1.1.3 Polyethylene Sheeting

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.

2.1.1.4 Tape and Adhesive Spray

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.

2.1.1.5 Containers

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

2.1.1.6 Chemical Paint Strippers

Chemical paint strippers must not contain methylene chloride and be formulated to prevent stain, discoloration, or raising of the substrate materials.

2.1.1.7 Chemical Paint Stripper Neutralizer

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.

2.1.1.8 Detergents and Cleaners

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

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Protection

3.1.1.1 Notification

a. Notify the Contracting Officer 10 days prior to the start of any lead, cadmium and chromium work.

c. Notification of the Commencement of LBP Hazard Abatement

Submit a copy of the notification of the commencement of LBP hazard abatement to the Government representative according to the procedures established.

3.1.1.2 Lead, Cadmium, Chromium Control Area

a. Physical Boundary - Provide physical boundaries around the lead, cadmium, chromium control area by roping off the area designated in the work plan or providing curtains, portable partitions or other enclosures to ensure that lead, cadmium and chromium will not escape outside of the lead, cadmium and chromium control area. Prohibit the general public from accessing the lead, cadmium, chromium control areas.

b. Warning Signs - Provide warning signs at approaches to lead, cadmium, chromium 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.

3.1.1.3 Heating, Ventilating and Air Conditioning (HVAC) Systems

Shut down, lock out, and isolate HVAC systems that supply, exhaust, or pass through the lead, cadmium, chromium control areas. Seal intake and exhaust vents in the lead, cadmium, chromium control area with 6 mil plastic sheet and tape. Seal seams in HVAC components that pass through the lead, cadmium, chromium control area.

3.1.1.4 Local Exhaust System

Provide a local exhaust system in the lead, cadmium, chromium control area in accordance with ASSP Z9.2, 29 CFR 1926.62, 29 CFR 1926.1126 and 29 CFR 1926.1127 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, cadmium, chromium 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, cadmium, chromium 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, cadmium, chromium control area. Filters on exhaust equipment must conform to ASSP Z9.2 and UL 586. Terminate the local exhaust system out of doors and remote from any public access or ventilation system intakes.

3.1.1.5 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 Contracting Officer 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 unless the Contracting Officer 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, cadmium and chromium contaminated waste.

b. Discontinuing Negative Air Pressure System. Operate the negative air pressure system continuously during abatement activities unless otherwise authorized by the Contracting Officer. 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 conform to written decontamination procedures and be as presented in the Lead, Cadmium, Chromium Compliance Plan. Seal the HEPA filter machine intakes with polyethylene to prevent environmental contamination.

3.1.1.6 Decontamination Shower Facility (if performing abatement and available)

Provide clean and contaminated change rooms and shower facilities in accordance with this specification and 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127.

3.1.1.7 Eye Wash Station

Provide suitable facilities within the work area for quick drenching or flushing of the eyes where eyes may be exposed to injurious corrosive materials, if abatement is performed.

3.1.1.8 Mechanical Ventilation System (if abatement is performed)

a. Use adequate ventilation to control personnel exposure to lead, cadmium and chromium in accordance with 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127. To the extent feasible, use local exhaust ventilation or other collection systems, approved by the CP. Evaluate and maintain local exhaust ventilation systems in accordance with 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127.

b. Vent local exhaust outside the building and away from building ventilation intakes or ensure system is connected to HEPA filters.

c. Use locally exhausted, power actuated tools or manual hand tools.

3.1.1.9 Personnel Protection

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, cadmium, chromium control area. No one will be permitted in the lead, cadmium, chromium control area unless they have been appropriately trained and provided with protective equipment.

3.2 ERECTION

3.2.1 Lead, Cadmium, Chromium Control Area Requirements

Establish a lead, cadmium, chromium control area by completely establishing barriers and physical boundaries around the area or structure where PWL or MCL removal operations will be performed.

Full containment - Contain removal operations by the use of critical barriers and HEPA filtered exhaust a negative pressure enclosure system with decontamination facilities and with HEPA filtered exhaust if required by the CP.

3.3 APPLICATION

3.3.1 Lead, Cadmium, Chromium Work

Perform lead, cadmium, chromium work in accordance with approved Lead, Cadmium, Chromium Compliance Plan. Use procedures and equipment required to limit occupational exposure and environmental contamination with lead, cadmium, chromium when the work is performed in accordance with 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127, and as specified herein. Dispose of all PWL or MCL and associated waste in compliance with federal, State, and local requirements.

3.3.2 Paint with Lead, Cadmium, Chromium or Material Containing Lead, Cadmium, Chromium Removal

Manual or power sanding or grinding of lead, cadmium, chromium 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, cadmium, chromium is prohibited. Provide methodology for removing lead, cadmium, chromium in the Lead, Cadmium, Chromium Compliance Plan. Select lead, cadmium, chromium removal processes to minimize contamination of work areas outside the control area with lead, cadmium, chromium contaminated dust or other lead, cadmium, chromium contaminated debris or waste and to ensure that unprotected personnel are not exposed to hazardous concentrations of lead, cadmium, chromium. Describe this removal process in the Lead, Cadmium, Chromium Compliance Plan.

Provide methodology for lead, cadmium and chromium, LBP/PWL removal and processes to minimize contamination of work areas outside the control area with lead, cadmium, chromium contaminated dust or other lead, cadmium, chromium contaminated debris/waste and to ensure that unprotected personnel are not exposed to hazardous concentrations of lead, cadmium, chromium. Describe this lead,, cadmium and chromium, LBP/PWL removal/control process in the Lead, Cadmium, Chromium Compliance Plan.

3.3.2.1 Paint with Lead, Cadmium, Chromium or Material Containing Lead, Cadmium, Chromium - Indoor Removal

Perform manual or mechanical removal and thermal cutting in the lead, cadmium, chromium 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.

3.3.3 Personnel Exiting Procedures (for abatement)

Whenever personnel exit the lead, cadmium, chromium controlled area, they must perform the following procedures and must not leave the work place 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. (if performing abatement)

d. Wash hands and face at the site, don appropriate disposable or uncontaminated reusable clothing, move to an appropriate shower facility, shower.

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

3.4 FIELD QUALITY CONTROL

3.4.1 Tests

3.4.1.1 Air and Wipe Sampling (if performing abatement)

Conduct sampling for lead, cadmium, chromium in accordance with

29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127 and as specified herein. Air and wipe sampling must be directed or performed by the CP.

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

b. Collect personal air samples on employees who are anticipated to have the greatest risk of exposure as determined by the 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.

c. Submit results of air samples, signed by the CP, within 72-hours after the air samples are taken.

d. Conduct area air sampling daily, on each shift in which lead, cadmium and chromium and lead-based paint removal operations are performed, in areas immediately adjacent to the lead, cadmium and chromium control area. Conduct sufficient area monitoring to ensure unprotected personnel are not exposed at or above 30 micrograms of lead per cubic meter of air or 2.5 micrograms of cadmium/chromium per cubic meter of air. If 30 micrograms of lead per cubic meter of air or 2.5 micrograms of cadmium/chromium per cubic meter of air is reached or exceeded, stop work, correct the conditions(s) causing the increased levels. Notify the Contracting Officer immediately. Determine if condition(s) require any further change in work methods. Resume removal work only after the CP and the Contracting Officer give approval.

e. Before any work begins, a third party consultant must collect and analyze baseline wipe 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, cadmium and chromium disturbance or removal. Provide Initial Sample Results to the Contracting Officer before work begins.

3.4.1.2 Sampling After Removal

After the visual inspection, collect wipe samples according to the HUD protocol contained in HUD 6780 to determine the lead, cadmium and chromium content of settled dust in micrograms per square meter foot of surface area.

3.4.1.3 Testing of Material Containing Lead, Cadmium, Chromium Residue

Test residue in accordance with 40 CFR 261 for hazardous waste.

3.5 CLEANING AND DISPOSAL

3.5.1 Cleanup

Maintain surfaces of the lead, cadmium, chromium 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, cadmium, chromium 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, Cadmium, Chromium 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 CP must then certify in writing that the area has been cleaned of lead, cadmium and chromium contamination before clearance testing.

3.5.1.1 Clearance Certification

The CP must certify in writing that air samples collected outside the lead, cadmium, chromium control area during paint removal operations are less than 30 micrograms of lead per cubic meter of airand less than 2.5 micrograms of cadmium/chromium per cubic meter of air; the respiratory protection used for the employees was adequate; the work procedures were performed in accordance with 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127; and that there were no visible accumulations of material and dust containing lead, cadmium, chromium left in the work site. Do not remove the lead, cadmium, chromium control area or roped off boundary and warning signs prior to the Contracting Officer's acknowledgement of receipt of the CP certification.

The third party consultant must certify surface wipe sample results collected inside and outside the work area are less than 10 micrograms of lead per square foot on floors, less than 100 micrograms of lead per square foot on interior window sills and less than 100 micrograms of lead per square foot on window troughs.

For lead, cadmium and chromium-based paint hazard abatement work, surface wipe must be conducted and clearance determinations made according to the work practice standards presented in 40 CFR 745.227.

3.5.2 Disposal

a. 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.

b. Contractor is responsible for segregation of waste. Collect lead, cadmium, chromium contaminated waste, scrap, debris, bags, containers, equipment, and lead, cadmium, chromiumcontaminated clothing that may produce airborne concentrations of lead, cadmium, chromium particles. Label the containers in accordance with 29 CFR 1926.62, 29 CFR 1926.1126, 29 CFR 1926.1127 and 40 CFR 261, 40 CFR 262 and corresponding state regulations.

c. Dispose of lead, cadmium, chromiumcontaminated material classified as hazardous waste at an EPA or NY State approved hazardous waste treatment, storage, or disposal facility off Government property.

d. 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 Contracting Officer or an authorized representative

will assign an area for accumulation of waste containers. Coordinate authorized accumulation volumes and time limits with the host installation environmental function.

e. Handle, store, transport, and dispose lead, cadmium, chromium or lead, cadmium, chromium 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.

f. All lead, cadmium, and chromium waste generation, management,and disposal will be coordinated with the host installation environmental function.

3.5.2.1 Disposal Documentation

Coordinate all disposal or off-site shipments of lead, cadmium, and chromium waste with the host installation environmental function. Submit written evidence of TSD approval to demonstrate the hazardous waste treatment, storage, or disposal facility (TSD) is approved for lead, cadmium, chromium 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. Provide turn-in documents or weight tickets for non-hazardous waste disposal.

3.5.2.2 Payment for Hazardous Waste

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 Contracting Officer. The manifest must detail and certify the amount of lead, cadmium, chromium containing materials or non-hazardous waste delivered to the treatment or disposal facility.

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SECTION 02 85 00

MOLD REMEDIATION
11/18

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN INDUSTRIAL HYGIENE ASSOCIATION (AIHA)

AIHA IMOM08-679	(2008) Recognition, Evaluation, and Control of Indoor Mold

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

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

INSTITUTE OF INSPECTION, CLEANING, AND RESTORATION CERTIFICATION (IICRC)

ANSI/IICRC S520	(2015) Standard and Reference Guide for Professional Mold Remediation
IICRC S500	(2015) Standard and Reference Guide for Professional Water Damage Restoration

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

29 CFR 1910.134	Respiratory Protection
29 CFR 1926.59	Hazard Communication
29 CFR 1926.62	Lead
29 CFR 1926.1101	Asbestos
29 CFR 1926.1126	Chromium
29 CFR 1926.1127	Cadmium

NAVY AND MARINE CORPS PUBLIC HEALTH CENTER (NMCPHC)

IHFOM, CH 13, Sec. 3	(2015) Mold Cleanup, Remediation, and Clearance Sampling

NEW YORK STATE DEPARTMENT OF LABOR (NYS)

NYS 32 § 930-940	Licensing of Mold Inspection, Assessment and Remediation Specialists and Minimum Work Standards

UNDERWRITERS LABORATORIES (UL)

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

1.2 DEFINITIONS

The below definitions must not supercede NYS 32 § 930 definitions.

1.2.1 AIHA

American Industrial Hygiene Association.

1.2.2 AIHA EMLAP

American Industrial Hygiene Association's Environmental Microbiology Laboratory Accreditation Program

1.2.3 AFU

Air filtration unit with High Efficiency particulate air (HEPA) filtered vacuum and exhaust ventilation equipment with a filter system capable of collecting and retaining microbial contamination ASSP Z9.2. Filters must retain 99.97 percent of particles 0.000012 inches or larger as indicated in UL 586.

1.2.4 Categories of Water

Category 1 Water: Water that originates from a sanitary water source and does not pose a substantial risk from dermal, ingestion, or inhalation exposure. IICRC S500

Category 2 Water: Water that contains significant contamination and has the potential to cause discomfort or sickness if contacted or consumed by humans. Can contain potentially unsafe levels of microorganisms or nutrients for microorganisms as well as other organic or inorganic matter. IICRC S500

Category 3 Water: Water that is grossly contaminated and can cause significant adverse reactions to humans if contacted or consumed. IICRC S500

1.2.5 Certified Industrial Hygienist (CIH)

An individual that has been certified by the American Board of Industrial Hygiene (ABIH), with professional qualifications and experience as required for an industrial hygienist, as presented in the definition of "Industrial Hygienist."

1.2.6 Complete Interior Building Demolition (Complete Gut)

Interior finishes of the building have been removed to expose basic structural elements.

1.2.7 Containment

Physical separation and engineering controls required to prevent contamination of undamaged materials and occupied areas. The level of

containment varies depending on the extent of the contamination.

1.2.7.1 Source Containment

Use when the contaminated surface area is less than 10 square feet, in both residential and non-residential buildings. At a minimum, source containment will include the following (ANSI/IICRC S520 and NYS 32 § 930-940):

a. Isolation of Work Areas. Install polyethylene barriers to isolate the areas or material to be demolished / remediated from non-remediation areas.

b. Floor protection. Maintain protection for finished floors through all construction activities.

c. HEPA vacuum to control dust created during the demolition. Hold HEPA vac intake at source of dust.

1.2.7.2 Limited Containment

Use when contaminated surface area is between 10 square feet and 100 square feet per room in both residential and non-residential buildings. At a minimum, limited containment includes the following (ANSI/IICRC S520 and NYS 32 § 930-940):

a. Containment. For residential buildings, a containment includes the entire room where work is being performed. The containment does not extend past the extents of the room unless there are instances of contamination extending from one room to the next. For non-residential buildings, the containment includes the area to be remediated, plus enough additional area to allow for all equipment and work activities.

b. Isolation of Work Areas. Install polyethylene barriers to isolate the areas to be demolished / remediated.

c. Floor protection. Maintain protection for finished floors through all construction activities.

d. Air Filtration / Pressurization Control. Install AFUs with HEPA filters in the containment. Configure the AFUs with splitters / diverters to allow some of the air to recirculate within the containment. Discharge the remainder of the air directly to the outside to maintain an overall negative pressure in the containment of 0.02 inch water column minimum to 0.04 inch water column maximum relative to the outside and other adjacent spaces not undergoing remediation(AIHA IMOM08-679). AFUs must filter a minimum of four air changes per hour and a maximum of six air changes per hour (ANSI/IICRC S520).

e. Protection for all items remaining in the containment. Protective devices must prevent physical damage (e.g., scratches and dents) and must provide a positive seal to prevent dust from settling in or on the items.

f. Decontamination. Construct a decontamination airlock for entry into and exit from the work area. HEPA vacuum the sealed bags of contaminated debris within the airlock. When possible, locate the

decontamination airlock so that the sealed bags can be passed directly from the airlock to the outside, through a door or window.

g. Containment Entrance. Install a triple-flap poly "door" to be used during demolition to provide a good separation between containment and occupied areas of the house / building.

h. HVAC System. Seal off all supply and return vents. HVAC may need to be shut down to ensure proper seal of the vents.

1.2.7.3 Full Containment

Use when contaminated surface area is greater than 100 square feet in both residential and nonresidential buildings. At a minimum, full containment includes the following(ANSI/IICRC S520 and NYS 32 § 930-940):

a. Containment. For residential buildings, a containment includes the entire room where work is being performed. The containment does not extend past the extents of the room unless there are instances of contamination extending from one room to the next. For non-residential buildings, the containment includes the area to be remediated, plus enough additional area to allow for all equipment and work activities.

b. Isolation of Work Areas. Construct polyethylene barriers to isolate the areas to be demolished / remediated.

c. Floor protection. Maintain protection for finished floors through all construction activities.

d. Air Filtration / Pressurization Control. Install AFUs with HEPA filters in the containment. Configure the AFUs with splitters / diverters to allow some of the air to recirculate within the containment. Discharge the remainder of the air directly to the outside to maintain an overall negative pressure in the containment of 0.02 inch water column minimum to 0.04 inch water column maximum relative to the outside and other adjacent spaces not undergoing remediation (AIHA IMOM08-679). AFUs must filter a minimum of four air changes per hour and a maximum of six air changes per hour (ANSI/IICRC S520 and NYS 32 § 930-940).

e. Protection for all items remaining in the containment. Protective devices must prevent physical damage (e.g., scratches and dents) and must provide a positive seal to prevent dust from settling in or on the items.

f. Decontamination. Construct a decontamination airlock for entry into and exit from the work area. HEPA vacuum the sealed bags of contaminated debris within the airlock. When possible, locate the decontamination airlock so that the sealed bags can be passed directly from the airlock to the outside, through a door or window.

g. Containment Entrance. Install a triple-flap poly "door" at the entrance to the airlock, and between the airlock and the work area during demolition to provide a good separation between containment and occupied areas of the house / building.

h. HVAC System. Seal off all supply and return vents. HVAC may need to be shut down to ensure proper seal of the vents.

1.2.7.4 Unoccupied Building Containment

Use when a building is unoccupied and large amounts of mold growth are present throughout the building:

a. Containment. The containment consists of the entire building. Install AFUs with HEPA filters in the building. Configure the AFUs to recirculate within the active remediation area. AFUs must filter a minimum of four air changes per hour and a maximum of six air changes per hour based on the size of the area undergoing active remediation (ANSI/IICRC S520 and NYS 32 § 930-940).

b. Isolation of Work Areas. Install polyethylene barriers to isolate remediation areas from non-remediation areas. AFU discharge may be used to positively pressurize non-remediation areas from areas undergoing remediation to prevent the movement of spores into "clean" areas.

c. Floor Protection. Maintain protection for finished floors through all construction activities.

d. Protection for all items remaining in the containment. Protective devices must prevent physical damage (e.g., scratches and dents) and must provide a positive seal to prevent dust from settling in or on the items.

e. Decontamination. Construct a decontamination airlock for entry into and exit from the building.

f. Containment Entrance. Install a triple-flap poly "door" to be used during demolition to provide a good separation between containment and non-remediation areas of the house / building.

g. HVAC System. Seal off all supply and return vents. HVAC may need to be shut down to ensure proper seal of the vents.

1.2.7.5 Cleaning Containment

For items being salvaged, set up a temporary containment structure to clean items removed from the containment. At a minimum, the cleaning area must contain:

a. Two chambers. Construct walls with polyethylene. Clean the items in the first chamber. Store the clean items in the second chamber.

b. Air Filtration / Pressurization Control Cleaning Chamber. Install AFUs with HEPA filters in the cleaning chamber. Configure the AFUs with splitters / diverters to allow some of the air to recirculate within the containment. Discharge the remainder of the air directly to the outside to maintain an overall negative pressure in the containment of 0.02 inch water column minimum to 0.04 inch water column (maximum) relative to the storage chamber (AIHA IMOM08-679).

c. Air Filtration, Storage Chamber. Install AFUs with HEPA filters in the storage chamber. Configure the AFUs to allow air to recirculate within the chamber. AFUs must provide air filtration at a rate of between four and six air changes per hour (ANSI/IICRC S520 and NYS 32 § 930-940).

d. Containment Entrance. Install a triple-flap poly "door" at the entrance to the cleaning chamber, between the cleaning and storage chambers, and at the exit of the storage chamber to provide a good separation between the chambers.

1.2.8 Decontamination Unit (Airlock)

An enclosed area adjacent to, and connected to, a regulated work area. It consists of various rooms that are used for the decontamination of workers, equipment, and materials.

1.2.9 Dehumidifier

Mechanism or machine to remove moisture from the air.

1.2.10 Detergent

A cleaning agent. The term refers to a prepared compound that may include surfactants, builders, dry solvents, softeners, etc, but does not include true soap.

1.2.11 Disinfectants or Biocide Sanitizing Solutions

One of three groups of antimicrobials registered by the EPA for public health uses. The EPA considers an antimicrobial to be a disinfectant when it destroys or irreversibly inactivates infectious or other undesirable organisms, but not necessarily their spores.

1.2.12 EPA

U.S. Environmental Protection Agency.

1.2.13 Fungal Growth Structures

Portions of fungi indicating active fungal growth is present on a surface. These include spores, conidiophores, hyphae, hyphal fragments, and mycelium.

1.2.14 Fungicidal Agents, (EPA)

An EPA registered fungicide that inhibits the spread and growth of mold with the ability to withstand moist and humid conditions.

1.2.15 HEPA Filter

A High Efficiency Particulate Air (HEPA) filter capable of trapping and retaining 99.97 percent of all particulate larger than 0.000012 inches.

1.2.16 HVAC

Heating, Ventilating, and Air Conditioning (System).

1.2.17 Industrial Hygienist (IH)

An individual designated and provided by the Contractor that is a professional qualified by education, training, and experience to anticipate, recognize, evaluate, and develop controls for occupational and indoor air quality hazards. Education must include a minimum 12 semester

hours or quarter hour equivalent of chemistry and 18 additional semester hours or quarter hour equivalent of courses in any combination of chemistry, physics, engineering, health physics, environmental health, biostatistics, biology, physiology, toxicology, epidemiology, or industrial hygiene. The Industrial Hygienist must be a CIH or under the supervision of a Certified Industrial Hygienist.

1.2.18 Microbial Remediation Supervisor

Individual responsible for the execution of the microbial remediation work as defined by the scope of work. This individual must have documented training in microbial remediation and have at least three years experience in microbial remediation work. The individual must meet the requirements of NYS 32 § 930-940.

1.2.19 Non-Porous Material

A material that does not absorb nor is easily penetrated by liquids, especially water. Generally, non-porous materials have a permeable factor of less than one. Some examples are metal, glass, plastic, ceramic tile.

1.2.20 Occupied Spaces (Areas)

The phrase "occupied space" within this specification refers to spaces that are occupied by unprotected non-remediation personnel while work is in progress. It also refers to areas adjacent to work areas that are not currently undergoing remediation.

1.2.21 Personal Protective Equipment (PPE)

Any material or device worn to protect a worker from exposure to, or contact with, any harmful material or force. PPE must be cleaned or disposed of prior to removal from the remediation work area.

1.2.22 Poly

Polyethylene sheet with a minimum thickness of 6 mils (IHFOM, CH 13, Sec. 3).

1.2.23 Porous Material

Permeable materials having the physical properties that allow liquids or gasses to pass through. These materials include but are not limited to the following: gypsum wall board, insulation, wallpaper, ceiling material, carpet, padding, paper goods (i.e., cardboard boxes, loose paper, books), stuffed furniture, wicker, fabrics.

1.2.24 Pressure Differential Measuring Instrument

Device used to measure the relative pressure difference between the work area/containment and areas outside the work area. For mold remediation, the device must measure accurately in the 0 to 0.04 inch of water range.

1.2.25 Semi-porous Material

A material that can absorb liquids if exposed over long periods of time. These materials include but are not limited to wood, concrete, linoleum, vinyl wall covering, wooden or hardboard furniture, plaster.

1.2.26 Ventilation System Mold Remediator (VSMR) Qualifications

An individual certified by the North American Duct Cleaning Association (NADCA) to clean HVAC systems.

1.2.27 Work Area

The area where remediation operations are actively performed and controlled to prevent the spread of dust / spores and entry by unauthorized personnel. A work area is the space, group of spaces, or the building, as defined by the Microbial Assessment Survey.

1.3 REQUIREMENTS

1.3.1 Description of Work

A mold remediation specification will be prepared by an independent third party, licensed NYS Mold Assessor if this project is defined as a mold abatement per NYS 32 § 930-940. The remediation specification will include:

a. Provide mold remediation work including the handling and control of mold contaminated materials and the resultant procedures and equipment required to protect workers, the environment and occupants of the building or area, or both, from contact with mold products and spores. The work also includes the disposal of any mold contaminated materials generated by the work. The mold removal work includes the demolition and removal of ceiling tile, drywall and plaster. Provide containment and engineering control techniques as outlined in this specification. All mold contaminated material removal work must be supervised by a NYS mold supervisor as specified herein.

b. No work in this specification section can be provided by any person, contractor, or contracting entity involved in the preparation of the contract documents of which this specification section is a part.

c. The following microbial remediation specifications apply to the cleaning / removal and disposal of fungally-contaminated porous, semi-porous and non-porous surfaces within various types of structures. The level of containment and requirements for cleaning and remediation of materials will depend on the condition of the space and materials being remediated.

d. The NYS mold assessor must monitor the site on a daily basis while remediation work is in progress, identifying work and work practices that are not in compliance with the approved microbial remediation plan, and performing all inspections required by this specification. The Contracting Officer may require the removal of any individual for non-compliance with quality requirements specified in the contract.

e. This specification section includes the protocol regarding proper disposal of the removed building material components from within the work site.

f. Use proper cleaning procedures, engineering controls, and apply best management practices to remove microbial growth and spore fallout from all surfaces and building materials to minimize the further release of microbial spores. Address semi-porous and nonporous surfaces within the facility in each cleaning phase of the project. Damp wipe and

HEPA vacuum all surfaces, at a minimum. Remove and dispose of porous building materials that are supporting microbial growth.

1.3.2 Security Requirements

Prior to granting access to any work area (i.e., building, area, room, or space) for mold remediation work, a determination must be made by the government agency whether classified or controlled unclassified information (paper material or electronic media) or equipment is contained in the work area(s).

It may be necessary depending on the sensitivity of the work area or the information contained in the area to authorize the Government activity or tenant command responsible for the work area to provide their own appropriately cleared military or government personnel to properly remove or secure any classified or controlled unclassified information, electronic media or equipment located in their work area(s). Prior authorization would be required and the area would need to be evaluated to ensure it is safe for personnel to enter and all personnel must utilize the required PPE to safely enter the work area.

a. If Contractor personnel require access to classified information or spaces to perform mold remediation work, the Government must issue the Contractor facility a Facility Clearance Level (FCL) (Contract Security Classification Specification) prior to the initiation of the work under the contract. If the Contractor facility does not possess a valid FCL issued by the Defense Security Service (DSS), the Government will be required to submit a sponsorship request to DSS requesting that the Contractor be processed for and issued a current FCL at the appropriate level.

b. Access to classified information (paper material, electronic media, and equipment) must only be granted to authorized and appropriately cleared government and U.S. contractor personnel that possess a personnel security clearance commensurate with the level of information contained in the work area that requires a mold remediation effort.

c. Access to Controlled Unclassified information (i.e., For Official Use Only, Sensitive but Unclassified, Privacy Act Information, Export Controlled unclassified) can be granted to DOD cleared contractors, consultants and grantees that are conducting official business for the DOD or DON. Non-cleared U.S. contractor personnel who only require access to controlled unclassified information can be granted access if they get a favorable trustworthiness determination on an individual Favorable Tier 1 investigation and fingerprint result submitted on their behalf by the government agency issuing the contract.

d. Classified information and controlled unclassified information must be safeguarded / secured, reproduced, and destroyed in accordance with SECNAV M-5510.36.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with

Section 01 33 29 SUSTAINABILITY REPORTING. Submittals with an "AE" are for submittal to the Designer of Record. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Ventilation System Mold Remediator (VSMR) Qualifications; G, RO

Mold Assessment Report; G, RO

Mold Remediation Plan written by a NYS Mold Assessor; G, RO

Respiratory Protection Program; G, RO

Worker Records;

NYS Mold Assessor License; G, RO

NYS Mold Remediation Supervisor Qualifications; G, RO

NYS Licensed Mold Remediation Contractor; G, RO

SD-03 Product Data

Disinfectants or Biocide Sanitizing Solutions; G, RO

Fungicidal Agents, (EPA); G, RO

Personal Protective Equipment (PPE); G, RO

Pressure Differential Measuring Instrument;

Safety Data Sheets (SDS) for All Materials; G, RO

Dehumidifiers;

Air Filtration Units;

SD-06 Test Reports

Licensed NYS Mold Assessor Daily Reports; G, RO

SD-11 Closeout Submittals

Submittals at Completion of Remediation Work; G, RO

1.4.1 Preconstruction Submittals

Within 10 days from the award of the contract and prior to the start of the work, submit to the Contracting Officer six copies of the following items for review and permanent file.

1.4.1.1 Preliminary Mold Visual Assessment Report

A written report to document the pre-remediation condition of the work areas and the results of the HVAC systems inspection.

1.4.1.2 Mold Remediation Plan

Submit a job-specific, written plan approved by a licensed NYS mold assessorto the Contracting Officer for final approval prior to start of work. The plan must address the following items at a minimum:

a. Description of materials to be remediated, providing location and quantities and methods to be used for remediation according to the requirements of NYS 32 § 930-940.

b. Products: Disinfectants, detergents, biocides, sanitizing solutions, and fungicidal agents, (EPA).

c. Containment procedures to include description and locations of engineering controls and decontamination unit to include entry and exit procedures (provide sketch of floor plan showing location of containment barriers and decontamination units). Include locations of AFUs and AFU discharges to the outside.

d. Description of personal protective equipment to be used during the remediation.

e. Construction barricades and barriers in occupied areas.

f. HVAC Shut down and start-up procedures.

g. HVAC Evaluation and remediation procedures.

h. Moisture and relative humidity control procedures and equipment.

i. Packaging and disposal procedures.

j. Safety Precautions to include lockout / tag-out, fall protection, confined space entry procedures, and fire protection.

k. Description of the method to be employed to control cross contamination of areas not in the work area. Include a risk assessment related to the suitability of people to occupy areas adjoining the remediation area while remediation activities are ongoing.

l. IH Quality Control procedures to include visual inspection.

m. Procedures to control, abate, and dispose of Asbestos Containing Materials (ACM), Presumed Asbestos Containing Materials (PACM) and Lead Based Paint (LBP) coincident with microbial remediation. ACM, PACM, and LBP must be identified before work begins; Identify the presence, location, and quantity of ACM,PACM, and LBP therein pursuant to paragraphs (g),(k)(1) of 29 CFR 1926.1101 and for lead 29 CFR 1926.62. Both asbestos and lead must be removed prior to mold activities.

1.4.1.3 Respiratory Protection Program

Provide written copy of Contractor's Respiratory Protection program.

1.4.1.4 Worker Records

Provide the following documents for all workers, including supervisory

personnel. If new workers are added to the crew, provide the same documentation for them.

Employee Instruction and Release Form: Provide documentation showing that each employee has been instructed on the following items:

a. Use and fit of respirators (for employees entering and working in the containment).

b. Protective clothing.

c. Protective measures.

d. Safety and Emergency Egress Procedures.

e. Site specific fall protection plan and training.

f. Microbial remediation hazards and practices including engineering controls and isolation. Training should include "hands on" training for microbial remediation supervisors.

g. Workers' release forms stating the potential hazards involved with the scope of the work.

Worker Training Certification: Submit copies of training certificates for each employee indicating that the employee has received training at the appropriate level for the work prescribed in the description of work.

1.4.1.5 Certified Industrial Hygienist (CIH)/Licensed NYS Mold Assessor Qualifications

Submit the name, address, and telephone number of the Certified Industrial Hygienist (CIH) and NYS Mold Assessor License. Provide copies of board certificates, resume to document field experience, and evidence that the CIH and Licensed NYS Mold Assessor have successfully completed training in microbial investigation and remediation.

1.4.1.6 NYS Mold Remediation Supervisor Qualifications

Onsite supervisor must be a Licensed NYS Mold Supervisor employed by a firm licensed to perform mold abatement and have one of the following certifications: Certified Microbial Remediator (CMR), Certified Microbial Remediation Supervisor (CMRS), or Applied Microbial Remediation Specialist (AMRS). Submit copies of supervisory training certificates.

1.4.2 Product Data

Within 10 days of contract award, submit product data for items identified for use in Mold Remediation Plan.

1.4.3 Licensed NYS Mold Assessor Daily Reports

Prepare a written Daily Report for each day that microbial remediation work is being accomplished. Submit the Licensed NY Mold Assessor Daily Reports to the Contracting Officer by 1000 hours of the following day. The Daily Report at a minimum must include measurements of differential pressure and temperature and relative humidity in work areas, and detail any non-compliance issues observed.

1.4.4 Submittals at Completion of Remediation Work

Within 14 days of completion, provide the following information:

a. Daily Project Logs.

b. Licensed NYS Mold Assessor Daily Reports.

c. Photographic Logs.

d. Contractor's Licensed NYS Mold Assessor Report certifying the microbial remediation is complete.

1.5 RECORD KEEPING

A Daily Project Log must form a permanent record of the project. Secure and maintain these logs and any other required documentation as part of the permanent project file.

1.5.1 Daily Project Log

The Mold Remediation Supervisor must maintain a Daily Project Log. The Daily Project Log must be used each day of the project to document the following information.

a. Date.

b. Name of Mold Remediation Supervisor.

c. Name of Licensed NYS Mold Assessor monitoring work area.

d. Number of workers on site.

e. Equipment utilized.

f. Brief description of daily work activities.

g. Listing of any non-compliance noted, emergencies, stop work orders (with detailed explanation),e.g.: exhaust system pressure differential recordings and descriptions of any other significant events.

PART 2 PRODUCTS

2.1 DISINFECTANTS, BIOCIDES, SANITIZING SOLUTIONS AND FUNGICIDAL AGENTS, (EPA)

Must be EPA Registered for the use detailed in the Mold Remediation Plan and used in accordance with the manufacturer's specifications. Provide SDS sheets to the Contracting Officer for any chemicals that will be used during the performance of the work for approval.

2.2 HAZARD COMMUNICATION

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.

PART 3 EXECUTION

3.1 EQUIPMENT

Provide manufacturer's certificate of compliance for all equipment used to contain the microbial contamination.

3.1.1 Respirators

Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services. Provide personnel engaged in set-up, pre-cleaning, cleanup, handling, and removal of contaminated materials with the appropriate respiratory protection as specified in 29 CFR 1910.134. Mold remediation plan must consider Table 17.1 in AIHA IMOM08-679 "Recognition, Evaluation, and Control of Indoor Mold", which lists the minimum levels of respiratory protection based on the activity and size of the remediated area.

3.1.2 Protective Clothing

Provide all workers with protective clothing as appropriate for the work being accomplished, as required by the Mold Remediation Plan.

3.1.3 Warning Signs and Labels

Provide bilingual warning signs printed in English and Spanish at all approaches to the work areas IICRC S500 and NYS 32 § 930-940. Locate signs at such a distance that personnel may read the sign and take the necessary protective steps required before entering the area. Warning signs may be in the form of continuous plastic tape.

3.1.4 Dehumidifiers

Install and use dehumidifiers as needed during the remediation to maintain relative humidity below 60 percent in the work area. Drain the condensate water to a permanent drain, or empty as needed to prevent water overflowing from the dehumidifiers.

3.1.5 Air Filtration Units (AFU)

Install and use AFUs with HEPA filters, and manufacturer specified pre-filters, as part of the exhaust ventilation system to develop and maintain the specified desired air pressure differential inside the enclosed work area relative to the outside areas. Acquire and pay for any licenses needed for use of any equipment, including but not limited to, air pressure differential systems and air filtration systems.

a. Replace HEPA filters and pre-filters for AFUs as required to maintain pressurization performance requirements during demolition and cleaning. Do not reuse filters. Bag used filters at a minimum in clear 6 mil polyethylene bags within the containment and disposed as contaminated waste.

b. Discharge air from any AFUs located in the work area containment to the outside environment when creating a negative pressure containment to create a negative pressure relative to the outside and adjacent work areas not undergoing active remediation of 0.02 inch H2O to 0.04 inch H20. Discharge air in excess of that required for creating the proper negative pressure to the work area. The AFUs must provide four

to six air changes per hour in the work area. Under no circumstances may air from AFUs discharge to an occupied area. Coordinate location of window sashes or doors required for discharge openings with the Contracting Officer. Exhaust discharge openings may be constructed of plywood, and the seals around such opening must be airtight.

c. Seal all exhaust and intake openings in AFUs with one layer of 6 mil polyethylene sheeting when not in use.

3.1.6 Vacuum Cleaners Equipped with HEPA Filters

Provide vacuum cleaners equipped with HEPA filters designed for continuous operation in order to complete the work in a timely and efficient manner.

a. Provide nozzle attachments as required to adequately remove all dust. As a minimum, nozzle attachments must include crevice and extended bristle brush nozzles. Any vacuum that is not equipped with a HEPA filter must not be used at anytime.

b. Provide sufficient vacuum cleaners equipped with HEPA filters designed for continuous operation in the work area during mold remediation inside the containment area.

c. Provide additional vacuum cleaners equipped with HEPA filters in the enclosed work area during remediation or cleaning work as required by the size (area) of the containment and to maintain timely progress of the work.

3.2 GENERAL REQUIREMENTS

3.2.1 Pre-Mold Remediation Work Conference

Meet with the Contracting Officer prior to beginning work to discuss in detail the Mold Remediation Plan, including work procedures and safety precautions. Once approved by the Contracting Officer, the plan will be enforced as if a part of this specification. Any variances to the specification as a result of the plan must be specifically identified to allow for free discussion and approved by the Contracting Officer in writing prior to starting work. Before work in areas with Asbestos Containing Materials (ACM), Presumed Asbestos Containing Materials (PACM) and Lead begins, identify the presence, location, and quantity of ACM, PACM and Lead. Ensure proper notification of regulatory authorities. Consult with Contracting Officer to obtain facility ACM / LBP surveys. Mitigate any disturbance of painted/coated surfaces in accordance with 29 CFR 1926.62, 29 CFR 1926.1126 and 29 CFR 1926.1127.

3.2.2 Containment Entry / Exit Procedure

Ensure that each worker and authorized visitor follows entry and exit procedures detailed in the Mold Remediation Plan.

3.3 REMOVAL PROCEDURES

3.3.1 Protection of Existing Work Areas

Perform work in a manner to minimize the damage or contamination to areas outside or directly adjacent to the work area. Inspect areas inside and outside proposed work areas to identify existing damage and notify Contracting Officer prior to start of work.

Where materials outside work area are damaged or contaminated as a result of the Contractors work efforts as verified by the Contracting Officer using visual inspection or sample analysis, it must be restored to its original condition or decontaminated by the Contractor at no expense to the Government as deemed appropriate by the Contracting officer. Should adjacent or outside areas become contaminated as a result of the Contractors work efforts, stop work immediately. Clean the newly contaminated areas at no additional expense to the Government. The work may proceed at the discretion of the Contracting Officer once the area has been verified by visual inspection as restored.

3.3.2 Remediation of Fungally Contaminated Building Materials

The removal of contaminated materials must follow in general the listed sequence of work. The Contractor may make changes to improve work flow with the approval of the Contracting Officer.

a. Provide level of containment and PPE required by the Mold Remediation Plan that will be developed by a Licensed NYS Mold Assessor.

b. Disable all HVAC units and exhaust fans in the area to be remediated. Cover and seal all supply vents, return vents, and air handling units in the project area using two layers of 6 mil poly.

c. Protect materials to remain in work area. Where possible, clean all materials to be salvaged in place to prevent possible cross-contamination created by moving materials through non-remediation areas.

d. Remove undamaged items and materials to be cleaned and salvaged from the work area. Store materials in an area with relative humidity maintained below 60 percent and where temperatures will not damage the material. Notify Contracting Officer of existing damage to items prior to removal.

e. Set up containments, including protection of materials remaining within the containment and AFUs. Notify Contracting Officer that the area is prepared for remediation activities.

f. Pre-demolition inspection by the NYS Licensed Mold Assessor.

g. Demolition and removal / cleaning of contaminated materials.

h. Post-remediation inspection by the NYS Licensed Mold Assessor.

i. Perform final cleaning in the containment.

j. Remove/demolish all carpet.

k. Clearance inspection by the NYS Licensed Mold Assessor.

l. Duct and HVAC cleaning, if necessary.

m. Deconstruction of containment, removal of AFUs.

n. Return items that were previously removed and cleaned to the occupied area.

3.3.3 Remediation Procedures

3.3.3.1 Remediation of Non-Porous Materials

Method of remediating non-porous items:

a. HEPA vacuum all surfaces.

b. Damp wipe all surfaces using clean water or a detergent solution.

c. Ensure all cleaned surfaces are dried thoroughly.

3.3.3.2 Porous Materials

a. Ceiling Tile: Remove/demolish all ceiling tile.

(1) Removal: Remove ceiling tile that has remained wet for 48-hours or longer, or has visible mold growth (AIHA IMOM08-679). If ceiling tile has dried out lightly mist before removal.

c. Textiles

(1) Discard textiles with visible mold growth.

(2) Clean textile based items, including clothing, linens, and toys that do not have visible mold growth, but have been wet, in standard commercial or residential washing machines with standard washing machine detergent.

(3) Dry all items completely before returning to the building / house.

(a) When possible, use dryers to dry items.

(b) If dryers will cause irreversible harm to the item, hang the item on a drying rack in a temperature and humidity controlled space. Discard items not dry within 48-hours (AIHA IMOM08-679).

d. Upholstered Furniture

(1) Removal: Discard upholstered furniture that has remained wet for 48-hours or longer (AIHA IMOM08-679), or that have visible mold growth.

(2) Cleaning: Clean upholstered furniture that has been exposed to mold spores but does not have visible mold growth by HEPA vacuuming upholstery and wood or metal structure, followed by a damp wipe of semi-porous or non-porous portions of the furniture. Dry furniture thoroughly after cleaning.

3.4 DETAILED SEQUENCE OF WORK FOR MOLD REMOVAL UNDER CONTAINMENT (If Required)

3.4.1 Preparation for Remediation Work

a. Provide level of containment and PPE required for the remediation based on the Mold Remediation Plan.

b. Disable all HVAC units and exhaust fans in the area to be remediated.

c. Remove undamaged materials from the work area if they are to be salvaged but cannot be cleaned in place. Store materials in an area with relative humidity maintained below 60 percent and where temperatures will not damage the material. Notify Contracting Officer of existing damage to items prior to removal. Clean materials using procedures detailed in Remediation Procedures.

d. Remove supply diffusers, return grilles and exhaust grilles. Clean diffusers and grilles using procedures detailed in Remediation Procedures.

e. Construct containment barriers. Existing walls can be used as a portion of the containment barriers if existing openings in walls (such as doors, wall openings, vents) are sealed using 6 mil polyethylene.

f. Install the AFUs and dehumidifiers.

g. Seal supply, return, and exhaust openings with 6 mil polyethylene sheeting and protect intakes to air handling units. Air handling units are to remain off.

h. Install all equipment needed for removal work in the containment area to minimize egress during demolition.

i. The Contracting Officer will inspect the containment to verify that the containment is properly constructed and the containment area has an overall negative pressure of 0.02 to 0.04 inch water column relative to the outside and adjacent work areas not undergoing active remediation, prior to beginning demolition work.

3.4.2 Demolition

a. Remove mold contaminated materials to be discarded, such as paper, and furniture. Double bag material in 6 mil poly bags. Seal poly bags using duct tape inside the containment. HEPA vacuum bags before removing them from the containment or airlock. When possible, pass the bags directly from the containment or airlock to the outside. Transport bags to a dumpster. Do not leave the bags at the building / house.

b. Lightly mist all contaminated materials that are being discarded to minimize generation of airborne mold spores during demolition/removal.

c. Use dust collection attachments on all power tools, such as sanders, saws, to capture dust created when using the tools. Outlet of dust collector should discharge into inlet of AFU.

d. If wood studs are contaminated, HEPA vacuum all surfaces, scrub them with a brush and detergent to remove mold. After scrubbing studs, HEPA vacuum again to remove any remaining dust. Replace wood studs with damage severe enough to reduce the structural capacity of the member. Prior to removal of any structural member consult with the Contracting Officer.

e. Clean all metal framing with a dilute detergent solution. Clean metal framing with light rust using steel wool and coat with a rust inhibiting paint. Replace metal framing with rust damage severe enough to reduce the structural capacity of the member. Prior to

removal of any structural material, consult with the Contracting Officer.

f. Remove contaminated carpet scheduled for removal.

g. Place removed carpet and remaining debris in two layers of 6 mil poly bags. Seal poly bags using duct tape inside the containment. HEPA vacuum bags before removing them from the containment or airlock. When possible pass the bags directly from the containment or airlock to the outside. Transport bags to a dumpster. Do not leave the bags at the building .

h. Remediation workers must HEPA vacuum their PPE, then remove their PPE within the airlock chamber. Discard disposable coverall suits into a 6 mil poly bag.

3.4.3 Post-Demolition Inspection

a. An independent, third-party NYS Licensed Mold Assessor (hired by the government) will inspect the containment area to verify that all contaminated materials have been removed.

b. Allow a minimum of 12-hours after completion of removal work, with AFUs operating, for airborne dust in the containment to settle or be removed by the AFUs.

3.4.4 Cleaning after Demolition, and Cleaning of Settled Spores from Porous / Non-Porous Materials

a. Continue to operate AFUs during cleaning.

b. Clean exposed surfaces.

(1) HEPA vacuum all surfaces.

(2) Damp wipe all non-porous exposed surfaces including polyethylene sheets used to protect materials, external surfaces of ductwork, studs, and floors with clean rag and clean potable water or detergent solution.

(3) Remove poly sheeting inside the containment.

(4) HEPA vacuum all surfaces protected by poly sheeting.

(5) Damp wipe non-porous surfaces protected by poly sheeting with clean water or a detergent solution.

c. Final clearance inspection will be conducted by an independent, third-party NYS Licensed Mold Assessor (hired by the government). Clearance inspections will be performed using the procedures detailed in Post-Remediation Inspection. If areas fail final clearance inspections, additional corrective actions taken by the contractor will be at no additional cost to the Government. Maintain containments in place until spaces are inspected and accepted by the Government as being fully remediated. The independent, third-party NYS Licensed Mold Assessor will determine whether additional cleaning is required by the Contractor and whether the clearance process will be repeated.

3.5 FIRE PROTECTION

Provide portable fire extinguishers within the containment area and outside the decontamination unit. Fire extinguishers Must be rated for the class of fire hazards in the work area and must be sized for coverage of the areas within the containment. At a minimum, one 10 pound ABC fire extinguisher for every 1,000 square feet must be strategically placed around the containment. Personnel must be trained for emergency egress and the use of fire extinguishers. Notify fire officials of work activities as required.

3.6 CONSTRUCTION BARRIERS

a. Provide interior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished and adjacent facilities or work to remain. Shoring, bracing or support will be necessary when structural wood studs or metal framing need to be removed and replaced when they cannot be cleaned.

b. Do not disturb mold-contaminated building materials while isolating work areas. This precaution prevents the release of mold spores.

c. Workers must wear respirators and other PPE as outlined in the mold remediation plan when installing critical barriers where mold contaminated surfaces (walls or surfaces with visible settled dusts) are likely to be disturbed. Operate an AFU if disturbance is likely during setup.

d. Monitor the air pressure differential across work area containments. The monitoring system must be in place before the start of remedial activities. Verification by the NYS Licensed Mold Assessor is required prior to the start of the mold remediation.

3.7 QUALITY ASSURANCE / QUALITY CONTROL REQUIREMENTS

3.7.1 Contractor Qualifications

Work must be performed by a NYS Licensed Mold Remediation Contractor. Contractor must carry insurance that specifically covers mold remediation.

a. Remediation contractor's on-site supervisor must have one of the following certifications: NYS Licensed per NYS 32 § 930-940.

b. Mold remediation workers must be given training in PPE and mold remediation activities as required for their particular job. Mold remediation plan must provide details of worker training.

3.7.2 Waste Management and Removal

Keep the site and work area free from accumulations of dust, waste materials, or rubbish caused by Contractor operations and free from any flammable materials or other sources of fire hazard. Remove all waste materials and rubbish from and about the work site in strict accordance with the specifications and applicable codes and regulations.

3.7.3 Post-Remediation Inspection

Clean up all debris and dust in interior spaces outside the work area resulting from the Contractor's remediation work.

After all visible accumulations of material and debris are removed from the containment, provide the NYS Licensed Mold Assessor a 24-hour notice for a final clearance visual inspection. The NYS Licensed Mold Assessor must conduct a thorough visual inspection of the work area. If during this inspection any visible debris or mold contamination are observed, the Contractor must re-clean the work area without additional cost to the Government.

3.7.3.1 Clearance

a. Clearance Criteria

Clearance will be based on visual assessment (all visible mold removed, all visible dust removed, based on a "white glove" test) by Contracting Officer. "White glove" test will consist of wiping the surface with a clean cloth of color suitable to reveal expected type of dust. For most surfaces, a white cloth is suitable. In addition, non-viable air samples collected inside containment and ambient air will be used as clearance. Inside concentrations must be at least 90% less than outside air. In addition, containment air must not include any high concentrations of the dominant species detected in the Mold Assessment Report.

b. Failed remediation areas will be recleaned at no additional cost to the Government and the AFUs kept in operation another 12-hours, followed by another visual assessment. Subsequent failures will follow the same routine until a pass condition is secured.

3.8 CLEAN-UP AND DISPOSAL

3.8.1 Disposal of Material

Dispose of contaminated bagged waste materials removed during this remediation as general construction debris. Follow all applicable local, State, and Federal requirements for the disposal of this material.

3.8.2 Material Packaging

Place waste, as waste is removed, into a disposal container promptly. Disposal containers must consist of at a minimum, two layers of clear 6 mil polyethylene bags. Tape bags in a gooseneck fashion to form an airtight seal and label appropriately. Bag waste from vacuums equipped with HEPA filters in 6 mil polyethylene bags.

3.8.3 Building Exit (Waste Disposal)

HEPA vacuum and damp wipe bags of contaminated waste material prior to removal from the building.. When possible pass the bags directly from the containment or airlock to the outside. Transport bags to a dumpster.

3.8.4 Hazardous Material

Should the Contractor encounter any hazardous materials, notify the NYS Licensed Mold Assessor immediately for direction.

-- End of Section --

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Asbestos Containing Materials Survey Report

Lincoln Hall

USMA West Point NY

Prepared for: Mr. Terry Allen
Mason and Hanger

Prepared by: **the oak group, inc.** 622 Cooper Street Camden, NJ 08102 (856) 377-0060 www.oakgroup.net
Mailing address: PO Box 2041 Voorhees, NJ 08043

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6.0 Certifications

1.0 NARRATIVES

1.0 NARRATIVES

1.1 Purpose:

The OAK Group Inc. (OAK,) was contracted by Mason and Hanger to perform an asbestos survey of the Lincoln Hall located at the United States Military Academy in West Point, NY.

The purpose of the survey was to identify and document asbestos-containing materials (ACM) for remediation prior to planned renovations. The EPA's National Emission Standard for Hazardous Air Pollutants (NESHAP) regulation requires that buildings scheduled for renovations/demolition have an inspection identifying asbestos materials. OSHA's Construction Standard for Asbestos (29 CFR 1926.1101) requires that building materials installed prior to 1981 be inspected for asbestos or they must be classified as presumed asbestos-containing materials (PACM).

1.2 Personnel:

Mr. Andrew Ward performed the building inspection on October 23-26, 2018 with the assistance of Mr. Isa Haj. Mr. Ward is an EPA-accredited, New York State-licensed building inspector. Mr. Haj is an EPA-accredited building inspector.

1.3 Discussion and Survey Results:

A total of forty-four (44) samples were collected from the building. All samples were analyzed by Polarized Light Microscopy (PLM), which classifies a material as asbestos-containing if it contains greater than one percent (>1%) asbestos. Asbestos (>1%) was identified in the following materials:

- Plaster Walls & Ceilings

As per the New York State Department of Labor Division of Safety & Health regulations governing asbestos, all non-friable organically bound (NOB) materials (i.e. floor tiles, mastics, roofing materials and caulking) must be analyzed by both PLM and TEM (Transmission Electron Microscopy) in order to classify a material as a non asbestos-containing material. **No** asbestos (>1%) was identified in any material by TEM analysis.

The following materials were observed and suspected to be asbestos-containing, but were unable to be sampled either because sampling the material would void a fire-rating associated with the material, there was no access to the location of the sample, or at the request of the United States Military Academy personnel escorts:

- ❖ Metal Fire Doors

Criterion was unable to gain access to the following rooms/areas:

- Room 303
- Room 300
- Room 311
- Room 309
- Room 306
- Room 312
- Room 310A
- Room 310
- Room B118
- Room B117
- Room B100

Certificates of analysis for PLM & TEM analysis can be found in Section 2.0.

Those materials that were observed, sampled, submitted for analysis and found not to be asbestos-containing materials are identified in Section 3.0 of this report.

1.4 Disclaimer:

Information contained herein was obtained by means of onsite observations, a detailed materials survey, and analytical data. Conclusions will be based upon the data obtained. This is not to imply that the data gathered is all the information that exists which may be pertinent to the site. Any areas inaccessible to the survey team due to reasons beyond the control of OAK (i.e., hidden pipe chases, secured spaces, etc.) will not be included in this survey.

1.5 Conclusions and Recommendations:

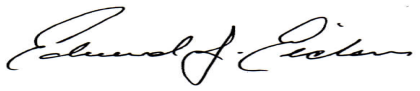
All identified ACM should be removed by a New York-licensed asbestos abatement contractor if they will be impacted by renovation/demolition activity.

Section 2.0, Laboratory Results, contains certificates of analyses for all bulk samples collected and analyzed. Section 3.0, Asbestos Inventory, lists specific locations and quantities of asbestos-containing materials associated with the structures to be demolished.

Section 6.0, Certifications, lists asbestos accreditations for all Criterion employees who worked on this project.

This report is intended to strictly comply with EPA, OSHA and State of New York regulations governing asbestos. This report should be referenced prior to disturbing any materials that may contain asbestos.

Criterion appreciates the opportunity to provide you with an asbestos-containing materials survey. Should you have any questions, please do not hesitate to contact me at (856) 377-0060 or eje@oakgroup.net.



Eduard J. Eichen, CIH
Project Manager

2.0 LABORATORY RESULTS

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EMSL Order:	041832709
CustomerID:	CRIT52
CustomerPO:	
ProjectID:	

Attn: **Steve Vera**
Criterion Laboratories, Inc.
400 Street Road
Bensalem, PA 19020

Phone:	(215) 244-1300
Fax:	(215) 244-4349
Received:	10/31/18 4:25 PM
Analysis Date:	11/7/2018
Collected:	

Project: **182364 / Lincoln Hall of United States Military Acdemy of West Point, NY / Floor 4**

Test Report:Asbestos Analysis of Bulk Material

Test	Analyzed Date	Color	Non Asbestos Fibrous	Non Asbestos Non-Fibrous	Asbestos
Sample ID 182364-01-Skim Coat *041832709-0001*		**Description** 4th Floor Hallway - Plaster Wall **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	11/7/2018	White		100.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 182364-01-Base Coat *041832709-0001A*		**Description** 4th Floor Hallway - Plaster Wall **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	11/7/2018	Gray		100.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 182364-02-Floor Tile *041832709-0002*		**Description** 4th Floor Hallway - Beige w/Green Spots 12"x12" FT **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018	Beige			**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018	Beige			**None Detected**
Sample ID 182364-02-Mastic *041832709-0002A*		**Description** 4th Floor Hallway - Black Mastic **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018	Black			**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018	Black			**None Detected**
Sample ID 182364-03-Floor Tile *041832709-0003*		**Description** 4th Floor Lobby - Beige w/Green Spots 12"x12" FT **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018	Beige			**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018	Beige			**None Detected**

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Test Report:Asbestos Analysis of Bulk Material

Test			Color	Non Asbestos Fibrous	Non-Fibrous	Asbestos
Sample ID	182364-03-Mastic *041832709-0003A*		**Description** **Homogeneity**	4th Floor Lobby - Black Mastic Homogeneous		
PLM NYS 198.1 Friable						**Not Analyzed**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB		11/7/2018	Yellow			**Inconclusive: None Detected**
TEM NYS 198.4 NOB		11/8/2018	Yellow			**None Detected**
Sample ID	182364-04-Drywall *041832709-0004*		**Description** **Homogeneity**	Server Room - Drywall Homogeneous		
PLM NYS 198.1 Friable		11/7/2018	Brown/White	15.00% Cellulose 5.00% Glass	80.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB						**Not Analyzed**
TEM NYS 198.4 NOB						**Not Analyzed**
Sample ID	182364-04-Joint Compound *041832709-0004A*		**Description** **Homogeneity**	Server Room - Joint Compound Homogeneous		
PLM NYS 198.1 Friable		11/7/2018	White		100.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB						**Not Analyzed**
TEM NYS 198.4 NOB						**Not Analyzed**
Sample ID	182364-05-Floor Tile *041832709-0005*		**Description** **Homogeneity**	Server Room - Grey 12"x12" Floor Tile Homogeneous		
PLM NYS 198.1 Friable						**Not Analyzed**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB		11/7/2018	Gray			**Inconclusive: None Detected**
TEM NYS 198.4 NOB		11/8/2018	Gray			**None Detected**
Sample ID	182364-05-Mastic *041832709-0005A*		**Description** **Homogeneity**	Server Room - Black Mastic Homogeneous		
PLM NYS 198.1 Friable						**Not Analyzed**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB		11/7/2018	Black			**Inconclusive: None Detected**
TEM NYS 198.4 NOB		11/8/2018	Black			**None Detected**
Sample ID	182364-37 *041832709-0006*		**Description** **Homogeneity**	Room 412 - White 2'x4' Lay-in Ceiling Tile Homogeneous		
PLM NYS 198.1 Friable						**Not Analyzed**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB		11/7/2018	Gray/White	1.8% Min. Wool		**Inconclusive: None Detected**
TEM NYS 198.4 NOB		11/8/2018	Gray/White			**None Detected**

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Test Report:Asbestos Analysis of Bulk Material

Test			Color	Fibrous	Non-Fibrous	Non Asbestos / Asbestos
Sample ID	182364-06	**Description**	Room B203 - White 2'x2' Lay-in Ceiling Tile			
	041832709-0007	**Homogeneity**	Homogeneous			
PLM NYS 198.1 Friable						**Not Analyzed**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018		Gray/White	8.1% Min. Wool		**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018		Gray/White			**None Detected**
Sample ID	182364-07-Floor Tile	**Description**	Main B2 Hallway - Tan 12"x12" Floor Tile			
	041832709-0008	**Homogeneity**	Homogeneous			
PLM NYS 198.1 Friable						**Not Analyzed**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018		Tan			**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018		Tan			**None Detected**
Sample ID	182364-07-Mastic	**Description**	Main B2 Hallway - Yellow Mastic			
	041832709-0008A	**Homogeneity**	Homogeneous			
PLM NYS 198.1 Friable						**Not Analyzed**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018		Yellow			**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018		Yellow			**None Detected**
Sample ID	182364-08-Floor Tile	**Description**	Main B2 Hallway - Tan 12"x12" Floor Tile			
	041832709-0009	**Homogeneity**	Homogeneous			
PLM NYS 198.1 Friable						**Not Analyzed**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018		Tan			**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018		Tan			**None Detected**
Sample ID	182364-08-Mastic	**Description**	Main B2 Hallway - Yellow Mastic			
	041832709-0009A	**Homogeneity**	Homogeneous			
PLM NYS 198.1 Friable						**Not Analyzed**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018		Yellow			**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018		Yellow			**None Detected**
Sample ID	182364-09-Skim Coat	**Description**	Utility Storage Hallway - Plaster Wall			
	041832709-0010	**Homogeneity**	Homogeneous			
PLM NYS 198.1 Friable	11/7/2018		White		100.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB						**Not Analyzed**
TEM NYS 198.4 NOB						**Not Analyzed**

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Test Report:Asbestos Analysis of Bulk Material

Test		Color	Non Asbestos Fibrous	Non-Fibrous	Asbestos
Sample ID 182364-09-Base Coat *041832709-0010A*		**Description** Utility Storage Hallway - Plaster Wall **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	11/7/2018	Gray		100.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 182364-10-Drywall *041832709-0011*		**Description** Utility Storage Hallway - Drywall **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	11/7/2018	Brown/White	15.00% Cellulose 5.00% Glass	80.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 182364-10-Joint Compound *041832709-0011A*		**Description** Utility Storage Hallway - Joint Compound **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	11/7/2018	White		100.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 182364-11-Floor Tile *041832709-0012*		**Description** G3/B3 Hallway - Salmon 12"x12" Floor Tile **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018	Pink			**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018	Pink			**None Detected**
Sample ID 182364-11-Mastic *041832709-0012A*		**Description** G3/B3 Hallway - Mastic **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018	Yellow			**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018	Yellow			**None Detected**
Sample ID 182364-12-Floor Tile *041832709-0013*		**Description** G3/B3 Hallway - Salmon 12"x12" Floor Tile **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018	Pink			**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018	Pink			**None Detected**

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Test Report:Asbestos Analysis of Bulk Material

Test			Color	Non Asbestos Fibrous	Non-Fibrous	Asbestos
Sample ID	182364-12-Mastic *041832709-0013A*		**Description** **Homogeneity**	G3/B3 Hallway - Mastic Homogeneous		
PLM NYS 198.1 Friable						**Not Analyzed**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB		11/7/2018	Yellow			**Inconclusive: None Detected**
TEM NYS 198.4 NOB		11/8/2018	Yellow			**None Detected**
Sample ID	182364-13 *041832709-0014*		**Description** **Homogeneity**	G3/B3 Hallway by Exit Doors - Floor Leveling Compound Homogeneous		
PLM NYS 198.1 Friable		11/7/2018	White		100.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB						**Not Analyzed**
TEM NYS 198.4 NOB						**Not Analyzed**
Sample ID	182364-14 *041832709-0015*		**Description** **Homogeneity**	G3/B3 Hallway by Exit Doors - Floor Leveling Compound Homogeneous		
PLM NYS 198.1 Friable		11/7/2018	Gray		100.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB						**Not Analyzed**
TEM NYS 198.4 NOB						**Not Analyzed**
Sample ID	182364-15 *041832709-0016*		**Description** **Homogeneity**	G3/B3 Hallway - White 2'x2' Lay-in Ceiling Tile Homogeneous		
PLM NYS 198.1 Friable						**Not Analyzed**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB		11/7/2018	Gray/White			**Inconclusive: None Detected**
TEM NYS 198.4 NOB		11/8/2018	Gray/White			**None Detected**
Sample ID	182364-16-Drywall *041832709-0017*		**Description** **Homogeneity**	G3/B3 Hallway - Drywall Homogeneous		
PLM NYS 198.1 Friable		11/7/2018	Brown/White	15.00% Cellulose 5.00% Glass	80.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB						**Not Analyzed**
TEM NYS 198.4 NOB						**Not Analyzed**
Sample ID	182364-16-Joint Compound *041832709-0017A*		**Description** **Homogeneity**	G3/B3 Hallway - Joint Compound Homogeneous		
PLM NYS 198.1 Friable		11/7/2018	White		100.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB						**Not Analyzed**
TEM NYS 198.4 NOB						**Not Analyzed**

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ProjectID:	

Test Report:Asbestos Analysis of Bulk Material

Test			Color	Non Asbestos Fibrous	Non-Fibrous	Asbestos
Sample ID	182364-45		**Description**	G3/B3 Hallway - White 2'x2' Lay-in Ceiling Tile		
	041832709-0018		**Homogeneity**	Homogeneous		
PLM NYS 198.1 Friable						**Not Analyzed**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB		11/7/2018	Gray/White	4.0% Min. Wool		**Inconclusive: None Detected**
TEM NYS 198.4 NOB		11/8/2018	Gray/White			**None Detected**
Sample ID	182364-17-Floor Tile		**Description**	Room 318 - Grey 12"x12" Floor Tile		
	041832709-0019		**Homogeneity**	Homogeneous		
PLM NYS 198.1 Friable						**Not Analyzed**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB		11/7/2018	Gray			**Inconclusive: None Detected**
TEM NYS 198.4 NOB		11/8/2018	Gray			**None Detected**
Sample ID	182364-17-Mastic		**Description**	Room 318 - Mastic		
	041832709-0019A		**Homogeneity**	Homogeneous		
PLM NYS 198.1 Friable						**Not Analyzed**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB		11/7/2018	Black			**Inconclusive: None Detected**
TEM NYS 198.4 NOB		11/8/2018	Black			**None Detected**
Sample ID	182364-18		**Description**	Men's Restroom - Rough White 2'x4' Layin Ceiling Tile		
	041832709-0020		**Homogeneity**	Homogeneous		
PLM NYS 198.1 Friable						**Not Analyzed**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB		11/7/2018	Gray/White			**Inconclusive: None Detected**
TEM NYS 198.4 NOB		11/8/2018	Gray/White			**None Detected**
Sample ID	182364-19		**Description**	Room 316 - White Dotted 2'x2' Layin Ceiling Tile		
	041832709-0021		**Homogeneity**	Homogeneous		
PLM NYS 198.1 Friable						**Not Analyzed**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB		11/7/2018	Gray/White			**Inconclusive: None Detected**
TEM NYS 198.4 NOB		11/8/2018	Gray/White			**None Detected**
Sample ID	182364-20-Skim Coat		**Description**	3rd Floor Hallway (East End) - Plaster Wall		
	041832709-0022		**Homogeneity**	Homogeneous		
PLM NYS 198.1 Friable		11/7/2018	White		100.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM						**Not Analyzed**
PLM NYS 198.6 NOB						**Not Analyzed**
TEM NYS 198.4 NOB						**Not Analyzed**

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EMSL Order:	041832709
CustomerID:	CRIT52
CustomerPO:	
ProjectID:	

Test Report:Asbestos Analysis of Bulk Material

Test		Color	Non Asbestos Fibrous	Non-Fibrous	Asbestos
Sample ID 182364-20-Base Coat *041832709-0022A*		**Description** **Homogeneity**	3rd Floor Hallway (East End) - Plaster Wall Homogeneous		
PLM NYS 198.1 Friable	11/7/2018	Gray		100.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 182364-40 *041832709-0023*		**Description** **Homogeneity**	Room 322 - White Design 2'x4' Layin Ceiling Tile Homogeneous		
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018	Gray/White	5.3% Min. Wool		**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018	Gray/White			**None Detected**
Sample ID 182364-21-Drywall *041832709-0024*		**Description** **Homogeneity**	West Stair Landing 3rd Floor - Drywall Homogeneous		
PLM NYS 198.1 Friable	11/7/2018	Brown/White	15.00% Cellulose 5.00% Glass	80.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 182364-21-Joint Compound *041832709-0024A*		**Description** **Homogeneity**	West Stair Landing 3rd Floor - Joint Compound		
PLM NYS 198.1 Friable	11/7/2018				**Not Submitted**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 182364-22 *041832709-0025*		**Description** **Homogeneity**	Men's Restroom - Rough White 2'x4' Layin Ceiling Tile Homogeneous		
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018	Gray/White	3.3% Min. Wool		**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018	Gray/White			**None Detected**
Sample ID 182364-23-Drywall *041832709-0026*		**Description** **Homogeneity**	Room 204 - Drywall Homogeneous		
PLM NYS 198.1 Friable	11/7/2018	Brown/White	15.00% Cellulose 5.00% Glass	80.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**

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EMSL Order:	041832709
CustomerID:	CRIT52
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ProjectID:	

Test Report:Asbestos Analysis of Bulk Material

Test		Color	Non Asbestos Fibrous	Non-Fibrous	Asbestos
Sample ID 182364-23-Joint Compound *041832709-0026A*		**Description** Room 204 - Joint Compound **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	11/7/2018	White		100.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 182364-24-Floor Tile *041832709-0027*		**Description** 2nd Floor Hallway (West End) - 12"x12" FT **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018	Tan			**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018	Tan			**None Detected**
Sample ID 182364-24-Mastic *041832709-0027A*		**Description** 2nd Floor Hallway (West End) - Yellow Mastic **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018	Yellow			**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018	Yellow			**None Detected**
Sample ID 182364-25 *041832709-0028*		**Description** 2nd Floor Hallway (East End) - White 2'x2' Layin Ceiling Tile **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018	Gray/White	1.4% Glass		**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018	Gray/White			**None Detected**
Sample ID 182364-26-Skim Coat *041832709-0029*		**Description** 2nd Floor Lobby - Plaster Wall **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	11/7/2018	White		100.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 182364-26-Base Coat *041832709-0029A*		**Description** 2nd Floor Lobby - Plaster Wall **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	11/7/2018	Tan		97.32% Non-fibrous (other)	**2.68% Chrysotile**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**

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EMSL Order:	041832709
CustomerID:	CRIT52
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ProjectID:	

Test Report:Asbestos Analysis of Bulk Material

Test		Color	Non Asbestos Fibrous	Non-Fibrous	Asbestos
Sample ID 182364-27-Floor Tile *041832709-0030*		**Description** **Homogeneity**	2nd Floor Lobby - Beige w/Green 12"x12" Floor Tile Homogeneous		
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018	Beige			**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018	Beige			**None Detected**
Sample ID 182364-27-Mastic *041832709-0030A*		**Description** **Homogeneity**	2nd Floor Lobby - Yellow Mastic Homogeneous		
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018	Yellow			**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018	Yellow			**None Detected**
Sample ID 182364-28 *041832709-0031*		**Description** **Homogeneity**	Custodial Closet Outside Mens Room - White Dotted 2'x2' Layin Ceiling Tile Homogeneous		
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018	Gray/White			**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018	Gray/White			**None Detected**
Sample ID 182364-29-Drywall *041832709-0032*		**Description** **Homogeneity**	Custodial Closet Outside Mens Room - Drywall Homogeneous		
PLM NYS 198.1 Friable	11/7/2018	Brown	30.00% Cellulose 5.00% Glass	65.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 182364-29-Joint Compound *041832709-0032A*		**Description** **Homogeneity**	Custodial Closet Outside Mens Room - Joint Compound Homogeneous		
PLM NYS 198.1 Friable	11/7/2018	White		100.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 182364-30-Skim Coat *041832709-0033*		**Description** **Homogeneity**	1st Floor Hallway West End - Plaster Wall Homogeneous		
PLM NYS 198.1 Friable	11/7/2018	White		100.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**

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EMSL Order:	041832709
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Test Report:Asbestos Analysis of Bulk Material

Test		Color	Non Asbestos Fibrous	Non Asbestos Non-Fibrous	Asbestos
Sample ID 182364-30-Base Coat *041832709-0033A*		**Description** 1st Floor Hallway West End - Plaster Wall **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	11/7/2018	Gray		100.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 182364-31-FT *041832709-0034*		**Description** 1st Floor Hallway West End - Bright Tan 12"x12" FT **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018	Tan			**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018	Tan			**None Detected**
Sample ID 182364-31-Mastic *041832709-0034A*		**Description** 1st Floor Hallway West End - Mastic **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018	Yellow			**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018	Yellow			**None Detected**
Sample ID 182364-32 *041832709-0035*		**Description** 1st Floor Hallway West End by Exit Doors - Floor Leveling Compound **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	11/7/2018	Tan		100.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 182364-33-Drywall *041832709-0036*		**Description** Room B116 - Drywall **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	11/7/2018	Brown	30.00% Cellulose 5.00% Glass	65.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 182364-33-Joint Compound *041832709-0036A*		**Description** Room B116 - Joint Compound **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	11/7/2018	White		100.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**

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Test Report:Asbestos Analysis of Bulk Material

Test		Color	Non Asbestos Fibrous	Non-Fibrous	Asbestos
Sample ID 182364-34-Floor Tile *041832709-0037*		**Description** Room B116 - Grey 12x12 Floor Tile **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018	Gray			**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018	Gray			**None Detected**
Sample ID 182364-34-Mastic *041832709-0037A*		**Description** Room B116 - Black Mastic **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018	Yellow			**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018	Yellow			**None Detected**
Sample ID 182364-35-Floor Tile *041832709-0038*		**Description** B1 Floor Hallway East End - Bright Tan 12"x12" FT **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018	Tan			**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018	Tan			**None Detected**
Sample ID 182364-35-Mastic *041832709-0038A*		**Description** B1 Floor Hallway East End - Mastic **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable					**Not Analyzed**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB	11/7/2018	Yellow			**Inconclusive: None Detected**
TEM NYS 198.4 NOB	11/8/2018	Yellow			**None Detected**
Sample ID 182364-36 *041832709-0039*		**Description** B1 Floor Lobby - Plaster Wall **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	11/7/2018	White		100.00% Non-fibrous (other)	**None Detected**
Base Coat not present in sample.					
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 182364-38 *041832709-0040*		**Description** Throughout 4th Floor Rooms - Spray-on Fireproofing **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	11/8/2018	Brown		100.00% Non-fibrous (other)	
Surfacing Material containing vermiculite. NYS requires ELAP method 198.8.					
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**

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Test Report:Asbestos Analysis of Bulk Material

Test		Color	Non Asbestos Fibrous	Non-Fibrous	Asbestos
Sample ID 182364-39 *041832709-0041*		**Description** Room 305 - Spray-on Fireproofing **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	11/8/2018	Brown		100.00% Non-fibrous (other)	
Surfacing Material containing vermiculite. NYS requires ELAP method 198.8.					
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 182364-41-Skim Coat *041832709-0042*		**Description** Above Ceiling Tile throughout 3rd Floor - Plaster Ceiling **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	11/7/2018	White		100.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 182364-41-Base Coat *041832709-0042A*		**Description** Above Ceiling Tile throughout 3rd Floor - Plaster Ceiling **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	11/7/2018	Brown	5.00% Hair	92.30% Non-fibrous (other)	**2.70% Chrysotile**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 182364-42 *041832709-0043*		**Description** Above Ceiling Tile Hallway West End - Spray-on Fireproofing **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	11/8/2018	Brown		100.00% Non-fibrous (other)	
Surfacing Material containing vermiculite. NYS requires ELAP method 198.8.					
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 182364-43 *041832709-0044*		**Description** Above Ceiling Hallway West End - Spray-on Fireproofing **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	11/8/2018	Brown		100.00% Non-fibrous (other)	
Surfacing Material containing vermiculite. NYS requires ELAP method 198.8.					
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**
Sample ID 182364-44-Skim Coat *041832709-0045*		**Description** Above Ceiling Lobby and East Wing - Plaster Ceiling **Homogeneity** Homogeneous			
PLM NYS 198.1 Friable	11/7/2018	White		100.00% Non-fibrous (other)	**None Detected**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**

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Test Report:Asbestos Analysis of Bulk Material

Test		Color	Non Asbestos Fibrous	Non-Fibrous	Asbestos
Sample ID 182364-44-Base Coat *041832709-0045A*		**Description** **Homogeneity**	Above Ceiling Lobby and East Wing - Plaster Ceiling Homogeneous		
PLM NYS 198.1 Friable	11/7/2018	Brown	5.00% Hair	93.20% Non-fibrous (other)	**1.80% Chrysotile**
PLM NYS 198.6 VCM					**Not Analyzed**
PLM NYS 198.6 NOB					**Not Analyzed**
TEM NYS 198.4 NOB					**Not Analyzed**

Analyst(s)

Dave Poitras *Ted Young*

Juli Patel

Keishla Vazquez Caraball

Benjamin Ellis, Laboratory Manager
or other approved signatory

NOB = Non Friable Organically Bound N/A = Not Applicable VCM = Vermiculite Containing Material

-In New York State, TEM is currently the only method that can be used to determine if NOB materials can be considered or treated as non-asbestos containing.
All samples examined for the presence of vermiculite when analyzed via NYS 198.1.
-NYS Guidelines for Vermiculite containing samples are available at http://www.wadsworth.org/labcert/elapcert/forms/VermiculiteInterimGuidance_Rev070913.pdf
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This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. This report may contain data that is not covered by the NVLAP accreditation.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NYS ELAP 10872, PA ID# 68-00367

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.

Site Address: Lincoln Hall at United States Military Academy at West Point, NY

Analysis: (PLM) TEM Other _____

Turnaround Time		Method of Submittal		
24 Hrs	48 Hrs	(Field)	Walk-in	US Mail
72 Hrs	Other _____	Fedex	Other _____	

FS Name-#/Work Area: Floor 4

Inspector: A. Ward Jr.

Project Manager: S. Vena

Sample Date: 10/23/18

Comments: Bare and fiberglass ducts and pipes.

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	1900	Plaster Wall	South Stair-well	3355F	Y	N		
NS	1900	Plaster Ceiling	South Stairwell	115SF	Y	N		
-01	1900	Plaster Wall	4th Floor Hallway	1300 SF	Y	N		
-02	2000/2100	Beige w/ green spots 12"x12" FT w/ Black mastic	4th Floor Hallway	600SF	N	N		
NS	1700	White 2'x2' Layin Ceiling Tile	4th Floor Hallway	600SF	Y	N		
NS	1900	Plaster Wall	4th Floor Lobby	650 SF	Y	N		
NS	1900	Plaster Ceiling	4th Floor Lobby	~~450~~ 500 SF	Y	N		
-03	2000/2500	Beige w/ green spots 12"x12" FT w/ Yellow mastic	4th Floor Lobby	~~500~~ 460 SF	N	N		
-04	2100	Drywall / Joint Compound	Server Room	370SF	Y	N		
-05	2000/2501	Grey 12"x12" Floor Tile w/ Black Mastic	Server Room	42 SF	N	N		
NS	1701	White Design 2'x4' Layin Ceiling Tile	Room 406	370 SF	Y	N		
NS	1900	~~White Design 2'x4' Layin Ceiling~~ Plaster Wall	Room 406	100 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 406	500 SF	Y	N		
NS	1701	White Design 2'x4' Layin Ceiling Tile	Room 405	650SF ~~SF~~	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr.	10-23-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: Floor 4
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
	Inspector: A. Ward Jr
	Project Manager: S. Vena
	Sample Date: 10/23/18
	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	1900	Plaster Wall	Room 405	200 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 405	700 SF	Y	N		
NS	1701	White Design 2'x4' Layin Ceilng Tile	Room 408	220 SF	Y	N		
NS	1900	Plaster Wall	Room 408	90 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 408	330 SF	Y	N		
NS	1701	White Design 2'x4' Layin Ceiling Tile	Room 409	220 SF	Y	N		
NS	1900	Plaster Wall	Room 409	90 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 409	330 SF	Y	N		
NS	1701	White Design 2'x4' Layin Ceilg Tile	Room 410	220 SF	Y	N		
NS	1900	Plaster Wall	Room 410	90 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 410	330 SF	Y	N		
NS	1701	White Design 2'x4' Layin Ceilg Tile	Room 411	220 SF	Y	N		
NS	1900	Plaster Wall	Room 411	90 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 411	330 SF	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr. / A. Ward	10-23-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: Floor 4
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
Inspector: A. Ward Jr	Sample Date: 10/23/18
Project Manager: S. Vena	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
~~A~~-37	1701	White Decor 2'x4' Lay-in Ceiling Tile	Room 412	220 SF	Y	N		
NS	1900	Plaster Wall	Room 412	90 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 412	330 SF	Y	N		
NS	1701	White Decor 2'x4' Lay-in Ceiling Tile	Room 404	220 SF	Y	N		
NS	1900	Plaster Wall	Room 404	90 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 404	330 SF	Y	N		
NS	1701	White Decor 2'x4' Layin Ceiling Tile	Room 407	180 SF	Y	N		
NS	1900	Plaster Wall	Room 407	80 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 407	300 SF	Y	N		
NS	1703	Rough White 2'x4' Layin Ceiling Tile	Mens Restroom	180 SF	Y	N		
NS	2100	Drywall / Joint Compound	Mens Restroom	350 SF	Y	N		
NS	1703	Rough White 2'x4' Layin Ceiling Tile	Womens Restroom	40 SF	Y	N		
NS	2100	Drywall / Joint Compound	Womens Restroom	180 SF	Y	N		
NS	2601	Fire Doors	Throughout 4th Floor	16 EA	N	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr. /	10-23-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: Floor B2
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
Inspector: A. Ward Jr	Project Manager: S. Vera
Sample Date: 10/23/18	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	2100	Drywall / Joint Compound	West Star Landing	320 SF	Y	N		
NS	1700	White 2'x2' Layin Ceilg Tile	Room B200	650 SF	Y	N		
NS	2002/2502	Tan 12"x12" FT w/ Yellow mastic	Room B200	650 SF	N	N		
NS	1900	Plaster Wall	Room B200	2525F	Y	N		
NS	2100	Drywall / Joint Compound	Room B200	525 SF	Y	N		
NS	1700	White 2'x2' Layin Ceilg Tile	Room B201	435 SF	Y	N		
NS	2002/2502	Tan 12"x12" FT w/ Yellow mastic	↓	435 SF	N	N		
NS	1900	Plaster Wall	↓	170 SF	Y	N		
NS	2100	Drywall / Joint Compound	↓	420 SF	Y	N		
NS	1700	White 2'x2' Layin Ceilg Tile	Room B202	325 SF	Y	N		
NS	2002/2502	Tan 12"x12" FT w/ Yellow mastic	↓	325 SF	N	N		
NS	1900	Plaster Wall	↓	130 SF	Y	N		
NS	2100	Drywall / Joint Compound	↓	380 SF	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr / [signature]	10-23-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other ____	FS Name-#/Work Area: Floor B2
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other ____	Method of Submittal: (Field) Walk-in US Mail Fedex Other ____
Inspector: A. Ward Jr.	Project Manager: S. Vena
Sample Date: 10/23/18	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
-06	1700	White 2'x2' Layin Ceiling Tile	Room B203	325 SF	Y	N		
NS	2002/2502	Tan 12"x12" Floor Tile w/ Yellow mastic	↓	325 SF	N	N		
NS	1900	Plaster Wall	↓	130 SF	Y	N		
NS	2100	Drywall / Joint Compound	↓	380 SF	Y	N		
NS	1703	Rough White 2'x4' Layin Ceiling Tile	Women Restroom	50 SF	Y	N		
NS	1900	Plaster Wall	↓	20 SF	Y	N		
NS	2100	Drywall / Joint Compound	↓	175 SF	Y	N		
NS	1703	Rough White 2'x4' Layin Ceiling Tile	Mens Restroom	220 SF	Y	N		
NS	1900	Plaster Wall	↓	20 SF	Y	N		
NS	2100	Drywall / Joint Compound	↓	280 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Main B2 Hallway	900 SF	Y	N		
NS	1900	~~Drywall / To~~ Plaster Wall	Main B2 Hallway	1800 SF	Y	N		
-07	2002/2502	Tan 12"x12" Floor Tile w/ Yellow Mastic	Main B2 Hallway	900 SF	N	N		
-08	2002/2502	Tan 12"x12" Floor Tile w/ Yellow Mastic	Main B2 Hallway	—	N	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A Ward Jr.	10-23-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: PLM TEM Other _____	FS Name-#/Work Area: Floor B2
Sample Date: 10/23/18	Comments:
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: Field Walk-in US Mail Fedex Other _____
Inspector: A. Ward Jr	
Project Manager: S. Vena	

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
-09	1900	Plaster Wall	Utility Storage Hallway	400 SF	Y	N		
-10	2100	Drywall / Joint Compound	Utility Storage Hallway	800 SF	Y	N		
NS	1900	Plaster Ceiling	Utility Storage Hallway	300 SF	Y	N		
NS	1900	Plaster Wall	Room B208	160 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room B208	80 SF	Y	N		
NS	1900	Plaster Ceiling	Room B208	65 SF	Y	N		
NS	2100	Drywall / Joint Compound	B206 Fan Room	400 SF	Y	N		
NS	2601	Fire Doors	Floor B2 Throughout	18 EA	N	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A Ward Jr / A Ward	10-23-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: Floor G3 (B3)
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
	Inspector: A. Ward Jr.
	Project Manager: S. Vena
	Sample Date: 10/23/18
	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
-11	2603/2603	Salmon 12"x12" Floor Tile w/ Yellow Mastic	G3/B3 Hallway	~~2305F~~ 230SF	N	N		
-12	2603/2603	Salmon 12"x12" Floor Tile w/ Yellow Mastic	G3/B3 Hallway	—	N	N		
-13	2600	Floor Leveling Compound	G3/B3 Hallway by East Doors	20 SF	Y	N		
-14	2600	Floor Leveling Compound	G3/B3 Hallway by East Doors	—	Y	N		
-15	1702	White 2'x2' Design Layin Ceilg Tile	G3/B3 Hallway	190SF	Y	N		
NS	2601	Fire Doors	G3/B3 Hallway	4EA	N	N		
-16	2100	Drywall/Joint Compound	G3/B3 Hallway	450SF	Y	N		
NS	2100	Drywall/Joint Compound	Room B302	200SF	Y	N		
NS	2100	Drywall/Joint Compound	Room B300	200SF	Y	N		
-45	1702	White 2'x2' Design Layin Ceilg Tile	G3/B3 Hallway	—	Y	N		
~~NS~~	~~2600~~							

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr / [signature]	10-23-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 18264

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other ____	FS Name-#/Work Area: Floor 3
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other ____	Method of Submittal: (Field) Walk-in US Mail Fedex Other ____
Inspector: A. Ward Jr.	Project Manager: S. Vera
Sample Date: 10/24/18	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	1900	Plaster Wall	Floor 3 South Stairwell	335SF	Y	N		
NS	2100	Drywall / Joint Compound	Floor 3 South Stairwell	115SF	Y	N		
-17	2003/2501	Grey 12"x12" Floor Tile w/ Black Mastic	Room 318	240SF	N	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 318	240SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 318	450SF	Y	N		
NS	1703	Rough White 2'x4' Layin Ceiling Tile	Women's Restroom	180SF	Y	N		
NS	2100	Drywall / Joint Compound	Women's Restroom	350SF	Y	N		
-18	1703	Rough White 2'x4' Layin Ceiling Tile	Men's Restroom	40SF	Y	N		
NS	2100	Drywall / Joint Compound	Men's Restroom	140SF	Y	N		
-19	1704	White Dotted 2'x2' Layin Ceiling Tile	Room 316	25SF	Y	D		
NS	1900	Plaster Ceiling	Room 316 Above Ceiling Tile	20SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 316	140SF	Y	N		
NS	1900	Plaster Wall	Men's Restroom	40SF	Y	N		
-20	1900	Plaster Wall	3rd Floor Hallway (East End)	1300SF	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr.	10-24-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: Floor 3
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
Inspector: A Ward Jr.	Project Manager: S. Vera
Sample Date: 10/24/18	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	2099/2500	Beige w/ Green spots 12"x12" FT w/ Yellow mastic	3rd ~~3~~ Floor Hallway (East End)	600 SF	N	N		
NS	1700	White 2'x2' Layin Ceiling Tile	3rd Floor Hallway (East End)	600 SF	Y	N		
NS	1900	Plaster Wall	3rd Floor Lobby	650 SF	Y	N		
NS	2100	Drywall/Joint Compound Ceiling	3rd Floor Lobby	500 SF	Y	N		
NS	2099/2500	Beige w/ Green spots 12"x12" FT w/ Yellow mastic	3rd Floor Lobby	450 SF	N	N		
NS	1701	White Design 2'x4' Layin Ceiling Tile	Room 319	240 ft	Y	N		
NS	1900	Plaster Wall	Room 319	100 ft	Y	N		
NS	2100	Drywall/Joint Compound	Room 319	330 ft	Y	N		
~~NS~~ -40	1701	White Design 2'x4' Layin Ceiling Tile	Room 322	240 ft	Y	N		
NS	1900	Plaster Wall	Room 322	100 ft	Y	N		
NS	2100	Drywall/Joint Compound	Room 322	330 ft	Y	N		
NS	1700	White ~~Design~~ 2'x~~4~~' Layin Ceiling Tile	Room 321	310 ft	Y	N		
NS	1900	Plaster Wall	Room 321	120 ft	Y	N		
NS	2100	Drywall/Joint Compound	Room 321	375 ft	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr.	10-24-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: PLM TEM Other	FS Name-#/Work Area: Floor 3
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other	Method of Submittal: Field Walk-in US Mail Fedex Other
Inspector: A. Ward Jr	Project Manager: S. Vera
Sample Date: 10/24/18	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	1701	White Design 2'x4' Layin Ceiling Tile	Room 323 A	250 SF	Y	N		
NS	1900	Plaster Wall	Room 323 A	100 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 323A	340 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 323	270 SF	Y	N		
NS	1900	Plaster Wall	Room 323	110 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 323	360 F	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 324	340 SF	Y	N		
NS	1900	Plaster Wall	Room 324	140 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 324	380 SF	Y	N		
NS	1701	White Design 2'x4' Layin Ceiling Tile	Room 307	240 SF	Y	N		
NS	1900	Plaster Wall	Room 307	100 Lf	Y	N		
NS	2100	Drywall / Joint Compound	Room 307	350 Lf	Y	N		
NS	1701	White Design 2'x4' Layin Ceiling Tile	Room 304	240 Lf	Y	N		
NS	1900	Plaster Wall	Room 304	100 Lf	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A Ward Jr /	10-24-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Ock Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other ____	FS Name-#/Work Area: Floor 3
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other ____	Method of Submittal: (Field) Walk-in US Mail Fedex Other ____
Inspector: A. Ward Jr.	Project Manager: S. Vera
Sample Date: 10/24/13	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	2100	Drywall / Joint Compound	Room 304	35sqft	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 305	290ft	Y	N		
NS	2001/2001	Grey 12"x12" Floor Tile W/Black Mastic	Room 305	290ft	N	N		
NS	1900	Plaster Wall	Room 305	120ft	Y	N		
NS	2100	Drywall / Joint Compound	Room 305	370ft	Y	N		
NS	1701	White Design 2'x4' Layin Ceiling Tile	Room 302	240ft	Y	N		
NS	1900	Plaster Wall	Room 302	100ft	Y	N		
NS	2100	Drywall / Joint Compound	Room 302	350ft	Y	N		
NS	1701	White Design 2'x4' Layin Ceiling Tile	Room 301	240ft	Y	N		
NS	1900	Plaster Wall	Room 301	100ft	Y	N		
NS	2100	Drywall / Joint Compound	Room 301	350ft	Y	N		
NS	1701	White Design 2'x4' Layin Ceiling Tile	Room 314	240ft	Y	N		
NS	1900	Plaster Wall	Room 314	100ft	Y	N		
NS	2100	Drywall / Joint Compound	Room 314	350ft	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr.	10-24-13

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: Floor 3
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
Inspector: A. Ward Jr	Project Manager: S. Vera
Sample Date: 10/24/18	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	1701	White Design 2'x4' Layin Ceiling Tile	Room 313	240sf	Y	N		
NS	1900	Plaster Wall	Room 313	100sf	Y	N		
NS	2100	Drywall / Joint Compound	Room 313	350sf	Y	N		
NS	1701	White Design 2'x4' Layin Ceiling Tile	Room 308	240sf	Y	N		
NS	1900	Plaster Wall	Room 308	100sf	Y	N		
NS	2100	Drywall / Joint Compound	Room 308	350sf	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	3rd Floor Hallway (West End)	900 sf	Y	N		
NS	1900	Plaster Wall	3rd Floor Hallway (West End)	1800 sf	Y	N		
NS	2000/2100	Beige w/ Green Spots 12"x12" FT w/ Yellow mastic	3rd Floor Hallway (West End)	900 SF	N	N		
~~NS~~-21	2100	Drywall / Joint Compound	West Stair Landing 3rd Floor	320 SF	Y	N		
		NO ACCESS	Room 303 [redacted]					
		NO ACCESS	Room 300 [redacted]					
		NO ACCESS	Room 311 [redacted]					
		NO ACCESS	Room 309 [redacted]					

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr / [signature]	10-24-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

PROJECT #: 182364

Client: The Oak Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: Floor 3,
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
Inspector: A. Ward Jr.	Sample Date: 10/24/18
Project Manager: S. Vera	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
		No ACCESS	Room 306					
		NO ACCESS	Room 312					
		NO ACCESS	Room 310A					
		NO ACCESS	Room 310					
NS	2601	Fire Doors	Throughout 3rd Floor	32 EA				

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr.	10-24-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: Floor 2
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
Inspector: Aulard Jr	Sample Date: 10/24/18
Project Manager: S. Vena	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	1700	White 2'x2' Layin Ceiling Tile	Room 224	420SF	Y	N		
NS	1900	Plaster Wall	Room 224	170SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 224	420SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 228	240ft	Y	N		
NS	1900	Plaster Wall	Room 228	100SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 228	350ft	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 222/222A	865SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 222/222A	930SF	Y	N		
NS	1701	White Design 2'x4' Layin Ceiling Tile	Room 225	240ft	Y	N		
NS	1900	Plaster Wall	Room 225	100SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 225	350SF	Y	N		
NS	1701	White Design 2'x4' Layin Ceiling Tile	Room 226	240ft	Y	N		
NS	1900	Plaster Wall	Room 226	100SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 226	350SF	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
Aulard Jr	10-24-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: Floor 2
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
Inspector: A. Ward Jr	Project Manager: S. Vena
Sample Date: 10/24/18	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
-22	1703	Rough White 2'x4' Layin Ceiling Tile	Mens Restroom	180 SF	Y	N		
NS	2100	Drywall / Joint Compound	Mens Restroom	350 SF	Y	N		
NS	1703	Rough White 2'x4' Layin Ceiling Tile	Womens Restroom	40 SF	Y	N		
NS	2100	Drywall / Joint Compound	Womens Restroom	105 SF	Y	N		
NS	1900	Plaster Wall	Womens Restroom	35 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 209	220 SF	Y	N		
NS	1900	Plaster Wall	Room 209	90 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 209	340 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 208	220 SF	Y	N		
NS	1900	Plaster Wall	Room 208	90 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 208	340 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 207	220 SF	Y	N		
NS	1900	Plaster Wall	Room 207	90 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 207	340 SF	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr.	10-24-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: Floor 2
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
Inspector: A. Ward Jr.	Project Manager: S. Vena
Sample Date: 10/24/18	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	1700	White 2'x2' Layin Ceilg Tile	Room 206	220 SF	Y	N		
NS	1900	Plaster Wall	Room 206	90 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 206	340 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 205	220 SF	Y	N		
NS	1900	Plaster Wall	Room 205	90 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 205	340 SF	Y	N		
NS	1700	White 2'x2' Layin Ceilg Tile	Room 204	130 SF	Y	N		
NS	1900	Plaster Wall	Room 204	50 SF	Y	N		
-23	2100	Drywall / Joint Compound	Room 204	310 SF	Y	N		
NS	1700	White 2'x2' Layin Ceilg Tile	Room 204A	130 SF	Y	N		
NS	1900	Plaster Wall	Room 204A	50 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 204A	310 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 203	220 SF	Y	N		
NS	1900	Plaster Wall	Room 203	90 SF	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr.	10-24-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: Floor 2
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
Inspector: A Ward Jr.	Project Manager: S. Vena
Sample Date: 10/24/18	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	1700	White 2'x2' Layin Ceiling Tile	Room 201	220 ft	Y	N		
NS	1900	Plaster Wall	Room 201	90 ft	Y	N		
NS	2100	Drywall / Joint Compound	Room 201	340 ft	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 200	160 ft	Y	N		
NS	1900	Plaster Wall	Room 200	60 ft	Y	N		
NS	2100	Drywall / Joint Compound	Room 200	310 ft	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 218	220 ft	Y	N		
NS	1900	Plaster Wall	Room 218	90 ft	Y	N		
NS	2100	Drywall / Joint Compound	Room 218	340 ft	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 217	220 ft	Y	N		
NS	1900	Plaster Wall	Room 217	90 ft	Y	N		
NS	2100	Drywall / Joint Compound	Room 217	340 ft	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 216	220 ft	Y	N		
NS	1900	Plaster Wall	Room 216	90 ft	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A Ward Jr	10-24-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: PLM TEM Other _____	FS Name-#/Work Area: Floor 2
Sample Date: 10/24/18	
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: Field Walk-in US Mail Fedex Other _____
Inspector: A. Ward Jr.	
Project Manager: S. Vera	
Comments:	

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	2100	Drywall / Joint Compound	Room 216	340SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 203	340SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 215	290ft	Y	N		
NS	1900	Plaster Wall	Room 215	115ft	Y	N		
NS	2100	Drywall / Joint Compound	Room 215	370ft	Y	N		
NS	1700	White 2'x2' Layin Ceilg Tile	Room 214	220ft	Y	N		
NS	1900	Plaster Wall	Room 214	90ft	Y	N		
NS	2100	Drywall / Joint Compound	Room 214	340ft	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 212	220ft	Y	N		
NS	1900	Plaster Wall	Room 212	90ft	Y	N		
NS	2100	Drywall / Joint Compound	Room 212	340ft	Y	N		
NS	1700	White 2'x2' Layin Ceilg Tile	Room 211	220ft	Y	N		
NS	1900	Plaster Wall	Room 211	90ft	Y	N		
NS	2100	Drywall / Joint Compound	Room 211	340ft	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr.	10-24-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: Floor 2
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
Inspector: A. Ward Jr	Project Manager: S. Vera
Sample Date: 10/24/18	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	1700	White 2'x2' Layin Ceiling Tile	Room 210	290 ft	Y	N		
NS	1900	Plaster Wall	Room 210	115 ft	Y	N		
NS	2100	Drywall / Joint Compound	Room 210	370 ft	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	2nd Floor Hallway (West End)	900 ft	Y	N		
NS	1900	Plaster Wall	2nd Floor Hallway (West End)	1800 ft	Y	N		
-24	2000 2004	~~Beige w/ Green Spots~~ Tan 12"x12" FT w/ Yellow mastic	2nd Floor Hallway (West End)	900 ft	N	N		
NS	2100	Drywall / Joint Compound	2nd Floor West Stair Landing	320 ft	Y	N		
NS	1900	Plaster Wall	2nd ~~Floor~~ Floor South Stair Landing	335 SF	Y	N		
NS	2100	Drywall / Joint Compound	2nd ~~Floor~~ Floor South Stair Landing	115 SF	Y	N		
-25	1700	White 2'x2' Layin Ceiling Tile	2nd Floor Hallway (East End)	600 SF	Y	N		
NS	1900	Plaster Wall	2nd Floor Hallway (East End)	1300 SF	Y	N		
NS	2000 2500	Beige w/ Green Spots 12"x12" FT w/ Yellow mastic	2nd Floor Hallway (East End)	600 SF	N	N		
NS	2001	Fire Doors	Throughout 2nd Floor	35 EA	N	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr / [signature]	10-24-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: Floor 2
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
Inspector: A. Ward Jr.	Project Manager: S. Vena
Sample Date: 10/24/18	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
[redacted]	1500	Plaster Wall	2nd Floor Lobby	650 SF	Y	N		
NS-22	2100	Drywall / Joint Compound	2nd Floor Lobby	500 SF	Y	N		
-27	2000/2500	Beige w/ Green Spots 12"x12" FT w Yellow mastic	2nd Floor Lobby	450 SF	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr.	10-24-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: Floor 1
Sample Date: 10/25/18	
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
Inspector: A. Ward Jr.	
Project Manager: S. Vera	
Comments:	

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	1700	White 2'x2' Layn Ceiling Tile	Room 120	290 SF	Y	N		
NS	1900	Plaster Wall	Room 120	120SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 120	380 SF	Y	N		
NS	1700	White 2'x2' Layn Ceiling Tile	Room 119	290SF	Y	N		
NS	1900	Plaster Wall	Room 119	120 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 119	380SF	Y	N		
NS	1700	White 2'x2' Layn Ceiling Tile	Room 118	200SF	Y	N		
NS	1900	Plaster Wall	Room 118	120SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 118	300 SF	Y	N		
NS	1700	White 2'x2' Layn Ceiling Tile	Room 121	290SF	Y	N		
NS	1900	Plaster Wall	Room 121	120SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 121	380SF	Y	N		
NS	1700	White 2'x2' Layn Ceiling Tile	Room 122	400 SF	Y	N		
NS	1900	Plaster Wall	Room 122	160 SF	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr.	10-25-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.

Site Address: Lincoln Hall at United States Military Academy at West Point, NY

Analysis: (PLM) TEM Other _____

Turnaround Time		Method of Submittal		
24 Hrs	48 Hrs	(Field)	Walk-in	US Mail
72 Hrs	Other _____	Fedex	Other _____	

FS Name-#/Work Area: Floor 1

Inspector: A. Ward Jr.

Project Manager: S. Vera

Sample Date: 10/25/18

Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	2100	Drywall / Joint Compound	Room 122	420SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 116	260 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 116	370 SF	Y	N		
NS	1703	Rough White 2'x4' Layin Ceiling Tile	Men's Restroom	180 SF	Y	N		
NS	1900	Plaster Wall	Men's Restroom	90 SF	Y	N		
NS	2100	Drywall / Joint Compound	Men's Restroom	260 SF	Y	N		
NS	1703	Rough White 2'x4' Ceiling Tile	Women's Restroom	40 SF	Y	N		
NS	2100	Drywall / Joint Compound	Women's Restroom	140 SF	Y	N		
-28	1704	White Dotted 2'x2' Layin Ceiling Tile	Custodial Closet Outside Men's Rest	25 SF	Y	N		
NS	1900	Plaster Ceiling	Custodial Closet Outside Men's Rest	25 SF	Y	N		
-29	2100	Drywall / Joint Compound	Custodial Closet Outside Men's Restroom	140 SF	Y	N		
NS	1900	Plaster Wall	Women's Restroom	40 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 122A (In between 122 & 123)	290 SF	Y	N		
NS	1900	Plaster Wall	Room 122A (In between 122 & 123)	120 SF	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr.	10-25-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: Floor 1
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
Inspector: A. Ward Jr.	Project Manager: S. Vena
Sample Date: 10/25/18	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	2100	Drywall / Joint Compound	Room 122A (In between 122 & 123)	380SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 123	670SF	Y	N		
NS	1900	Plaster Wall	Room 123	270SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 123	540SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 105	110SF	Y	N		
NS	1900	Plaster Wall	Room 105	90SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 105	210SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 103	110SF	Y	N		
NS	1900	Plaster Wall	Room 103	90SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 103	210SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 102	130SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 102	380SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 104	100SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 104	280SF	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr. / [signature]	10-25-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Ogle Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: Floor 1
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
Inspector: A. Ward Jr	Sample Date: 10/25/18
Project Manager: J. Vera	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	1700	White 2'x2' Layin Ceiling Tile	Room 106	200 SF	Y	N		
NS	1900	Plaster Wall	Room 106	40 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 106	340 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 101/101A	720 SF	Y	N		
NS	1900	Plaster Wall	Room 101/101A	280 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 101/101A	550 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 100	720 SF	Y	N		
NS	1900	Plaster Wall	Room 100	280 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 100	550 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 111	200 SF	Y	N		
NS	1900	Plaster Wall	Room 111	855 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 111	330 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 112	340 SF	Y	N		
NS	1900	Plaster Wall	Room 112	130 SF	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr.	10-25-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: 1 Floor
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
Inspector: A. Ward Jr	Sample Date: 10/25/18
Project Manager: S. Vena	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	2100	Drywall / Joint Compound	Room 112	380SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 110	340SF	Y	N		
NS	1900	Plaster Wall	Room 110	130SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 110	360SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 109	230SF	Y	N		
NS	1900	Plaster Wall	Room 109	90 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 109	340SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room 108	270SF	Y	N		
NS	1900	Plaster Wall	Room 108	110SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 108	360SF	Y	N		
NS	1705	White Dotted 2'x4' Layin Ceiling Tile	Room 107A	270SF	Y	N		
NS	1900	Plaster Wall	Room 107A	110SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 107A	360SF	Y	N		
NS	2001/2501	Gry 12"x12" FT w/ Black Mastic	Room 107A	270SF	N	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr	10-25-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.

Site Address: Lincoln Hall at United States Military Academy at West Point, NY

Analysis: (PLM) TEM Other _____

Turnaround Time		Method of Submittal		
24 Hrs	48 Hrs	(Field)	Walk-in	US Mail
72 Hrs	Other _____	Fedex	Other _____	

FS Name-#/Work Area: Floor 1

Inspector: A. Ward Jr

Project Manager: S. Vena

Sample Date: 10/25/18

Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	1705	White Dotted 2'x4' Layin Ceiling Tile	Room 107	310SF	Y	N		
NS	1900	Plaster Wall	Room 107	1200SF	Y	N		
NS	2100	Drywall / Joint Compound	Room 107	380SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	1st Floor Hallway (West End)	90SF	Y	N		
-30	1900	Plaster Wall	1st Floor Hallway (West End)	1800SF	Y	N		
-31	2004/2504	Bright Tan 12"x12" FT w/ Yellow Mastic	1st Floor Hallway (West End)	90SF	N	N		
NS	2100	Drywall / Joint Compound	1st Floor West Stair Landing	32SF	Y	N		
NS	1900	Plaster Wall	1st Floor South Stair Landing	335SF	Y	N		
NS	2100	Drywall / Joint Compound	1st Floor South Stair Landing	115SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	1st Floor Hallway (East End)	600SF	Y	N		
NS	1900	Plaster Wall	1st Floor Hallway (East End)	1300SF	Y	N		
NS	2004/2504	Bright Tan 12"x12" FT w/ Yellow Mastic	1st Floor Hallway (East End)	600SF	N	N		
NS	1900	Plaster Wall	1st Floor Lobby	650SF	Y	N		
NS	2100	Drywall / Joint Compound	1st Floor Lobby	500SF	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A Ward Jr.	10-25-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: Floor 1
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
Inspector: A. Ward Jr.	Sample Date: 10/25/18
Project Manager: S. Vera	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	2601	Fire Doors	Throughout 1st Floor	3 LEA	N	N		
			~~West End Hallway 1st Floor~~					
-32	2600	Floor Leveling Compound (Under Floor Tile)	1st Floor Hallway (West End) by Exit doors	30 SF	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr.	10-25-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 18236.4

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: Floor B1
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
Inspector: A. Ward Jr.	Project Manager: S. Vera
Sample Date: 10/25/18	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	1700	White 2'x2' Layin Ceiling Tile	Room B119	200SF	Y	N		
NS	1900	Plaster Wall	Room B119	90SF	Y	N		
NS	2100	Drywall / Joint Compound	Room B119	330SF	Y	N		
		NO ACCESS	Room B118					
		NO ACCESS	Room B117					
NS	1700	White 2'x2' Layin Ceiling Tile	Room B120	250SF	Y	N		
NS	1900	Plaster Wall	Room B120	100SF	Y	N		
NS	2100	Drywall / Joint Compound	Room B120	360SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room B115	230SF	Y	N		
NS	1900	Plaster Wall	Room B115	100SF	Y	N		
NS	2100	Drywall / Joint Compound	Room B115	440SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room B121	220SF	Y	N		
NS	1900	Plaster Wall	Room B121	90SF	Y	N		
NS	2100	Drywall / Joint Compound	Room B121	410SF	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr /	10-25-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Galt Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other ____	FS Name-#/Work Area: Floor B1
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other ____	Method of Submittal: (Field) Walk-in US Mail Fedex Other ____
Inspector: A. Ward Jr.	Sample Date: 10/25/18
Project Manager: S. Vena	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	1700	White 2'x2' Layin Ceilg Tile	Room B116	555F	Y	N		
NS	1900	Plaster Wall	Room B116	60SF	Y	N		
-33	2100	Drywall / Joint Compound	Room B116	230 SF	Y	N		
-34	2001/2101	Grey 12"x12" Floor Tile w/ Black Mastic	Room B116	555F	N	N		
NS	1700	White 2'x2' Layin Ceilg Tile	Mens Restroom	180 SF	Y	N		
NS	1900	Plaster Wall	Mens Restroom	90 SF	Y	N		
NS	2100	Drywall / Joint Compound	Mens Restroom	260SF	Y	N		
NS	1700	White 2'x2' Layin Ceilg Tile	Womens Restroom	40SF	Y	N		
NS	1900	Plaster Wall	Womens Restroom	35SF	Y	N		
NS	2100	Drywall / Joint Compound	Womens Restroom	140SF	Y	N		
NS	1704	White Dotted 2'x2' Layin Ceilg Tile	Custodial Closet Outside Mens Restroom	20 SF	Y	D		
NS	1900	Plaster Ceiling	Custodial Closet Outside Mens Restroom	45SF	Y	N		
NS	2100	Drywall / Joint Compound	Custodial Closet Outside Mens Restroom	140SF	Y	N		
NS		[redacted] NO ACCESS	Room B124					

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr.	10-25-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: Floor B1
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
Inspector: A. Ward Jr.	Sample Date: 10/25/18
Project Manager: S. Vera	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	1700	White 2'x2' Layin Ceiling Tile	Room B123	180 SF	Y	N		
NS	1900	Plaster Wall	Room B123	70 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room B123	330 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Suite B103	540 SF	Y	N		
NS	1900	Plaster Wall	Suite B103	210 SF	Y	N		
NS	2100	Drywall / Joint Compound	Suite B103	1,300 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room B102	470 SF	Y	N		
NS	1900	Plaster Wall	Room B102	180 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room B102	620 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room B101B	420 SF	Y	N		
NS	1900	Plaster Wall	Room B101B	160 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room B101B	575 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room B101A	420 SF	Y	N		
NS	1900	Plaster Wall	Room B101A	160 SF	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr. / [signature]	10-25-18

LAB INFORMATION

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PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: Floor B1
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
Inspector: A. Ward Jr	Sample Date: 10/25/18
Project Manager: S. Vera	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	2100	Drywall / Joint Compound	Room B101A	575SF	Y	N		
		NO ACCESS	Room B100		~~Y~~	~~N~~		
NS	1700	White 2'x2' Layin Ceiling Tile	Room B111	180SF	Y	N		
NS	1900	Plaster Wall	Room B111	70SF	Y	N		
NS	2100	Drywall / Joint Compound	Room B111	330SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room B110	180 SF	Y	N		
NS	1900	Plaster Wall	Room B110	70 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room B110	330 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room B109A	230 SF	Y	N		
NS	1900	Plaster Wall	Room B109A	90 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room B109A	340 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room B109	230 SF	Y	N		
NS	1900	Plaster Wall	Room B109	90 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room B109	340 SF	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr	10-25-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.	Site Address: Lincoln Hall at United States Military Academy at West Point, NY
Analysis: (PLM) TEM Other _____	FS Name-#/Work Area: Floor B1
Turnaround Time: 24 Hrs 48 Hrs 72 Hrs Other _____	Method of Submittal: (Field) Walk-in US Mail Fedex Other _____
Inspector: A. Ward Jr	Sample Date: 10/25/18
Project Manager: S. Vena	Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	1700	White 2'x2' Layin Ceiling Tile	Room B108	180 SF	Y	N		
NS	1900	Plaster Wall	Room B108	70 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room B108	330 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	Room B107	230 SF	Y	N		
NS	1900	Plaster Wall	Room B107	90 SF	Y	N		
NS	2100	Drywall / Joint Compound	Room B107	340 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	~~Room~~ B106 Suite	400 SF	Y	N		
NS	1900	Plaster Wall	~~Room~~ B106 Suite	160 SF	Y	N		
NS	2100	Drywall / Joint Compound	~~Room~~ B106 Suite	720 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	B1 Floor Hallway (West End)	900 SF	Y	N		
NS	1900	Plaster Wall	B1 Floor Hallway (West End)	1800 SF	Y	N		
NS	2100	Drywall / Joint Compound	B1 Floor Hallway (West End)	~~100~~ SF	Y	N		
NS	2009 ~~2500~~	Tan 12"x12" Floor Tile Yellow Mastic	B1 Floor Hallway (West End	900 SF	Y/N	N		
NS	2100	Drywall / Joint Compound	B1 Floor West Stair Landing	320 SF	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A Ward Jr	10-25-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc.

Site Address: Lincoln Hall at United States Military Academy at West Point, NY

Analysis: (PLM) TEM Other _____

Turnaround Time		Method of Submittal		
24 Hrs	48 Hrs	(Field)	Walk-in	US Mail
72 Hrs	Other _____	Fedex	Other _____	

FS Name-#/Work Area: Floor B1

Inspector: A. Ward Jr.

Project Manager: S. Vera

Sample Date: 10/25/18

Comments:

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
NS	1900	Plaster Wall	B1 Floor South Stair Landing	335 SF	Y	N		
NS	2100	Drywall / Joint Compound	B1 Floor South Stair Landing	115 SF	Y	N		
NS	1700	White 2'x2' Layin Ceiling Tile	B1 Floor Hallway (East End)	600 SF	Y	N		
NS	1900	Plaster Wall	B1 Floor Hallway (East End)	1300 SF	Y	N		
-35	2004/2504	Bright Tan 12"x12" FT w/ Yellow Mas	B1 Floor Hallway (East End)	600 SF	N	N		
NS	1700	B. White 2'x2' Layin Ceiling Tile	B1 Floor Lobby	600 SF	Y	N		
-36	1900	Plaster Wall	B1 Floor Lobby	250 SF	~~Y~~ N	N		
NS	2004/2504	Bright Tan 12"x12" FT w/ Yellow Mas	B1 Floor Lobby	450 SF	N	N		
NS	2601	Iron Doors	Throughout B1 Floor	36 EA	N	N		
NS	2100	Drywall / Joint Compound	B1 Floor Lobby	250 SF	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A Ward Jr / [signature]	10-25-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

PROJECT #: 182364

CRITERION LABORATORIES, INC.
ASBESTOS BULK SAMPLE LOG

Criterion

Client: The Oak Group Inc

Site Address: Lincoln Hall at United States Military Academy at West Point, NY

Analysis: (PLM) TEM Other _____

Turnaround Time		Method of Submittal		
24 Hrs	48 Hrs	(Field)	Walk-in	US Mail
72 Hrs	Other _____	Fedex	Other _____	

FS Name-#/Work Area: Above Ceiling Tile

Inspector: A. Ward Jr.

Project Manager: S. Vena

Sample Date: 10/26/18

Comments: * Listed fireproofing that was observed. Not all rooms and hallways contain fireproofing* Could not access all rooms to check above all ceiling tiles.

Sample #	HID #	Material Description (Including Color)	Sample Location	Qty (SF/LF)	Friable (Y/N)	Damaged (S/D/N)	For Laboratory Analysis: Asbestos Type (s)	%
-38	0100	Spray-On Fireproofing	Throughout 4th Floor Rooms	360 SF	Y	N		
-39	0100	Spray-On Fireproofing	Room 305	30 SF	Y	N		
-41	1900	Plaster Ceiling	Above Ceiling Tile Throughout 3rd Floor	9,000 SF	Y	N		
-42	0100	Spray-On Fireproofing	Above Ceiling Tile Hallway West End 2nd Flr	200 SF	Y	N		
NS	1900	Plaster Ceiling	Above Ceiling Tile Throughout 2nd Floor	9,000 SF	Y	N		
NS	1900	Plaster Ceiling	Above Ceiling Tile Throughout 1st Floor	9,000 SF	Y	N		
-43	0100	Spray-On Fireproofing	Above Ceiling Tile Hallway West End Floor B1	200 SF	Y	N		
-44	1900	Plaster Ceiling	Above Ceiling Tile Lobby & East Wing Floor B1	4,000 SF	Y	N		
NS	1900	Plaster Ceiling	Above Ceiling Tile Hallway West End Floor B2	5,000 SF	Y	N		

CHAIN OF CUSTODY

Relinquished By (Print/Sign)	Date/Time
A. Ward Jr / [signature]	10-26-18

LAB INFORMATION

Received By (Print/Sign)	Date/Time	Analyzed By (Print/Sign)	Date/Time

3.0 ASBESTOS INVENTORY

SECTION 3.0
ASBESTOS INVENTORY

United States Military Academy
Lincoln Hall
West Point, NY

Location	Material	Quantity
Floor 4		
South Stairwell	Plaster Walls	3,355 Square Feet (SF)
South Stairwell	Plaster Ceiling	115 SF
4th Floor Hallway	Plaster Walls	1,300 SF
4th Floor Lobby	Plaster Walls	650 SF
4th Floor Lobby	Plaster Ceiling	500 SF
Room 406	Plaster Walls	100 SF
Room 405	Plaster Walls	200 SF
Room 408	Plaster Walls	90 SF
Room 409	Plaster Walls	90 SF
Room 410	Plaster Walls	90 SF
Room 411	Plaster Walls	90 SF
Room 412	Plaster Walls	90 SF
Room 404	Plaster Walls	90 SF
Room 407	Plaster Walls	80 SF
Throughout 4th Floor	Fire Doors (Assumed)	16 Each (Ea)
Floor B2		
Room B200	Plaster Walls	252 SF
Room B201	Plaster Walls	170 SF
Room B202	Plaster Walls	130 SF

SECTION 3.0
ASBESTOS INVENTORY

Floor B2 (Continued)		
Room B203	Plaster Walls	130 SF
Women's Restroom	Plaster Walls	20 SF
Men's Restroom	Plaster Walls	20 SF
Main B2 Hallway	Plaster Walls	1,800 SF
Utility Storage Hallway	Plaster Walls	400 SF
Utility Storage Hallway	Plaster Ceiling	300 SF
Room B208	Plaster Walls	160 SF
Room B208	Plaster Ceiling	65 SF
Floor B2 Throughout	Fire Doors (Assumed)	18 Ea
Above Ceiling Tile in Hallway – West End	Plaster Ceiling	5,000 SF
Floor G3 (B3)		
G3/B3 Hallway	Fire Doors (Assumed)	4 Ea
Floor 3		
Floor 3 South Stairwell	Plaster Walls	335 SF
Room 316 Above Ceiling Tile	Plaster Ceiling	20 SF
Men's Restroom	Plaster Walls	40 SF
3rd Floor Hallway (East End)	Plaster Walls	1,300 SF
3rd Floor Lobby	Plaster Walls	650 SF
Room 319	Plaster Walls	100 SF
Room 322	Plaster Walls	100 SF
Room 321	Plaster Walls	120 SF

SECTION 3.0
ASBESTOS INVENTORY

Floor 3 (Continued)		
Room 323A	Plaster Walls	100 SF
Room 323	Plaster Walls	110 SF
Room 324	Plaster Walls	140 SF
Room 307	Plaster Walls	100 SF
Room 304	Plaster Walls	100 SF
Room 305	Plaster Walls	120 SF
Room 302	Plaster Walls	100 SF
Room 301	Plaster Walls	100 SF
Room 314	Plaster Walls	100 SF
Room 313	Plaster Walls	100 SF
Room 308	Plaster Walls	100 SF
3rd Floor Hallway (West End)	Plaster Walls	1,800 SF
Throughout 3rd Floor	Fire Doors (Assumed)	32 Ea
Above Ceiling Tile Throughout 3rd Floor	Plaster Ceiling	9,000 SF
Floor 2		
Room 224	Plaster Walls	170 SF
Room 228	Plaster Walls	100 SF
Room 225	Plaster Walls	100 SF
Room 226	Plaster Walls	100 SF
Women's Restroom	Plaster Walls	35 SF
Room 209	Plaster Walls	90 SF
Room 208	Plaster Walls	90 SF

SECTION 3.0
ASBESTOS INVENTORY

Floor 2 (Continued)		
Room 207	Plaster Walls	90 SF
Room 206	Plaster Walls	90 SF
Room 205	Plaster Walls	90 SF
Room 204	Plaster Walls	50 SF
Room 204A	Plaster Walls	50 SF
Room 203	Plaster Walls	90 SF
Room 201	Plaster Walls	90 SF
Room 200	Plaster Walls	60 SF
Room 218	Plaster Walls	90 SF
Room 217	Plaster Walls	90 SF
Room 216	Plaster Walls	90 SF
Room 215	Plaster Walls	115 SF
Room 214	Plaster Walls	90 SF
Room 212	Plaster Walls	90 SF
Room 211	Plaster Walls	90 SF
Room 210	Plaster Walls	115 SF
2nd Floor Hallway (West End)	Plaster Walls	1,800 SF
2nd Floor South Stair Landing	Plaster Walls	335 SF
2nd Floor Hallway (East End)	Plaster Walls	1,300 SF
Throughout 2nd Floor	Fire Doors (Assumed)	35 Ea
2nd Floor Lobby	Plaster Walls	650 SF
Above Ceiling Tile Throughout 2nd Floor	Plaster Ceiling	9,000 SF

SECTION 3.0
ASBESTOS INVENTORY

Floor 1		
Room 120	Plaster Walls	120 SF
Room 119	Plaster Walls	120 SF
Room 118	Plaster Walls	120 SF
Room 121	Plaster Walls	120 SF
Room 122	Plaster Walls	160 SF
Men's Restroom	Plaster Walls	90 SF
Custodial Closet Outside Men's Restroom	Plaster Ceiling	25 SF
Women's Restroom	Plaster Walls	40 SF
Room 122A (In Between 122 & 123)	Plaster Walls	120 SF
Room 123	Plaster Walls	270 SF
Room 105	Plaster Walls	90 SF
Room 103	Plaster Walls	90 SF
Room 106	Plaster Walls	40 SF
Room 101/101A	Plaster Walls	280 SF
Room 100	Plaster Walls	280 SF
Room 111	Plaster Walls	85 SF
Room 112	Plaster Walls	130 SF
Room 110	Plaster Walls	130 SF
Room 109	Plaster Walls	90 SF
Room 108	Plaster Walls	110 SF
Room 107A	Plaster Walls	110 SF
Room 107	Plaster Walls	120 SF

SECTION 3.0
ASBESTOS INVENTORY

Floor 1 (Continued)		
1st Floor Hallway (West End)	Plaster Walls	1,800 SF
1st Floor South Stair Landing	Plaster Walls	335 SF
1st Floor Hallway (East End)	Plaster Walls	1,300 SF
1st Floor Lobby	Plaster Walls	650 SF
1st Floor Throughout	Fire Doors (Assumed)	36 Ea
Above Ceiling Throughout 1st Floor	Plaster Ceiling	9,000 SF
Floor B1		
Room B119	Plaster Walls	90 SF
Room B120	Plaster Walls	100 SF
Room B115	Plaster Walls	100 SF
Room B121	Plaster Walls	90 SF
Room B116	Plaster Walls	60 SF
Men's Restroom	Plaster Walls	90 SF
Women's Restroom	Plaster Walls	35 SF
Custodial Closet Outside Men's Restroom	Plaster Ceiling	45 SF
Room B123	Plaster Walls	70 SF
Suite B103	Plaster Walls	210 SF
Room B102	Plaster Walls	180 SF
Room B101B	Plaster Walls	160 SF
Room B101A	Plaster Walls	160 SF
Room B111	Plaster Walls	70 SF
Room B110	Plaster Walls	70 SF

SECTION 3.0
ASBESTOS INVENTORY

Floor B1 (Continued)		
Room B109A	Plaster Walls	90 SF
Room B109	Plaster Walls	90 SF
Room B108	Plaster Walls	70 SF
Room B107	Plaster Walls	90 SF
B106 Suite	Plaster Walls	160 SF
B1 Floor Hallway (West End)	Plaster Walls	1,800 SF
B1 Floor South Stair Landing	Plaster Walls	335 SF
B1 Floor Hallway (East End)	Plaster Walls	1,300 SF
B1 Floor Lobby	Plaster Walls	250 SF
Throughout B1 Floor	Fire Doors (Assumed)	36 Ea
Above Ceiling Tile in Lobby & East Wing	Plaster Ceilings	4,000 SF

4.0 SUSPECT MATERIALS TESTING NEGATIVE FOR ASBESTOS CONTENT

4.0 Suspect Materials Testing Negative for Asbestos Content

The following materials were observed, sampled, submitted for analysis and found not to be asbestos-containing materials:

- Beige with Green Spots 12”x12” Floor Tile with Black Mastic
- White 2’x2’ Lay-In Ceiling Tile
- Drywall/Joint Compound
- Grey 12”x12” Floor Tile with Black Mastic
- White Design 2’x4’ Lay-In Ceiling Tile
- Rough White 2’x4’ Lay-In Ceiling Tile
- Tan 12”x12” Floor Tile with Yellow Mastic
- Salmon 12”x12” Floor Tile with Yellow Mastic
- Floor Leveling Compound
- White Dotted 2’x2’ Lay-In Ceiling Tile
- Floor Leveling Compound
- Spray-on Fireproofing

5.0 SAMPLING METHODOLOGY

5.0 Sampling Methodology

Bulk samples of suspected asbestos-containing material (ACM) were collected in accordance with guidelines set forth by the Environmental Protection Agency (EPA) and the National Institute for Occupational Safety and Health (NIOSH). The procedures for obtaining a bulk sample of suspected ACM are:

1. "Functional Spaces" in the Property were identified. A Functional Space is a spatially distinct unit within a building, which contains identifiable populations of building occupants (i.e. corridor, office space, mechanical area, etc.).

2. The total amount and location of each type of suspected ACM was tabulated.

3. The types of suspected ACM were then grouped as homogeneous materials. Each homogeneous material is defined as being uniform in texture and appearance. Based on these parameters, each homogeneous material was assigned a specific identification number as listed below.

Homogeneous Material I.D. #Reference List

Surfacing

0100 to 0199 - Sprayed-On
0200 to 0299 - Troweled-On
0300 to 0399 - Blown-In
0400 to 0499 - Other Surfacing
1900 to 1999 - Plaster Walls and Ceilings

Thermal

0500 to 0599 - Lagging
0600 to 0699 - Breeching
0700 to 0799 - Duct Insulation
0800 to 0899 - Tank Insulation
0900 to 0999 - Block Pipe Insulation
1000 to 1099 - Joints associated with Block Pipe Insulation
1100 to 1199 - Corrugated/Air Cell Pipe Insulation
1200 to 1299 - Joints associated with Corrugated Pipe Insulation
1300 to 1399 - Compressed Pipe Insulation
1400 to 1499 - Joints associated with Compressed Pipe Insulation
1500 to 1599 - Joints associated with Fibrous Glass Pipe Insulation
1600 to 1699 - Other Thermal

5.0 Sampling Methodology (Continued)

Miscellaneous

1700 to 1799 - Lay-In Ceiling Tiles
1800 to 1899 - Spline Ceiling Tiles
2000 to 2099 - Floor Tiles
2100 to 2199 - Drywall
2200 to 2299 - Linoleum
2300 to 2399 - Transite
2400 to 2499 - Expansion Joints
2500 to 2599 - Mastic Floor Tiles
2600 to 2699 - Other Miscellaneous
2700 to 2799 - Mastic Linoleum

4. A sampling scheme was devised based upon the amounts and locations of the different homogeneous materials in order to obtain representative samples.

5. Trained personnel using an appropriate sampling tool and a leak-tight, labeled sample container took the actual bulk samples. The sampling was conducted in areas of the building that are not readily visible to the building occupants. These areas included above lay-in ceiling tiles and beneath cabinets and desks, etc.

6. The personnel employed proper decontamination procedures to prevent contamination of the building environment and possible exposure to themselves and others.

7. Each location of suspicious asbestos-containing material (ACM) was documented on the Asbestos Bulk Sample Log. This documentation included the location of suspicious materials, type of material located and square footage of suspicious ACM. All bulk samples taken were documented on the Sample Log form and a Chain of Custody form. Each was completed for all samples taken by the inspector and handler.

8. The samples were then taken to the laboratory for analysis. The Certificates of Analysis and Chain of Custody relative to each sample are included in this report.

9. The inspector assessed the condition of the suspicious ACM using the eight EPA factors.

6.0 CERTIFICATIONS

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

N.Y.S

ANDREW O WARD JR
CLASS(EXPIRES)
C ATEC(06/19) D INSP(06/19)
H PM (06/19)

CERT# 99-13728
DMV# 623146812

MUST BE CARRIED ON ASBESTOS PROJECTS

01213 004637019 36

EYES BLU
HAIR BRO
HGT 5' 11"

IF FOUND RETURN TO:
NYSDOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240

Number 747340

Expiration Date:
11/06/2019

Certificate of Training

CRITERION LABORATORIES, INC.

HEREBY CERTIFIES THAT

Isa Haj

HAS SUCCESSFULLY COMPLETED A 4 HOUR COURSE ENTITLED

Asbestos Building Inspector Refresher

INCLUDING CLASSROOM INSTRUCTION

on this 6th day of November 2018

Exam passed on this 6th day of November 2018 - Score - 92

Approved for AHERA Accreditation Under TSCA Title II

400 Street Road
Bensalem, PA 19020
(215) 244-1300 - Phone
(215) 244-4349 - Fax
www.criterionlabs.com

Rev. 20170501
Course is conducted in English

DIRECTOR: J-C Weltz

James A. Weltz, CIH, President

Fungal Investigation Report

Lincoln Hall

USMA West Point NY

Prepared for: Mr. Terry Allen
Mason and Hanger

Prepared by: **the oak group, inc.** 622 Cooper Street Camden, NJ 08102 (856) 377-0060 www.oakgroup.net
Mailing address: PO Box 2041 Voorhees, NJ 08043

PURPOSE

A fungal investigation was conducted within Lincoln Hall of the United States Military Academy located in West Point, NY. The investigation was performed on October 26, 2018.

PERSONNEL

The fungal investigation was performed by, Ms. Melissa Billingsley, Industrial Hygienist. The findings were reviewed by Eduard Eichen, CIH

CONCLUSIONS

Visible fungal growth was observed on walls within B1 Level - Room B101B and on the walls within the B2 Level Hallways.

Analysis of the indoor airborne fungal spore samples collected from throughout Lincoln Hall revealed levels of airborne fungal spores lower than those found outdoors on the day of the site visit. However, *Stachybotrys sp.* spores were found on several samples collected on the B1& B2 Levels and were not found on the outdoor sample, indicating that fungal growth may be occurring in these areas. There areas included B1 Level – Room B1116 (Copy Room), B2 Level – Room B201, and B2 Level – Elevator/Center Stair Lobby.

RECOMMENDATIONS

Any water-intrusions or leaks causing water-damage should be repaired as soon as possible.

Porous building materials (ceiling tile, carpet, drywall, fiberglass insulation) exhibiting fungal growth or that have been, or potentially will stay, wet for greater than 48 hours or that exhibit fungal growth or staining should be removed.

Non and semi-porous (plaster, concrete, floor tiles, wood, metal) fungal-affected building materials should be thoroughly cleaned with an anti-microbial detergent solution, consisting of a biocide, or a 10% bleach solution. Materials should be treated with the solution, scrubbed, treated a second time with the solution, and then wiped clean. Any building materials that cannot be cleaned, to the satisfaction of an Industrial Hygienist, or that are too damaged to be cleaned, should be removed.

In the absence of visible fungal growth, a thorough wet-wiping and HEPA-vacuuming of horizontal surfaces in the areas of concern should remove excess spores from the area.

Please do not hesitate to contact me at (856) 377-0060 or eje@oakgroup.net if you should you have any questions or concerns.

PROCEDURES

A thorough visual inspection of the area of concern, for visible fungal growth and water damage, was conducted prior to sampling for fungal spores.

Airborne fungal spore samples were collected for fifteen minute intervals using Air-O-Cell® spore cassettes attached to a high volume sampling pump calibrated at approximately 15 liters per minute (lpm).

All samples were quantitatively analyzed for fungal spores at Critereon Labs, an American Association (AIHA), EMLAP Lab ID #100424 laboratory in Bensalem, PA. Airborne Fungal spore samples were quantitatively analyzed for fungal spores using a Kohler illuminated light microscope at 1,000 time magnification (oil immersion). Results are given to the genus level of the spores found. All sampling equipment was calibrated in the field prior to the air sampling.

RESULTS

Sample #	**Location**	**Results – (**spores per cubic meter)
162364-01-192-01-001	4th Floor Hallway at Room 412	1,813
162364-01-192-01-002	3rd Floor – Room 305 (Eatery)	1,600
162364-01-192-01-003	3rd Floor – Room 318 (Main & Distribution)	2,093
162364-01-192-01-004	2nd Floor – Hallway at Room 227 & 228	4,587
162364-01-192-01-005	2nd Floor – Room 204A (Copy Room)	2,693
162364-01-192-01-006	1st Floor – Office 116	2,227
162364-01-192-01-007	1st Floor – Room 107A (Copy Room)	3,387
162364-01-192-01-008	B1 Level – Room B101B	2,640
162364-01-192-01-009	B1 Level – Room B116 (Copy Room)	2,760
162364-01-192-01-010	B2 Level – Room B201	4,253
162364-01-192-01-011	B2 Level – Elevator/Center Stair Lobby	6,080
162364-01-192-01-012	Outdoor – Rear of Building	16,533

Laboratory results are included at the end of this report.

DISCUSSION

Airborne fungal spore samples were collected both indoors and outdoors to establish an Indoor/Outdoor (I/O) ratio that was compared to the indoor site of concern. The ratio is determined by dividing the total number of spores found in the indoor sample by the total number of spores in the outdoor sample. If the I/O ratio is greater than 2.0, the indoor site is considered to be an amplification site, i.e., the spores are believed to be originating from inside the building.

By this parameter, most areas of Lincoln Hall are not considered fungal amplification sites, meaning the spores that are present are believed to be originating from the outdoor air. However, the presence of visible fungal growth indicates the need for corrective actions.

Lead Based Paint Investigation Report

Lincoln Hall

USMA West Point NY

Prepared for: Mr. Terry Allen

Mason and Hanger

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1.0 EXECUTIVE SUMMARY

A Lead based paint survey of Lincoln Hall (the "Property") located in West Point, NY was performed. The purpose of the screening was to explore the presence and condition of painted surfaces for Lead based Paint.

Ms. Melissa Billingsley, an EPA-certified Lead Risk Assessor in the state of New York performed the screening and risk assessment October 23, 24, and 25, 2018.

Painted surfaces were analyzed for lead using an X-ray Fluorescence Spectrometer (XRF) manufactured by Thermo Scientific-NITON.

The U.S. Department of Housing and Urban Development (HUD) considers 1.0 milligrams of lead per square centimeter of painted surface, or greater, to be lead based paint (≥ 1.0 mg/c m^2).

2.0 FINDINGS AND RECOMMENDATIONS

During the screening, the presence of lead-based paint was detected in several areas. The inspector made recommendations based on many factors, i.e., condition, friction/non-friction surface, height at which lead-based paint is located, and other information that was obtained from the client. Listed on the attached sheets (Attachments) are location, components and the recommendation codes for the areas where painted surfaces were sampled. **A summary of the locations/components testing positive for lead-based paint is included in the following table. You will find a legend in the Attachments Section, which will explain the codes used in this table.**

The Environmental Protection Agency's (EPA) Renovation, Repair, and Painting Program Final Rule (40 CFR Part 745) (RRP Rule) mandates that if lead-based paint is disturbed during renovation or painting activity then the work should be completed using lead-safe work practices as defined in the RRP Rule. In addition, the individual disturbing the lead-based paint has to be certified as well as the firm for whom he/she is employed.

Any painted surface that has lead content should not be sanded, demolished or disturbed without the proper engineering controls and work methods, as spelled out under the OSHA's 29 CFR Part 1926.62 Lead Exposure in Construction, Interim Rule. Improper disturbance of any paint with lead content can cause lead to become airborne. The emphasis on controlling lead dust derives from the conclusion that lead dust appears to be the primary route of exposure to lead, especially of low-level exposure.

It is therefore important that occupants of the building and any contractors be made aware of the presence of the lead-based paint and the potential health risks associated with the ingestion of lead-based paint or the associated dust that results from the damaging of the painted surfaces. Occupants and/or contractors should also be made aware of the importance of not damaging the painted surfaces and creating loose and flaking paint or the creation of dust. If the painted surfaces are damaged this should be reported to the proper building representative/maintenance personnel to properly correct the problem to prevent an increased exposure potential.

The following is a list of paints that tested positive for lead content. The recommendation code indicates all acceptable response acts for that particular paint.

Lincoln Hall- West Point, NY

Location	Color/Substrate/ Component	Surface/Condition	Recommendation Code
B2 Level			
Room B203	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room B202	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room B201	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room B200	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Classroom Hallway	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
West Side Stairs	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Women's Restroom	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Men's Restroom	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Elevator Lobby	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Center Stairs	Black/Metal/Stair Riser	Non-Friction/Intact	HR, OSHA
Center Stairs	Black/Metal/Banister	Friction/Fair	HR, OSHA, CA
Center Stairs	Black/Metal/Spindle	Non-Friction/Intact	HR, OSHA
Center Stairs	Black/Metal/Stair Stringer	Non-Friction/Intact	HR, OSHA
Utilities and Storage Hall	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Utilities and Storage Hall	Off White/Plaster/Ceiling	Non-Friction/Intact	HR, OSHA
B208	White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
B208	White/Plaster/Ceiling	Non-Friction/Intact	HR, OSHA
4th Floor			
Elevator Lobby	White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Elevator Lobby	White/Plaster/Column	Non-Friction/Intact	HR, OSHA
Women's Restroom	Tan/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 404	Blue/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 405	White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 406	Light Gray/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 407	Blue/Plaster/Wall	Non-Friction/Intact	HR, OSHA

Lincoln Hall- West Point, NY			
	Color/Substrate/		**Recommendation**
Location	**Component**	**Surface/Condition**	**Code**
4th Floor – Continued			
Room 408	Blue/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 409	Blue/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 410	Blue/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 411	Blue/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 412	White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
3rd Floor			
Room 324	Light Blue/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 323	Light Blue/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 323A	Light Blue/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 322	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
East Side Hallway	White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Elevator Lobby	White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Elevator Lobby	White/Plaster/Ceiling	Non-Friction/Intact	HR, OSHA
Elevator Lobby	White/Plaster/Column	Non-Friction/Intact	HR, OSHA
Elevator Lobby	Black/Metal/Stair Stringer	Non-Friction/Intact	HR, OSHA
Elevator Lobby	Black/Metal/Spindle	Non-Friction/Intact	HR, OSHA
Room 305	Light Tan/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 304	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 301	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 313	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 314	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
West Side Hallway	White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 321	Light Gray/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 319	Light Blue/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 308	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 307	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 302	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA

Lincoln Hall- West Point, NY

Location	Color/Substrate/ Component	Surface/Condition	Recommendation Code
2nd Floor			
Room 224	Gray/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 225	Gray/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 226	Gray/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 228	White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Women's Restroom	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 210	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 211	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 212	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 214	Tan/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 215	Tan/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 216	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 217	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 218	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 200	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 201	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 203	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 204A	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 204	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 205	Tan/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 206	Tan/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 207	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 208	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 209	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
East Side Hallway	White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Elevator Lobby	White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Elevator Lobby	White/Plaster/Column	Non-Friction/Intact	HR, OSHA
Elevator Lobby	White/Plaster/Ceiling	Non-Friction/Intact	HR, OSHA

Lincoln Hall- West Point, NY

Location	Color/Substrate/ Component	Surface/Condition	Recommendation Code
2nd Floor – Continued			
Elevator Lobby	Black/Metal/Stair Stringer	Non-Friction/Intact	HR, OSHA
Elevator Lobby	Black/Metal/Stair Spindle	Non-Friction/Intact	HR, OSHA
West Side Hallway	White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
1st Floor			
Room 120	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 122	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 123	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 119	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 118	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Women's Restroom	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Janitor's Closet	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Janitor's Closet	Cream/Plaster/Ceiling	Non-Friction/Intact	HR, OSHA
Room 112	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 111	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 110	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 109	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 108	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 107A	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 107	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 100	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 101A	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 105	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 103	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room 106	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA
East Hallway	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA
West Hallway	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Main Lobby	Cream/Plaster/Wall	Non-Friction/Intact	HR, OSHA

Lincoln Hall- West Point, NY

Location	Color/Substrate/ Component	Surface/Condition	Recommendation Code
1st Floor – Continued			
Main Lobby	Cream/Plaster/Ceiling	Non-Friction/Intact	HR, OSHA
Main Lobby	Cream/Plaster/Column	Non-Friction/Intact	HR, OSHA
B1 Level			
Room B125	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room B123	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room B122	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room B121	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room B120	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room B119	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Janitor's Closet	Off White/Plaster/Ceiling	Non-Friction/Fair	HR, OSHA, A ENCP
Women's Restroom	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Elevator Lobby	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Elevator Lobby	Off White/Plaster/Ceiling	Non-Friction/Intact	HR, OSHA
Elevator Lobby	Off White/Plaster/Column	Non-Friction/Intact	HR, OSHA
Elevator Lobby	Black/Metal/Stair Stringer	Non-Friction/Intact	HR, OSHA
Elevator Lobby	Black/Metal/Stair Spindle	Non-Friction/Intact	HR, OSHA
Suite 106 (includes 105)	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room B107	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room B108	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room B109	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA
Room B111	Off White/Plaster/Wall	Non-Friction/Intact	HR, OSHA

ATTACHMENTS

Testing Report Legend

Recommendations

HR – Hazard Reduction

It is recommended that these surfaces be periodically observed for chalking, peeling or cracking.

If the surface is chalking, it can be cleaned with trisodium phosphate and repainted. If it is peeling or cracking, it should be repaired or abated.

AR – Abatement Replacement

A strategy of abatement that entails the removal of building components coated with lead-based paint and installation of new components free of lead-based paint.

A Encp – Abatement Encapsulation

"Encapsulant" means a coating or rigid material that relies on adhesion to a lead-based paint surface and is not mechanically fastened to the substrate with a 20-year warranty.

"Encapsulation" means a process to make lead-based paint inaccessible by providing a barrier between the lead-based paint and the environment, where the primary means of attachment for the encapsulant is bonding of a product to the surface covered either by the product itself or through the use of an adhesive.

A Encl – Abatement Enclosure

"Enclosure" means the installation of a rigid, durable barrier that is mechanically attached to building components, with all edges and seams sealed with caulk or other sealant and having a design life of at least 20 years.

CA – Complete Abatement

A process designed either to permanently eliminate lead-based paint hazards on a component and includes, but is not limited to: the removal of lead-based paint and lead-contaminated dust.

OSHA

Any painted surface that has lead content should not be sanded, demolished or disturbed without the proper engineering controls and work methods. As spelled out under OSHA's CFR Part 1926 Lead Exposure in Construction, Interim Rule. Improper disturbance of any paint with lead content can cause lead to become airborne.

NA – Non-applicable

X-ray Fluorescence Spectrometer (XRF) results indicated 0.0 or below, which indicates no lead detected by the XRF Spectrometer.

Surface/Condition

Surface

- A determination of whether a painted surface is considered friction/impact surface or non-friction impact surface.
- Friction/Impact Surface – any interior or exterior surface subject to abrasion, friction or damage by repeated impact or contact.
- Non-friction/Impact Surface – any interior or exterior surface not subject to abrasion, friction or damage by repeated impact or contact.

Condition

- An intact good paint surface is smooth, continuous and free of surface defect, which would result in the release of paint dust or chips.
- Large surfaces such as walls, floors and ceilings should be rated as follows:
  - Good or intact condition shall indicate a surface that is entirely intact;
  - Fair condition shall indicate a surface where less than or equal to two square feet of surface are not intact;
  - Poor condition shall indicate a surface where more than two square feet of surface are not intact.
- Components without large surfaces, such as window sills, baseboards, or other small areas, shall be rated as follows:
  - Good or intact condition shall indicate that the surface is entirely intact;
  - Fair condition shall indicate that less than or equal to 10 percent of the surface is not intact;
  - Poor condition shall indicate that more than 10 percent of the surface is not intact.

- Exterior components with large surface areas shall be rated as follows:
  - Good or intact condition shall indicate that the surface is entirely intact;
  - Fair condition shall indicate that less than or equal to ten square feet of surface is not intact;
  - Poor condition shall indicate that more than ten square feet of surface is not intact.

Wall

When entering a room the wall that is the address side of the room is labeled as "A" Wall. The walls are then labeled in a clockwise fashion as "B" Wall and "D" Wall.

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent: 2nd Floor

Project No.: 182364

Room #: Rm 228

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* White	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	209	A	Center	14.3	14.3	**POS**, NEG, INC	FRICTION, **INTACT**, **NON-FRICTION**, FAIR, POOR	**HR**, A ENCP, AR, CA, A ENCL, **OSHA**, N/A
White	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	210	B	Center	0.03	0.02	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, A ENCP, AR, CA, A ENCL, OSHA, N/A
			211	C	↓	0.01				
			212	D	↓	0.02				
White	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Pwr Comp.	213	A	Center	0.03	0.02	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, A ENCP, AR, CA, A ENCL, OSHA, N/A
			214	A	↓	0.01				
White	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	215	C	Center	0.04	0.04	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, A ENCP, AR, CA, A ENCL, OSHA, N/A
White	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Frame	216	C	Center	0.03	0.03	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, A ENCP, AR, CA, A ENCL, OSHA, N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent:

Project No.: 182364

Room #: 2nd Floor Women's Restroom

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* off white	Wood Brick Sheetrock ~~Plaster~~ Metal Concrete	Wall	217	A	Center	10.9	10.9	POS NEG INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
off white	Wood Brick ~~Sheetrock~~ Plaster Metal Concrete	Wall	218	B	Center	0.04	0.02	POS NEG INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			219	C	↓	0.03				
			220	D	↓	0.01				
off white	Wood Brick Sheetrock Plaster ~~Metal~~ Concrete	Pwr comp.	221	A	Casing	0.02	0.02	POS NEG INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			222	A	Jamb	0.03				
	Wood Brick Sheetrock Plaster Metal Concrete							POS NEG INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
	Wood Brick Sheetrock Plaster Metal Concrete							POS NEG INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 2nd Floor

Project No.: 182364

Room #: Men's Restroom

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
off white	Wood, Brick, (Sheetrock), Plaster, Metal, Concrete	Wall	223	A	Center	0.04	0.02	POS, (NEG), INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			224	B	↓	0.01				
			225	C		0.00				
			226	D		0.00				
off white	(Wood), Brick, Sheetrock, Plaster, Metal, Concrete	Window Scene	227	C	Center	0.01	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
off white	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Heater	228	C	Top	0.03	0.03	POS, (NEG), INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
off white	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Door Comp.	229	A	Casing	0.02	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			230	A	Jamb	0.01				
	Wood, Brick, Sheetrock, Plaster, Metal, Concrete							POS, NEG, INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 2nd Floor

Project No.: 182364

Room #: Rm 210

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Off White	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	231	A	Center	14.7	14.7	**POS**, NEG, INC	FRICTION, **NON-FRICTION**; **INTACT**, FAIR, POOR	**HR**, AR, A ENCL; A ENCP, CA, **OSHA**, N/A
Off White	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	232	B	Center	0.01	0.01	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			233	C	↓	0.01				
			234	D	↓	0.00				
Off White	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Stone	235	C	Center	0.03	0.03	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Off White	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	236	C	Top	0.01	0.01	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Off White	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door Comp.	237	A	Casing	0.06	0.04	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			238	A	Seals	0.02				

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 2nd Floor

Project No.: 182364

Room #: Rm 211

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* off white	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	239	A	Center	21.3	21.3	**POS**, NEG, INC	**NON-FRICTION**, FRICTION; **INTACT**, FAIR, POOR	**HR**, AR, A ENCL; A ENCP, CA, **OSHA**, N/A
off white	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	240	B	Center	0.01	0.02	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			241	C	↓	0.03				
			242	D	↓	0.02				
off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	243	E	Top	0.01	0.01	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door Comp.	244	A	Casing	0.01	0.01	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			245	A	Seams	0.02				
off white	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Same	246	C	Center	0.03	0.03	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent: 2nd Floor

Project No.: 182364

Room #: Rm 212

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Classification	Surface/Condition	Recommendation
off white	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	247	A	Center	15.4	15.4	**POS**, NEG, INC	FRICTION, **NON-FRICTION**; **INTACT**, FAIR, POOR	**HR**, AR, A ENCL; A ENCP, CA, **OSHA**, N/A
off white	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	248	B	Center	0.01	0.02	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			249	C	↓	0.03				
			250	D	↓	0.02				
off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door Comp.	251	A	Casing	0.02	0.02	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			252	A	Jamb	0.03				
off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	253	C	Top	0.01	0.01	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
off white	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Sram	254	C	Center	0.06	0.06	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Room Equivalent: 2nd Floor

Room #: Rm 214

Date: 10/24/18

Signature: [signature]

Project No.: 182364

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
Tan	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	255	A	Center	21.7	21.7	**POS**, NEG, INC	**FRICTION**, **NON-FRICTION**; **INTACT**, FAIR, POOR	**HR**, AR, A ENCL; A ENCP, CA, **OSHA**, N/A
Tan	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	256	B	Center	0.01	0.01	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			257	C	↓	0.02				
			258	D	↓	0.01				
Tan	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	259	C	Top	0.03	0.03	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Tan	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door Comp.	260	A	Casing	0.01	0.01	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			261	A	Jamb	0.02				
Tan	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Sash	262	C	Center	0.06	0.06	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 2nd Floor

Project No.: 182364

Room #: Rm 215

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Tan	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	263	A	Center	14.4	14.4	**POS**, NEG, INC	FRICTION, **NON-FRICTION**; **INTACT**, FAIR, POOR	**HR**, AR, A ENCL; A ENCP, CA, **OSHA**, N/A
Tan	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	264	B	Center	0.02	0.02	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			265	C	↓	0.03				
			266	D	↓	0.02				
Tan	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	window system	267	C	Center	0.07	0.07	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Tan	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door Comp.	268	A	Casing	0.03	0.03	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			269	A	Jamb	0.04				
Tan	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	270	C	Top	0.04	0.04	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent: 2nd Flor

Project No.: 182369

Room #: Rm 216

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
off white *	Wood, Brick, Sheetrock, (Plaster), Metal, Concrete	Wall	271	A	Center	24.2	24.2	(POS), NEG, INC	FRICTION, (INTACT), NON-FRICTION, FAIR, POOR	(HR), AR, A ENCL, A ENCP, CA, (OSHA), N/A
off white	Wood, Brick, (Sheetrock), Plaster, Metal, Concrete	Wall	272	B	Center	0.01	0.01	POS, (NEG), INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			273	C	↓	0.02				
			274	D	↓	0.01				
off white	(Wood), Brick, Sheetrock, Plaster, Metal, Concrete	Window Sane	275	C	Center	0.03	0.03	POS, (NEG), INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
off white	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Heater	276	C	Center	0.01	0.01	POS, (NEG), INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
off white	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Door Comp.	277	A	Center	0.04	0.03	POS, (NEG), INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			278	A	↓	0.03				

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 2nd Floor

Project No.: 182364

Room #: Rm 217

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Off White	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	279		Center	17.9	17.9	**POS**, NEG, INC	**INTACT**, FAIR, POOR; **NON-FRICTION**, FRICTION	**HR**, AR, A ENCL; A ENCP, CA, **OSHA**, N/A
Off White	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	280		Center	0.03	0.02	**NEG**, POS, INC	INTACT, FAIR, POOR; FRICTION, NON-FRICTION	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			281		↓	0.02				
			282		↓	0.02				
Off White	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Stone	283		Center	0.06	0.06	**NEG**, POS, INC	INTACT, FAIR, POOR; FRICTION, NON-FRICTION	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Off White	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	284		Top	0.04	0.04	**NEG**, POS, INC	INTACT, FAIR, POOR; FRICTION, NON-FRICTION	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Off White	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door Comp	285		Casing	0.05	0.03	**NEG**, POS, INC	INTACT, FAIR, POOR; FRICTION, NON-FRICTION	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			286		Sash	0.02				

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent: 2nd Floor

Project No.: 182364

Room #: Rm 218

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Off White	Wood, Brick, Sheetrock, (Plaster), Metal, Concrete	Wall	287		Center	18.8	18.8	(POS), NEG, INC	FRICTION, (INTACT), (NON-FRICTION), FAIR, POOR	(HR), AR, A ENCL, A ENCP, CA, (OSHA), N/A
Off White	Wood, Brick, (Sheetrock), Plaster, Metal, Concrete	Wall	288		Center	0.00	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			289		↓	0.02				
			290			0.01				
Off White	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Door Comp.	291	A	Casing	0.01	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			292	A	Jamb	0.01				
Off White	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Heater	293	C	Top	0.02	0.02	POS, (NEG), INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Off White	(Wood), Brick, Sheetrock, Plaster, Metal, Concrete	Window Frame	294	C	Center	0.03	0.03	POS, (NEG), INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 2nd Floor

Project No.: 182364

Room #: Rm 200

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
K Off White	Wood, Brick, Sheetrock, (Plaster), Metal, Concrete	Wall	295	A	Center	15.1	15.1	(POS), NEG, INC	FRICTION, (NON-FRICTION); (INTACT), FAIR, POOR	(HR), AR, A ENCL; A ENCP, CA, (OSHA), N/A
Off White	Wood, Brick, (Sheetrock), Plaster, Metal, Concrete	Wall	296	B	Center	0.03	0.02	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			297	C	↓	0.02				
			298	D	↓	0.02				
Off White	(Wood), Brick, Sheetrock, Plaster, Metal, Concrete	Window Frame	299	C	Center	0.01	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Off White	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Heater	300	C	Top	0.02	0.02	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Off White	Wood, Brick, Sheetrock, (Plaster), (Metal), Concrete	Door Comp.	301	A	Casing	0.03	0.02	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			302	A	Sash	0.01				

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 2nd Floor

Project No.: 182364

Room #: Rm 201

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
off white	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	303	A	Center	19.3	19.3	**POS**, NEG, INC	FRICTION, **INTACT**, **NON-FRICTION**, FAIR, POOR	**HR**, AR, A ENCL, A ENCP, CA, **OSHA**, N/A
off white	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	304	B	Center	0.03	0.02	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			305	C	↓	0.02				
			306	D	↓	0.02				
off white	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Frame	307	C	Center	0.01	0.01	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	308	C	Top	0.03	0.03	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Pwr Comp.	309	A	Casing	0.06	0.04	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			310	A	Jamb	0.02				

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 2nd Floor

Project No.: 182364

Room #: Rm 203

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Off White	Wood, Brick, Sheetrock, (Plaster), Metal, Concrete	Wall	311	A	Center	24.3	24.3	(POS), NEG, INC	FRICTION, (NON-FRICTION), (INTACT), FAIR, POOR	(HR), AR, A ENCL, A ENCP, CA, (OSHA), N/A
Off White	Wood, Brick, (Sheetrock), Plaster, Metal, Concrete	Wall	312	B	Center	0.02	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			313	C	↓	0.01				
			314	D	↓	0.02				
Off White	(Wood), Brick, Sheetrock, Plaster, Metal, Concrete	Window Stone	315	C	Center	0.03	0.03	POS, (NEG), INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Off White	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Heater	316	C	Center	0.02	0.02	POS, (NEG), INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Off White	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Door Comp.	317	A	Casing	0.06	0.05	POS, (NEG), INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			318	A	Jamb	0.04				

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent: 2nd Floor

Project No.: 182364

Room #: Rm 204A

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
off white	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	319	A	Center	21.6	21.6	**POS**, NEG, INC	FRICTION, **INTACT**, **NON-FRICTION**, FAIR, POOR	**HR**, A ENCP, CA, AR, **OSHA**, A ENCL, N/A
off white	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	320	B	Center	0.02	0.02	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, A ENCP, CA, AR, OSHA, A ENCL, N/A
			321	C	↓	0.03				
			322	D	↓	0.03				
off white	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window frame	323	C	Center	0.06	0.06	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, A ENCP, CA, AR, OSHA, A ENCL, N/A
off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	324	C	Top	0.04	0.04	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, A ENCP, CA, AR, OSHA, A ENCL, N/A
off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door Comp.	325	A	Casing	0.01	0.02	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, A ENCP, CA, AR, OSHA, A ENCL, N/A
			326	A	Sash	0.03				

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent: 2nd Floor

Project No.: 182364

Room #: Rm 264

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
off white	Wood, Brick, Sheetrock, **Plaster**, ~~Metal~~, Concrete	Wall	327	A	Center	21.5	21.5	**POS**, NEG, INC	**FRICTION**, **NON-FRICTION**; **INTACT**, FAIR, POOR	**HR**, AR, A ENCL; A ENCP, CA, **OSHA**, N/A
off white	Wood, Brick, ~~Sheetrock~~, Plaster, Metal, Concrete	Wall	328	B	Center	0.1	0.02	POS, **NEG**, INC	**FRICTION**, **NON-FRICTION**; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			329	C	↓	0.00				
			330	D	↓	0.02				
off white	~~Wood~~, Brick, Sheetrock, Plaster, Metal, Concrete	Window Stone	331	C	Center	0.01	0.01	POS, **NEG**, INC	FRICTION, **NON-FRICTION**; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
off white	Wood, Brick, Sheetrock, Plaster, ~~Metal~~, Concrete	Heater	332	C	Top	0.03	0.03	POS, **NEG**, INC	FRICTION, **NON-FRICTION**; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
off white	Wood, Brick, Sheetrock, Plaster, ~~Metal~~, Concrete	Door Comp.	333	A	Casing	0.01	0.01	POS, **NEG**, INC	FRICTION, **NON-FRICTION**; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			334	A	Jamb	0.02				

* Wall

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent: 2nd Floor

Project No.: 182364

Room #: Rm 265

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Classification	Surface/Condition	Recommendation
* Tan	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	335	A	Center	~~0~~ 20.1	20.1	**POS**, NEG, INC	FRICTION, **INTACT**, **NON-FRICTION**, FAIR, POOR	**HR**, AR, A ENCL, A ENCP, CA, **OSHA**, N/A
Tan	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	336	B	Center	0.03	0.03	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			337	C	↓	0.04				
			338	D	↓	0.03				
Tan	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Sone	339	C	Center	0.02	0.02	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Tan	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	340	C	Top	0.01	0.01	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Tan	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door Comp.	341	A	Casing	0.03	0.03	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			342	A	Jamb	0.04				

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent: 2nd Floor

Project No.: 182364

Room #: Rm 206

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
Tan	(Plaster)	Wall	343	A	Center	21.3	21.3	POS	FRICTION, INTACT	HR, OSHA
								NEG	NON-FRICTION	
								INC	FAIR, POOR	A ENCP, CA, AR, A ENCL, N/A
Tan	(Sheetrock)	Wall	344	B	Center	0.01	0.02	POS	FRICTION, INTACT	
			345	C	↓	0.02		NEG	NON-FRICTION, FAIR, POOR	
			346	D	↓	0.02		INC		HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Tan	(Wood)	Window Stone	347	C	Center	0.03	0.03	POS	FRICTION, INTACT	
								NEG	NON-FRICTION, FAIR, POOR	
								INC		HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Tan	(Metal)	Heater	348	C	Top	0.04	0.04	POS	FRICTION, INTACT	
								NEG	NON-FRICTION, FAIR, POOR	
								INC		HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Tan	(Metal)	Pier Comp.	349	A	Casing	0.02	0.01	POS	FRICTION, INTACT	
			350	A	Jamb	0.01		NEG	NON-FRICTION, FAIR, POOR	
								INC		HR, AR, A ENCL, A ENCP, CA, OSHA, N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent: 2nd Floor

Project No.: 182364

Room #: Rm 207

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Off White	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	351	A	Center	21.8	21.8	**POS**, NEG, INC	**FRICTION**, **NON-FRICTION**; **INTACT**, FAIR, POOR	**HR**, AR, A ENCL; A ENCP, CA, **OSHA**, N/A
Off White	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	352	B	Center	0.03	0.02	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			353	C	↓	0.02				
			354	D	↓	0.02				
Off White	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Sill	355	C	Center	0.03	0.03	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Off White	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	356	C	Top	0.04	0.04	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Off White	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door Comp.	357	A	Casing	0.02	0.02	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			358	A	Jamb	0.02				

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent:

Project No.: 182364

Room #: Room 208

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Off White	Wood, Brick, Sheetrock, ~~Plaster~~, Metal, Concrete	Wall	359	A	Center	17.4	17.4	POS, NEG, INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Off White	Wood, Brick, ~~Sheetrock~~, Plaster, Metal, Concrete	Wall	360	B	Center	0.03	0.02	POS, NEG, INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			361	C	↓	0.02				
			362	D	↓	0.02				
Off White	~~Wood~~, Brick, Sheetrock, Plaster, Metal, Concrete	Window Frame	363	C	Center	0.01	0.01	POS, NEG, INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Off White	Wood, Brick, Sheetrock, Plaster, ~~Metal~~, Concrete	Heater	364	C	Top	0.02	0.02	POS, NEG, INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Off White	Wood, Brick, Sheetrock, Plaster, ~~Metal~~, Concrete	Door Comp.	365	A	Casing	0.01	0.01	POS, NEG, INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			366	A	Jamb	0.01				

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent:

Project No.: 182364

Room #: Room 209

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* off white	Wood Brick Sheetrock **Plaster** Metal Concrete	Wall	367	A	Center	19.4	19.4	**POS** NEG INC	FRICTION **NON-FRICTION** **INTACT** FAIR POOR	**HR** AR A ENCL A ENCP CA **OSHA** N/A
off white	Wood Brick **Sheetrock** Plaster Metal Concrete	Wall	368	B	Center	0.03	0.02	POS **NEG** INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			369	C	↓	0.02				
			370	D	↓	0.02				
off white	**Wood** Brick Sheetrock Plaster Metal Concrete	Window Frame	371	C	Center	0.01	0.01	POS **NEG** INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
off white	Wood Brick Sheetrock Plaster **Metal** Concrete	Heater	372	C	Top	0.03	0.03	POS **NEG** INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
off white	Wood Brick Sheetrock Plaster **Metal** Concrete	Door Comp	373	A	Casing	0.01	0.01	POS **NEG** INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			374	A	Jamb	0.02				

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 2nd Floor

Project No.: 182364

Room #: East Side Hallway

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* White	Wood, Brick, Sheetrock, (Plaster), Metal, Concrete	Wall	375	A	Center	17.1	16.9	(POS), NEG, INC	FRICTION, (NON-FRICTION); (INTACT), FAIR, POOR	(HR), AR, A ENCL; A ENCP, CA, (OSHA), N/A
			376	B	↓	18.9				
			377	C		10.2				
			378	D		21.3				
off White	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Pwr Casing	379		Center	0.03	0.03	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
off White	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Heater	380		Top	0.01	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
off White	(Wood), Brick, Sheetrock, Plaster, Metal, Concrete	Window Frame	381		Center	0.02	0.02	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
	Wood, Brick, Sheetrock, Plaster, Metal, Concrete							POS, NEG, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Room Equivalent: 2nd Flor

Room #: Elevator / Center stair Hallway

Date: 10/24/18

Signature: [signature]

Project No.: 182364

XRF Serial No.: 25357

	Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
*	White	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	382	A	Center	10.1	13.3	**POS**, NEG, INC	FRICTION, **NON-FRICTION**; **INTACT**, FAIR, POOR	**HR**, AR, A ENCL; A ENCP, CA, **OSHA**, N/A
				383	B	↓	21.4				
				384	C	↓	9.8				
				385	D	↓	11.7				
*	White	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Column	386		Center	17.2	17.8	**POS**, NEG, INC	FRICTION, **NON-FRICTION**; **INTACT**, FAIR, POOR	**HR**, AR, A ENCL; A ENCP, CA, **OSHA**, N/A
				387		↓	18.3				
*	White	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Ceiling	388		Center	12.9	12.9	**POS**, NEG, INC	FRICTION, **NON-FRICTION**; **INTACT**, FAIR, POOR	**HR**, AR, A ENCL; A ENCP, CA, **OSHA**, N/A
	Off White	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Wall	389	A	Center	0.00	0.01	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
				390	B	↓	0.01				
				391	C	↓	0.02				
				392	D	↓	0.01				
	Off White	Wood, Brick, Sheetrock, Plaster, Metal, Concrete	Elevator Pier cap	393		Door	0.04	0.03	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
				394		Casing	0.03				

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 2nd Floor

Project No.: 182364

Room #: Elevator / center Stair Hallway

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
off white	(Wood) Brick Sheetrock Plaster Metal Concrete	Window Casing	395		Center	0.02	0.02	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
off white	(Wood) Brick Sheetrock Plaster Metal Concrete	Hand Rail	396		Top	0.01	0.01	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
* Black	Wood Brick Sheetrock Plaster (Metal) Concrete	Stair Stringer	397		Center	4.1	4.1	(POS) NEG INC	FRICTION (INTACT) FAIR POOR NON-FRICTION	(HR) AR A ENCL A ENCP CA (OSHA) N/A
* Black	Wood Brick Sheetrock Plaster (Metal) Concrete	Stair Spindle	398		Center	7.3	7.3	(POS) NEG INC	FRICTION (INTACT) FAIR POOR (NON-FRICTION)	(HR) AR A ENCL A ENCP CA (OSHA) N/A
	Wood Brick Sheetrock Plaster Metal Concrete							POS NEG INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/24/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 2nd Floor

Project No.: 182364

Room #: West Side Hallway

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* White	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	399	A	Center	16.2	12.9	**POS**, NEG, INC	**FRICTION**, **INTACT**, NON-FRICTION, FAIR, POOR	**HR**, A ENCP, AR, CA, A ENCL, **OSHA**, N/A
			400	B	↓	10.8				
			401	C		9.4				
			402	D	↓	15.3				
Off White	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	403		Top	0.01	0.01	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, A ENCP, AR, CA, A ENCL, OSHA, N/A
Off White	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Stone	404		Center	0.02	0.02	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, A ENCP, AR, CA, A ENCL, OSHA, N/A
Off White	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door Casing	405		Center	0.04	0.04	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, A ENCP, AR, CA, A ENCL, OSHA, N/A
	Wood, Brick, Sheetrock, Plaster, Metal, Concrete							POS, NEG, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, A ENCP, AR, CA, A ENCL, OSHA, N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Room Equivalent: 1st Floor

Room #: Rm 120

Date: 10/25/10

Signature:

Project No.: 182364

XRF Serial No.: 25357

	Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Classification	Surface/Condition	Recommendation
*	Cream	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	4	A	Center	21.2	21.2	**POS**, NEG, INC	FRICTION, **INTACT**, **NON-FRICTION**, FAIR, POOR	**HR**, A ENCP, AR, CA, A ENCL, **OSHA**, N/A
	Cream	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	5	B	Center	0.01	0.02	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, A ENCP, AR, CA, A ENCL, OSHA, N/A
				6	C	↓	0.04				
				7	D	↓	0.02				
	Brown	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door Comp.	8	A	Casing	0.01	0.01	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, A ENCP, AR, CA, A ENCL, OSHA, N/A
				9	A	Sash	0.00				
	Varnish	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Sash	10	C	Top	0.03	0.03	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, A ENCP, AR, CA, A ENCL, OSHA, N/A
	Varnish	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Sash	11	C	Center	0.00	0.00	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, A ENCP, AR, CA, A ENCL, OSHA, N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 1st floor

Project No.: 182364

Room #: Rm 122

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Cream	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	12	A	Centr	10.8	10.6	**POS**, NEG, INC	**INTACT**, FAIR, POOR; FRICTION, **NON-FRICTION**	**HR**, AR, A ENCL; A ENCP, CA, **OSHA**, N/A
Cream	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	13	B	Centr	0.01	0.01	POS, **NEG**, INC	INTACT, FAIR, POOR; FRICTION, NON-FRICTION	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			14	C	↓	0.03				
			15	D	↓	0.01				
Brown	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door Comp.	16	A	Casing	0.00	0.01	POS, **NEG**, INC	INTACT, FAIR, POOR; FRICTION, NON-FRICTION	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			17	A	Sash	0.01				
Varnish	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Heater	18	C	Top	0.02	0.02	POS, **NEG**, INC	INTACT, FAIR, POOR; FRICTION, NON-FRICTION	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Varnish	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Frame	19	C	Centr	0.01	0.01	POS, **NEG**, INC	INTACT, FAIR, POOR; FRICTION, NON-FRICTION	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 1st Flor

Project No.: 182364

Room #: Rm 123

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Cream	Wood Brick Sheetrock (Plaster) Metal Concrete	Wall	20	A	Center	17.8	17.8	(POS) NEG INC	FRICTION (INTACT) NON-FRICTION FAIR POOR	(HR) AR A ENCL A ENCP CA (OSHA) N/A
Cream	Wood Brick (Sheetrock) Plaster Metal Concrete	Wall	21	B	Center	0.01	0.01	POS (NEG) INC	FRICTION INTACT NON-FRICTION FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			22	C	↓	0.00				
			23	D	↓	0.01				
Brown	Wood Brick Sheetrock Plaster (Metal) Concrete	Door comp.	~~29~~	A	Casing	0.02	0.02	POS (NEG) INC	FRICTION INTACT NON-FRICTION FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			~~29~~	A	Sash	0.03				
Varnish	(Wood) Brick Sheetrock Plaster Metal Concrete	Heater	26	C	Top	0.01	0.01	POS (NEG) INC	FRICTION INTACT NON-FRICTION FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
Varnish	(Wood) Brick Sheetrock Plaster Metal Concrete	Window Frame	27	C	Center	0.00	0.00	POS (NEG) INC	FRICTION INTACT NON-FRICTION FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent: 1st Floor

Project No.: 182364

Room #: Rm 119

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Cream	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	28	A	Center	12.1	12.1	**POS**, NEG, INC	**FRICTION**, **INTACT**, **NON-FRICTION**, FAIR, POOR	**HR**, AR, A ENCL, A ENCP, CA, **OSHA**, N/A
Cream	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	29	B	Center	0.04	0.02	POS, **NEG**, INC	FRICTION, **INTACT**, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			30	C	↓	0.00				
			31	D	↓	0.00				
Brown	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door Comp	32	A	Casing	0.02	0.01	POS, **NEG**, INC	FRICTION, **INTACT**, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			33	A	Sash	0.01				
Varnish	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Heater	34	C	Top	0.03	0.03	POS, **NEG**, INC	FRICTION, **INTACT**, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Varnish	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Stone	35	C	Center	0.01	0.01	POS, **NEG**, INC	FRICTION, **INTACT**, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 1st Floor

Project No.: 182364

Room #: Rm 118

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Cream	Wood, Brick, Sheetrock, (Plaster), Metal, Concrete	Wall	36		Center	17.8	17.8	(POS), NEG, INC	FRICTION, (NON-FRICTION); (INTACT), FAIR, POOR	(HR), AR, A ENCL; A ENCP, CA, (OSHA), N/A
Cream	Wood, Brick, (Sheetrock), Plaster, Metal, Concrete	Wall	37		Center	0.01	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			38		↓	0.00				
			39		↓	0.01				
Brown	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Door comp.	40		Casing	0.03	0.02	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			41		Jamb	0.02				
Varnish	(Wood), Brick, Sheetrock, Plaster, Metal, Concrete	Heater	42		Top	0.01	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Varnish	(Wood), Brick, Sheetrock, Plaster, Metal, Concrete	Window Frame	43		Center	0.03	0.03	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 1st Floor

Project No.: 182364

Room #: Rm 116

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
Green	Wood, Brick, (Sheetrock), Plaster, Metal, Concrete	Wall	44	A	Center	0.01	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			45	B	↓	0.00				
			46	C		0.01				
			47	D		0.01				
Brown	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Door Comp.	48	A	Casing	0.02	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			49	A	Sash	0.01				
Varnish	(Wood), Brick, Sheetrock, Plaster, Metal, Concrete	Heater	50	C	Top	0.03	0.03	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Varnish	(Wood), Brick, Sheetrock, Plaster, Metal, Concrete	Window Sash	51	C	Center	0.02	0.02	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
	Wood, Brick, Sheetrock, Plaster, Metal, Concrete							POS, NEG, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 1st Floor

Project No.: 182364

Room #: Mens Restroom

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
Green	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	52	A	Center	0.02	0.01	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			53	B	↓	0.01				
			54	C		0.01				
			55	D		0.01				
Brown	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Poor comp	56	A	Casing	0.00	0.00	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			57	A	Jamb	0.00				
Varnish	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Heater	58		Top	0.01	0.01	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Varnish	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Frame	59		Center	0.02	0.02	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
	Wood, Brick, Sheetrock, Plaster, Metal, Concrete							POS, NEG, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 1st floor

Project No.: 182364

Room #: Women's Restroom

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Cream	Wood, Brick, Sheetrock, ~~Plaster~~, Metal, Concrete	Wall	60	A	Center	18.3	18.3	POS, NEG, INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Cream	Wood, Brick, Sheetrock, Plaster, Metal, Concrete	Wall	61	B	Center	0.02	0.01	POS, NEG, INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			62	C	↓	0.01				
			63	D	↓	0.01				
Brown	Wood, Brick, Sheetrock, Plaster, Metal, Concrete	Door Comp	64	A	Casing	0.03	0.02	POS, NEG, INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			65	A	Jamb	0.01				
Varnish	Wood, Brick, Sheetrock, Plaster, Metal, Concrete	Heater	66	C	Top	0.01	0.01	POS, NEG, INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Varnish	Wood, Brick, Sheetrock, Plaster, Metal, Concrete	Window Frame	67	C	Center	0.00	0.00	POS, NEG, INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at the United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 1st Floor

Project No.: 182364

Room #: Janitors Closet

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Green	Wood, Brick, Sheetrock, (Plaster), Metal, Concrete	Wall	68	A	Center	17.1	17.1	(POS), NEG, INC	FRICTION, (NON-FRICTION); (INTACT), FAIR, POOR	(HR), AR, A ENCL; A ENCP, CA, (OSHA), N/A
* Green	Wood, Brick, Sheetrock, (Plaster), Metal, Concrete	Ceiling	69		Center	18.2	18.2	(POS), NEG, INC	FRICTION, (NON-FRICTION); (INTACT), FAIR, POOR	(HR), AR, A ENCL; A ENCP, CA, (OSHA), N/A
Green	Wood, Brick, (Sheetrock), Plaster, Metal, Concrete	Wall	70	B	Center	0.01	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			71	C	↓	0.02				
			72	D	↓	0.01				
Blue	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Door Comp.	73	A	Casing	0.01	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			74	A	Jamb	0.01				
	Wood, Brick, Sheetrock, Plaster, Metal, Concrete							POS, NEG, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 1st Flor

Project No.: 182364

Room #: Rm 112

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Green	Wood, Brick, Sheetrock, (Plaster), Metal, Concrete	Wall	75	B	Center	18.2	18.2	(POS), NEG, INC	FRICTION, (NON-FRICTION); (INTACT), FAIR, POOR	(HR), AR, A ENCL; A ENCP, CA, (OSHA), N/A
Green	Wood, Brick, (Sheetrock), Plaster, Metal, Concrete	Wall	76	A	Center	0.01	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			77	C	↓	0.00				
			78	D	↓	0.01				
Green	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Pwr comp.	79		Casing	0.02	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			80		Sash	0.01				
Green	~~Wood~~, Brick, Sheetrock, Plaster, (Metal), Concrete	Heater	~~80~~		Top	0.00	0.00	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Green	(Wood), Brick, Sheetrock, Plaster, Metal, Concrete	Window Stone	82		Center	0.02	0.02	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 1st Floor

Project No.: 182364

Room #: Rm 111

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Cream	Wood Brick Sheetrock **Plaster** Metal Concrete	Wall	83	A	Center	19.9	19.9	**POS** NEG INC	FRICTION **NON-FRICTION** / **INTACT** FAIR POOR	**HR** AR A ENCL / A ENCP CA **OSHA** N/A
Cream	Wood Brick **Sheetrock** Plaster Metal Concrete	Wall	84	B	Center	0.01	0.02	POS **NEG** INC	FRICTION NON-FRICTION / INTACT FAIR POOR	HR AR A ENCL / A ENCP CA OSHA N/A
			85	C	↓	0.00				
			86	D	↓	0.03				
Cream	Wood Brick Sheetrock Plaster **Metal** Concrete	Door Comp.	87	A	Casing	0.9	0.06	POS **NEG** INC	FRICTION NON-FRICTION / INTACT FAIR POOR	HR AR A ENCL / A ENCP CA OSHA N/A
			88	A	Jamb	0.07				
Cream	Wood Brick Sheetrock Plaster **Metal** Concrete	Heater	89	C	Top	0.04	0.04	POS **NEG** INC	FRICTION NON-FRICTION / INTACT FAIR POOR	HR AR A ENCL / A ENCP CA OSHA N/A
Cream	**Wood** Brick Sheetrock Plaster Metal Concrete	Window Comp.	90	C	Center	0.02	0.02	POS **NEG** INC	FRICTION NON-FRICTION / INTACT FAIR POOR	HR AR A ENCL / A ENCP CA OSHA N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Room Equivalent: 1st Flor

Room #: Rm 110

Date: 10/25/18

Signature: [signature]

Project No.: 182364

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
Cream	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	91	D	Center	12.4	12.4	**POS**, NEG, INC	**FRICTION**, **INTACT**, NON-FRICTION, FAIR, POOR	**HR**, AR, A ENCL, A ENCP, CA, **OSHA**, N/A
Cream	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	92	A	Center	0.01	0.01	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			93	B	↓	0.00				
			94	C	↓	0.01				
Cream	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door Comp.	95	A	Casing	0.00	0.00	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			96	A	Jamb	0.00				
Cream	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	97	B	Top	0.02	0.02	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Cream	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Sill	98	B	Center	0.01	0.01	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A

*

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent: 1st Floor

Project No.: 182364

Room #: Rm 109

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Cream	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	99	A	Center	19.4	19.4	**POS**, NEG, INC	FRICTION, **INTACT**, **NON-FRICTION**, FAIR, POOR	**HR**, AR, A ENCL, A ENCP, CA, **OSHA**, N/A
Cream	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	100	B	Center	0.01	0.01	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			101	C	↓	0.00				
			102	D	↓	0.00				
Cream	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door Comp	103	A	Casing	0.02	0.01	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			104	A	Sash	0.01				
Cream	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	105	C	Top	0.03	0.03	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Cream	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Stone	106	C	Center	0.01	0.01	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 1st Floor

Project No.: 182364

Room #: Rm 108

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Classification	Surface/Condition	Recommendation
* Cream	Wood, Brick, Sheetrock, (Plaster), Metal, Concrete	Wall	107	A	Center	14.4	14.4	(POS), NEG, INC	FRICTION, (NON-FRICTION); (INTACT), FAIR, POOR	(HR), AR, A ENCL; A ENCP, CA, (OSHA), N/A
Cream	Wood, Brick, (Sheetrock), Plaster, Metal, Concrete	Wall	108	D	Center	0.01	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			109	C	↓	0.00				
			110	D	↓	0.02				
Cream	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Door Comp.	111	A	Casing	0.01	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			112	A	Sash	0.02				
Cream	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Heater	113	C	Top	0.03	0.03	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Cream	(Wood), Brick, Sheetrock, Plaster, Metal, Concrete	Window Stone	114	C	Center	0.01	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 1st Flor

Project No.: 182364

Room #: Rm 107A

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Cream	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	115	A	Center	21.7	21.7	**POS**, NEG, INC	FRICTION, **NON-FRICTION**; **INTACT**, FAIR, POOR	**HR**, AR, A ENCL; A ENCP, CA, **OSHA**, N/A
Cream	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	116	B	Center	0.01	0.02	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			117	C	↓	0.03				
			118	D	↓	0.02				
Cream	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Pwr comp	119	A	Casing	0.01	0.01	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			120	A	Sash	0.01				
Cream	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	121	C	Top	0.02	0.02	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Cream	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Stone	122	C	Center	0.03	0.03	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 1st Floor

Project No.: 182364

Room #: 107

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Cream	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Cream	123		Center	21.9	21.9	**POS**, NEG, INC	FRICTION, **INTACT**, NON-FRICTION, FAIR, POOR	**HR**, AR, A ENCL, A ENCP, CA, **OSHA**, N/A
Cream	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Cream	124		Center	0.01	0.01	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			125		↓	0.00				
			126		↓	0.02				
Cream	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door Comp.	127		Casing	0.03	0.02	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			128		Jamb	0.01				
Cream	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	129		Top	0.01	0.01	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Cream	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Stone	130		Center	0.02	0.02	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 1st Floor

Project No.: 182364

Room #: Rm 100

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* White Cream	(Wood) Brick Sheetrock (Plaster) Metal Concrete	Wall	131		Center	19.2	19.2	(POS) NEG INC	FRICTION (NON-FRICTION) (INTACT) FAIR POOR	(HR) AR A ENCL A ENCP CA (OSHA) N/A
Cream	Wood Brick (Sheetrock) Plaster Metal Concrete	Wall	132		Center	0.01	0.01	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			133		↓	0.00				
			134		↓	0.01				
Cream	Wood Brick Sheetrock Plaster (Metal) Concrete	Door Comp.	135		Casing	0.02	0.01	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			136		Sash	0.01				
Cream	Wood Brick Sheetrock Plaster (Metal) Concrete	Hook	137		Top	0.00	0.00	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
Cream	(Wood) Brick Sheetrock Plaster Metal Concrete	Window Sash	138		Center	0.00	0.00	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/25/16

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 1st Floor

Project No.: 182364

Room #: Rm 101A

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Green	Wood, Brick, Sheetrock, (Plaster), Metal, Concrete	Wall	139	A	Center	15.4	15.4	(POS), NEG, INC	FRICTION, (NON-FRICTION); (INTACT), FAIR, POOR	(HR), AR, A ENCL; A ENCP, CA, (OSHA), N/A
Green	Wood, Brick, (Sheetrock), Plaster, Metal, Concrete	Wall	140	B	Center	0.06	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			141	C	↓	0.02				
			142	D		0.01				
Green	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Door comp.	143		Casing	0.01	0.02	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			144		Jamb	0.03				
Green	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Heater	145		Top	0.03	0.03	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Green	(Wood), Brick, Sheetrock, Plaster, Metal, Concrete	Window Stone	146		Center	0.11	0.11	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 1st Floor

Project No.: 182364

Room #: Rm 105

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Classification	Surface/Condition	Recommendation
Cream	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	147		Center	17.8	17.8	**POS**, NEG, INC	FRICTION, **NON-FRICTION**; **INTACT**, FAIR, POOR	**HR**, AR, A ENCL; A ENCP, CA, **OSHA**, N/A
Cream	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	148		Center	0.01	0.01	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			149		↓	0.01				
			150		↓	0.02				
Cream	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Par Comp	151	A	Casing	0.01	0.01	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			152	A	Jamb	0.02				
	Wood, Brick, Sheetrock, Plaster, Metal, Concrete							POS, NEG, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
	Wood, Brick, Sheetrock, Plaster, Metal, Concrete							POS, NEG, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 1st Floor

Project No.: 182364

Room #: Rm 103

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Cream	Wood, Brick, Sheetrock, **(Plaster)**, Metal, Concrete	Wall	153	D	Center	14.2	14.2	**(POS)**, NEG, INC	FRICTION, **(NON-FRICTION)**; **(INTACT)**, FAIR, POOR	**(HR)**, AR, A ENCL; A ENCP, CA, **(OSHA)**, N/A
Cream	Wood, Brick, **(Sheetrock)**, Plaster, Metal, Concrete	Wall	154	A	Center	0.01	0.01	POS, **(NEG)**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			155	B	↓	0.03				
			156	C	↓	0.01				
Cream	Wood, Brick, Sheetrock, Plaster, **(Metal)**, Concrete	Door Comp	157	A	Casing	0.02	0.01	POS, **(NEG)**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			158	A	Sash	0.01				
	Wood, Brick, Sheetrock, Plaster, Metal, Concrete							POS, NEG, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
	Wood, Brick, Sheetrock, Plaster, Metal, Concrete							POS, NEG, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent: 1st Floor

Project No.: 182364

Room #: Rm 106

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Cream	Wood Brick Sheetrock (Plaster) Metal Concrete	Wall	159	B	Center	17.9	17.9	(POS) NEG INC	FRICTION (INTACT) NON-FRICTION FAIR POOR	(HR) AR A ENCL A ENCP CA (OSHA) N/A
Cream	Wood Brick (Sheetrock) Plaster Metal Concrete	Wall	160	A	Center	0.03	0.02	POS (NEG) INC	FRICTION INTACT NON-FRICTION FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			161	B	↓	0.01				
			162	C	↓	0.01				
Cream	Wood Brick Sheetrock Plaster (Metal) Concrete	Door Comp	163	A	Casing	0.02	0.01	POS (NEG) INC	FRICTION INTACT NON-FRICTION FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			164	A	Jamb	0.01				
Cream	Wood Brick Sheetrock Plaster (Metal) Concrete	Heater	165		Top	0.00	0.00	POS (NEG) INC	FRICTION INTACT NON-FRICTION FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
Cream	(Wood) Brick Sheetrock Plaster Metal Concrete	Window Sash	166		Center	0.01	0.01	POS (NEG) INC	FRICTION INTACT NON-FRICTION FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Room Equivalent:

Room #: Rm 104

Date: 10/25/16

Signature:

Project No.: 182364

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
Cream	Wood, Brick, (Sheetrock), Plaster, Metal, Concrete	Wall	167	A	Center	0.00	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			168	B	↓	0.01				
			169	C		0.02				
			170	D		0.01				
Cream	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Door Comp.	171	A	Casing	0.03	0.02	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			172	A	Jamb	0.02				
Cream	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Heater	173	C	Top	0.01	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Cream	(Wood), Brick, Sheetrock, Plaster, Metal, Concrete	Window Stone	174	C	Center	0.03	0.03	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
	Wood, Brick, Sheetrock, Plaster, Metal, Concrete							POS, NEG, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent: 1st Floor

Project No.: 182364

Room #: Rm 102

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
Green	Wood, Brick, (Sheetrock), Plaster, Metal, Concrete	Wall	175	A	Center	0.01	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			176	B	↓	0.00				
			177	C		0.02				
			178	D		0.01				
Green	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Door Comp.	179	A	Casing	0.02	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			180	A	Jamb	0.01				
Green	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Heater	181	C	Top	0.03	0.03	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			~~182~~	~~C~~						
Green	(Wood), Brick, Sheetrock, Plaster, Metal, Concrete	Window Frame	182	C	Center	0.1	~~0.0~~ 0.1	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
	Wood, Brick, Sheetrock, Plaster, Metal, Concrete							POS, NEG, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent: 1st Floor

Project No.: 182364

Room #: East Hallway

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Green	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	183	A	Center	21.4		**POS**	FRICTION, **INTACT**	**HR**, A ENCP
			184	B	↓	17.8		NEG	NON-FRICTION, FAIR	AR, CA
			185	C		19.3				A ENCL, **OSHA**
			186	D		20.2		INC	POOR	N/A
Green	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	187	A	Center	0.03	0.03	POS, **NEG**, INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Varnish	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Frame	188		Center	0.01	0.01	POS, **NEG**, INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Varnish	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Heater	189		Top	0.06	0.06	POS, **NEG**, INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Brown	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door Comp.	190		Ceiling	0.01	0.02	POS, **NEG**, INC	FRICTION, NON-FRICTION, INTACT, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			191		Jamb	0.03				

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 1st Floor

Project No.: 182364

Room #: West Hallway

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Green	Wood, Brick, Sheetrock, (Plaster), Metal, Concrete	Wall	192	A	Center	19.3		(POS), NEG, INC	FRICTION, (NON-FRICTION); (INTACT), FAIR, POOR	(HR), AR, A ENCL; A ENCP, CA, (OSHA), N/A
			193	B	↓	21.4				
			194	C		22.8				
			195	D		17.2				
~~Green~~ Brown	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Door Comp.	196		Casing	0.01	0.03	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			197		Jamb	0.04				
	Wood, Brick, Sheetrock, Plaster, Metal, Concrete							POS, NEG, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
	Wood, Brick, Sheetrock, Plaster, Metal, Concrete							POS, NEG, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
	Wood, Brick, Sheetrock, Plaster, Metal, Concrete							POS, NEG, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 1st Floor

Project No.: 182364

Room #: Main Lobby / ~~Hall~~ Elevator Lobby / Center Stairs Lobby

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Green	Wood, Brick, Sheetrock, (Plaster), Metal, Concrete	Wall	198	A	Center	17.8		(POS), NEG, INC	FRICTION, (NON-FRICTION); (INTACT), FAIR, POOR	(HR), AR, A ENCL; A ENCP, CA, (OSHA), N/A
			199	B	↓	21.3				
			200	C		10.1				
			201	D	☆	18.2				
* Green	Wood, Brick, Sheetrock, (Plaster), Metal, Concrete	Ceiling	202		Center	7.5		(POS), NEG, INC	FRICTION, (NON-FRICTION); (INTACT), FAIR, POOR	(HR), AR, A ENCL; A ENCP, CA, (OSHA), N/A
* Cream	Wood, Brick, Sheetrock, (Plaster), Metal, Concrete	Column	203		Center	21.2		(POS), NEG, INC	FRICTION, (NON-FRICTION); (INTACT), FAIR, POOR	(HR), AR, A ENCL; A ENCP, CA, (OSHA), N/A
			204		↓	17.9				
Tan	(Wood), Brick, Sheetrock, Plaster, Metal, Concrete	Wall	205	A	Center	0.01	0.04	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			206	B	↓	0.1				
			207	C		0.08				
			208	D	☆	0.02				
Tan	(Wood), Brick, Sheetrock, Plaster, Metal, Concrete	Ceiling	209		Center	0.06	0.06	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: 1st Floor

Project No.: 182369

Room #: Main lobby / Elevator lobby / center stair lobby

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
Varnish	(Wood) Brick Sheetrock Plaster Metal Concrete	Wall	210	B	Center	0.00	0.00	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			211	C	↓	0.00				
			212	D	↓	0.00				
Varnish	(Wood) Brick Sheetrock Plaster Metal Concrete	Column	213		Center	0.01	0.01	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			214		↓	0.00				
Green	Wood Brick Sheetrock Plaster (Metal) Concrete	Elevator Door Comp.	215	C	Casing	0.02	0.01	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			216	C	Door	0.01				
Varnish	(Wood) Brick Sheetrock Plaster Metal Concrete	Header	217	C	Top	0.01	0.01	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
Green	Wood Brick Sheetrock Plaster Metal (Concrete)	Wall	218	A	Center	0.03	0.02	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			219	D	↓	0.02				
			220	C	↓	0.01				
			221	D	↓	0.01				

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent:

Project No.: 182364

Room #: 1st Floor Main Lobby / Elevator Lobby / Center Stairs Lobby

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
Varied	(Wood) Brick Sheetrock Plaster Metal Concrete	Window Sill	222	C	Center	0.11	0.11	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
Tan	(Wood) Brick Sheetrock Plaster Metal Concrete	Hand Rail	223		Top	0.09	0.09	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
Tan	(Wood) Brick Sheetrock Plaster Metal Concrete	Stair Stringer	224		Center	0.19	0.19	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
Tan	(Wood) Brick Sheetrock Plaster Metal Concrete	Spindle	225		Center	0.18	0.18	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
	Wood Brick Sheetrock Plaster Metal Concrete							POS NEG INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: B1 level

Project No.: 182364

Room #: B125

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Classification	Surface/Condition	Recommendation
off white	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	229	A	Center	17.1	17.1	**POS**, NEG, INC	FRICTION, **NON-FRICTION**; **INTACT**, FAIR, POOR	**HR**, AR, A ENCL; A ENCP, CA, **OSHA**, N/A
off white	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	230	B	Center	0.02	0.02	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			231	C	↓	0.03				
			232	D	↓	0.01				
off white	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	~~Heater~~ Window Screen	233	C	Center	0.00	0.00	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	234	C	Top	0.01	0.01	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Pwr comp	235	A	Center	0.02	0.02	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			236	A	↓					

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent: B1 Level

Project No.: 182364

Room #: B123

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Off White	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	237	A	Center	22.7	22.7	**POS**, NEG, INC	**NON-FRICTION**; **INTACT**, FAIR, POOR	**HR**, AR, A ENCL; A ENCP, CA, **OSHA**, N/A
Off White	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	238	~~B~~	Center	0.00	0.00	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			239	C	↓	0.00				
			240	D	↓	0.00				
Off White	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	~~Heater~~ window Seam	241	C	Center	0.01	0.01	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Off White	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door Comp	242	~~A~~	Center	0.01	0.0	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			243	A						
Off White	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	244	C	Top	0.02	0.02	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at the United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: B1 Level

Project No.: 182364

Room #: B122

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Off White	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	245	A	Center	19.8	19.8	**POS**, NEG, INC	**FRICTION**, **INTACT**, **NON-FRICTION**, FAIR, POOR	**HR**, AR, A ENCL, A ENCP, CA, **OSHA**, N/A
Off White	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	246	B	Center	0.01	0.01	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			247	C	↓	0.02				
			248	D	↓	0.02				
Off White	~~Wood~~, Brick, Sheetrock, Plaster, **Metal**, ~~Concrete~~	Master	249		Top	0.03	0.03	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Off White	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Frame	250		Center	0.02	0.02	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
Off White	Wood, Brick, Sheetrock, Plaster, ~~Metal~~, Concrete	Door Corp	251		~~Cent~~ Cesily	0.02	0.02	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			252		Sam	0.03				

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: B1 Level

Project No.: 182364

Room #: B121

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
off white	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	253	A	Center	21.8	21.8	**POS**, NEG, INC	FRICTION, **NON-FRICTION**; **INTACT**, FAIR, POOR	**HR**, AR, A ENCL; A ENCP, CA, **OSHA**, N/A
off white	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	254	B	Center	0.01	0.02	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			255	C	↓	0.03				
			256	D	↓	0.02				
off white	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Frame	257	C	Center	0.06	0.06	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	258	C	Top	0.01	0.01	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Floor Comp.	259	A	Casing	0.03	0.03	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			260	A	Sash					

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Room Equivalent: B1 Level

Room #: B120

Date: 10/25/18

Signature: [signature]

Project No.: 182364

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Classification	Surface/Condition	Recommendation
off wht	Wood Brick Sheetrock (Plaster) Metal Concrete	Wall	261	A	Center	21.8	21.8	(POS) NEG INC	FRICTION (INTACT) NON-FRICTION FAIR POOR	(HR) AR A ENCL A ENCP CA (OSHA) N/A
off wht	Wood Brick (Sheetrock) Plaster Metal Concrete	Wall	262	B	Center	0.03	0.02	POS (NEG) INC	FRICTION INTACT NON-FRICTION FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			263	C	↓	0.01				
			264	D	↓	0.02				
off wht	(Wood) Brick Sheetrock Plaster Metal Concrete	Window Frame	265	C	Center	0.03	0.03	POS (NEG) INC	FRICTION INTACT NON-FRICTION FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
off wht	Wood Brick Sheetrock Plaster (Metal) Concrete	Heater	266	C	Top	0.01	0.01	POS (NEG) INC	FRICTION INTACT NON-FRICTION FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
off wht	Wood Brick Sheetrock Plaster (Metal) Concrete	Rear Comp.	267	A	Casing	0.02	0.01	POS (NEG) INC	FRICTION INTACT NON-FRICTION FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			268	A	Jamb	0.01				

*

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: B1 Level

Project No.: 182364

Room #: B119

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
off white	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	269	B	Center	17.8	17.8	**POS**, NEG, INC	**FRICTION**, **NON-FRICTION**; **INTACT**, FAIR, POOR	**HR**, AR, A ENCL; A ENCP, CA, **OSHA**, N/A
off white	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	270	A	Center	0.01	0.01	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			271	C	"	0.02				
			272	D	"	0.01				
off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	273	C	Top	0.06	0.06	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
off white	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Frame	274	C	Center	0.02	0.02	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Rear Comp	275	A	Casing	0.01	0.02	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			276	A	Sash	0.03				

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/25/10

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent: B1 Level

Project No.: 182364

Room #: Room B116

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
off white	Wood Brick (Sheetrock) Plaster Metal Concrete	Wall	277	A	Center	0.01	0.01	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			278	B	↓	0.02				
			279	C		0.01				
			280	D	↓	0.03				
off white	Wood Brick Sheetrock Plaster (Metal) Concrete	Door Comp.	281	A	Casing	0.02	0.01	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			282	A	Jamb	0.01				
	Wood Brick Sheetrock Plaster Metal Concrete							POS NEG INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
	Wood Brick Sheetrock Plaster Metal Concrete							POS NEG INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
	Wood Brick Sheetrock Plaster Metal Concrete							POS NEG INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: B1 Level

Project No.: 182364

Room #: Rm B115

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
off white	Wood, Brick, (Sheetrock), Plaster, Metal, Concrete	Wall	283	A	Center	0.00	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			284	B	↓	0.02				
			285	C		0.01				
			286	D		0.02				
off white	(Wood), Brick, Sheetrock, Plaster, (Metal), Concrete	Hall	287	C	Top	0.01	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
off white	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Door Comp	288	A	Casing	0.03	0.0	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			289	A	Sub	0.02				
off white	(Wood), Brick, Sheetrock, Plaster, Metal, Concrete	Window Frame	290	C	Center	0.0	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
	Wood, Brick, Sheetrock, Plaster, Metal, Concrete							POS, NEG, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/25/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent: B1 Level

Project No.: 182364

Room #: Janitors Closet

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition		Recommendation	
Blue	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	291	A	Center	0.00	0.02	POS, **NEG**, INC	FRICTION, NON-FRICTION	INTACT, FAIR, POOR	HR, AR, A ENCL	A ENCP, CA, OSHA, N/A
			292	B	↓	0.01						
			293	C		0.01						
			294	D		0.03						
off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door Comp	295	A	Casing	0.01	0.02	POS, **NEG**, INC	FRICTION, NON-FRICTION	INTACT, FAIR, POOR	HR, AR, A ENCL	A ENCP, CA, OSHA, N/A
			296	A	Jamb	0.04						
off white	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Ceiling	297		Center	10.8	10.8	**POS**, NEG, INC	**NON-FRICTION**, FRICTION	**FAIR**, INTACT, POOR	**HR**, AR, A ENCL	**A ENCP**, CA, **OSHA**, N/A
	Wood, Brick, Sheetrock, Plaster, Metal, Concrete							POS, NEG, INC	FRICTION, NON-FRICTION	INTACT, FAIR, POOR	HR, AR, A ENCL	A ENCP, CA, OSHA, N/A
	Wood, Brick, Sheetrock, Plaster, Metal, Concrete							POS, NEG, INC	FRICTION, NON-FRICTION	INTACT, FAIR, POOR	HR, AR, A ENCL	A ENCP, CA, OSHA, N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/28/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: B1 Level

Project No.: 182364

Room #: Men's Restroom

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
Off White	Wood, Brick, (Sheetrock), Plaster, Metal, Concrete	Wall	298	A	Center	0.00	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			299	B		0.01				
			306	C		0.00				
			301	D		0.00				
Tan	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Door Comp	302	A	Casing	0.03	0.02	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			303	A	Jamb	0.02				
Tan	(Wood), Brick, Sheetrock, Plaster, Metal, Concrete	Window Frame	304	C	Center	0.01	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Tan	Wood, Brick, Sheetrock, Plaster, (Metal), Concrete	Heater	305	C	Top	0.04	0.04	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
	Wood, Brick, Sheetrock, Plaster, Metal, Concrete							POS, NEG, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/25/16

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: B1 Level

Project No.: 182364

Room #: Womens Restroom

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
off white	Wood Brick Sheetrock (Plaster) Metal Concrete	Wall	306	A	Center	0.9	0.9	(POS) NEG INC	FRICTION (INTACT) NON-FRICTION FAIR POOR	(HR) AR A ENCL A ENCP CA (OSHA) N/A
off white	Wood Brick (Sheetrock) Plaster Metal Concrete	Wall	307	B	Center	0.01	0.01	POS (NEG) INC	FRICTION INTACT NON-FRICTION FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			308	C	↓	0.02				
			309	D	↓	0.01				
off white	Wood Brick Sheetrock Plaster (Metal) Concrete	Rear Ceiling	310	A	Casing	0.01	0.01	POS (NEG) INC	FRICTION INTACT NON-FRICTION FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			311	A	Sash	0.00				
	Wood Brick Sheetrock Plaster Metal Concrete							POS NEG INC	FRICTION INTACT NON-FRICTION FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
	Wood Brick Sheetrock Plaster Metal Concrete							POS NEG INC	FRICTION INTACT NON-FRICTION FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/28/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent:

Project No.: 182364

Room #: Elevator / Center Stair Lobby

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* White	Wood, Brick, Sheetrock, (Plaster), Metal, Concrete	Wall	312	A	Center	21.3		(POS), NEG, INC	FRICTION, (NON-FRICTION); (INTACT), FAIR, POOR	(HR), AR, A ENCL; A ENCP, CA, (OSHA), N/A
			313	B	↓	18.2				
			314	C		16.5				
			315	D		5.4				
* White	Wood, Brick, Sheetrock, (Plaster), Metal, Concrete	Ceiling	316		Center	10.1	10.1	(POS), NEG, INC	FRICTION, (NON-FRICTION); (INTACT), FAIR, POOR	(HR), AR, A ENCL; A ENCP, CA, (OSHA), N/A
			3							
* White	Wood, Brick, Sheetrock, (Plaster), Metal, Concrete	Column	317		Center	8.7		(POS), NEG, INC	FRICTION, (NON-FRICTION); (INTACT), FAIR, POOR	(HR), AR, A ENCL; A ENCP, CA, (OSHA), N/A
			318		↓	9.2				
Brown	(Wood), Brick, Sheetrock, Plaster, Metal, Concrete	Wall	319	A	Center	0.01	0.01	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			320	B	↓	0.00				
			321	C		0.00				
			322	D		0.00				
White	(Wood), Brick, Sheetrock, Plaster, Metal, Concrete	Hand Rail	323		Top	0.03	0.03	POS, (NEG), INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/29/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent:

Project No.: 182364

Room #: Elevator / Center Stair Lobby

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Black	Wood Brick Sheetrock Plaster (Metal) Concrete	Stair Stringer	324		Center	17.1	17.1	(POS) NEG INC	FRICTION (NON-FRICTION) INTACT FAIR POOR	(HR) AR A ENCL A ENCP CA (OSHA) N/A
* Black	Wood Brick Sheetrock Plaster (Metal) Concrete	Stair Spindle	325		Center	8.9	8.9	(POS) NEG INC	FRICTION (NON-FRICTION) INTACT FAIR POOR	(HR) AR A ENCL A ENCP CA (OSHA) N/A
Off White	Wood Brick Sheetrock Plaster (Metal) Concrete	Elevator Door Comp	326	C	Door	0.1	0.07	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			327	C	Casing	0.09				
			328	C	Stand	0.07				
Off White	Wood Brick Sheetrock Plaster (Metal) Concrete	Door Casing	329		Center	0.01	0.01	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
Brn	Wood Brick Sheetrock Plaster (Metal) Concrete	Door Casing	330		Center	0.01	0.01	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/28/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent:

Project No.: 182364

Room #: B106 Suite (includes B105)

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Classification	Surface/Condition	Recommendation
Off White *	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	331	A	Center	12.8	12.8	**POS**, NEG, INC	**FRICTION**, NON-FRICTION; **INTACT**, FAIR, POOR	**HR**, AR, A ENCL; A ENCP, CA, **OSHA**, N/A
Off White	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	332	B	Center	0.01	0.02	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			333	C	↓	0.03				
			334	D	↓	0.02				
Off White	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door Comp.	335	A	Casing	0.01	0.04	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			336	A	Jamb	0.06				
Off White	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	337	C	Top	0.03	0.03	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Off White	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Sill	338	C	Center	0.01	0.01	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/28/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: B1 Level

Project No.: 182364

Room #: B107

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
* Off white	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	339	A	Center	19.1	19.1	**POS**, NEG, INC	**FRICTION**, NON-FRICTION; **INTACT**, FAIR, POOR	**HR**, AR, A ENCL; A ENCP, CA, **OSHA**, N/A
Off white	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	340	B	Center	0.01	0.02	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			341	C	↓	0.02				
			342	D	↓	0.02				
Off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door comp.	343	A	Casing	0.04	0.03	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
			344	A	Sash	0.01				
Off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	345	C	Center	0.02	0.02	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A
Off white	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Sash	346	C	Center	0.01	0.01	POS, **NEG**, INC	FRICTION, NON-FRICTION; INTACT, FAIR, POOR	HR, AR, A ENCL; A ENCP, CA, OSHA, N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/28/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent: B1 Level

Project No.: 182364

Room #: Rm. B108

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Classification	Surface/Condition	Recommendation
* off white	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	347	A	Center	12.9	12.9	**POS**, NEG, INC	FRICTION, **INTACT**, **NON-FRICTION**, FAIR, POOR	~~HR~~, AR, A ENCL, A ENCP, CA, **OSHA**, N/A
off white	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	348	B	Center	0.03	0.01	POS, **NEG**, INC	FRICTION, **INTACT**, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			349	C	↓	0.01				
			350	D	↓	0.02				
off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	351	C	Top	0.00	0.00	POS, NEG, INC	FRICTION, **INTACT**, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Rear Comp	352	A	Casing	0.02	0.02	POS, NEG, INC	FRICTION, **INTACT**, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			353	A	Jamb	0.02				
off white	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Sill	354	C	Center	0.04	0.04	POS, NEG, INC	FRICTION, **INTACT**, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/28/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: B/ Level

Project No.: 182364

Room #: B109

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
off white	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	355	A	Center	11.8	11.8	**POS**, NEG, INC	**NON-FRICTION**; FRICTION; **INTACT**; FAIR; POOR	**HR**; AR; A ENCL; A ENCP; CA; **OSHA**; N/A
off white	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	356	B	Center	0.04	0.02	POS, **NEG**, INC	NON-FRICTION; FRICTION; INTACT; FAIR; POOR	HR; AR; A ENCL; A ENCP; CA; OSHA; N/A
			357	C	↓	0.01				
			358	D	↓	0.02				
off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Door Comp	359	A	Casing	0.03	0.02	POS, **NEG**, INC	NON-FRICTION; FRICTION; INTACT; FAIR; POOR	HR; AR; A ENCL; A ENCP; CA; OSHA; N/A
			360	A	Jamb	0.02				
off white	Wood, Brick, Sheetrock, Plaster, ~~Metal~~, Concrete	Heater	361	C	Top	0.11	0.11	POS, **NEG**, INC	NON-FRICTION; FRICTION; INTACT; FAIR; POOR	HR; AR; A ENCL; A ENCP; CA; OSHA; N/A
off white	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Frame	362		Center	0.03	0.03	POS, **NEG**, INC	NON-FRICTION; FRICTION; INTACT; FAIR; POOR	HR; AR; A ENCL; A ENCP; CA; OSHA; N/A

*

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/28/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature: [signature]

Room Equivalent: B1 Level

Project No.: 182364

Room #: Rm B111

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
off white	Wood, Brick, Sheetrock, **Plaster**, Metal, Concrete	Wall	363	A	Center	12.8	12.8	**POS**, NEG, INC	FRICTION, **INTACT**, **NON-FRICTION**, FAIR, POOR	**HR**, AR, A ENCL, A ENCP, CA, **OSHA**, N/A
off white	Wood, Brick, **Sheetrock**, Plaster, Metal, Concrete	Wall	364	B	Center	0.02	0.02	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			365	C	↓	0.01				
			366	D	↓	0.03				
off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Poor comp	367	A	Casing	0.01	0.01	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
			368	A	Sash	0.00				
off white	Wood, Brick, Sheetrock, Plaster, **Metal**, Concrete	Heater	369	C	Top	0.03	0.03	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A
off white	**Wood**, Brick, Sheetrock, Plaster, Metal, Concrete	Window Sill	370	C	Center	0.01	0.01	POS, **NEG**, INC	FRICTION, INTACT, NON-FRICTION, FAIR, POOR	HR, AR, A ENCL, A ENCP, CA, OSHA, N/A

Criterion

XRF Testing Report

Client: The Oak Group, Inc.

Date: 10/28/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent:

Project No.: 182364

Room #: B101 A/B

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
off white	Wood Brick (Sheetrock) Plaster Metal Concrete	Wall	371	A	Center	0.01	0.01	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			372	B	↓	0.00				
			373	C		0.02				
			374	D	↓	0.01				
off white	Wood Brick Sheetrock Plaster (Metal) Concrete	Door comp.	375	A	Casing	0.03	0.02	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			376	A	Jamb	0.02				
off white	Wood Brick Sheetrock Plaster (Metal) Concrete	Heater	377	C	Top	0.01	0.01	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
	Wood Brick Sheetrock Plaster Metal Concrete							POS NEG INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
	Wood Brick Sheetrock Plaster Metal Concrete							POS NEG INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A

XRF Testing Report

Criterion

Client: The Oak Group, Inc.

Date: 10/28/18

Sampling Location: Lincoln Hall at The United States Military Academy at West Point, NY

Signature:

Room Equivalent: B1 level

Project No.: 182364

Room #: Rm B102

XRF Serial No.: 25357

Color	Substrate	Component	Reading No.	Wall	Test Location	XRF Reading mg/cm²	Results mg/cm²	Class-ification	Surface/Condition	Recommendation
off white	Wood Brick ~~Sheetrock~~ Plaster Metal Concrete	Wall	378	A	Center	0.02	0.01	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			379	B	↓	0.01				
			380	C		0.00				
			381	D		0.02				
off white	Wood Brick Sheetrock Plaster (Metal) Concrete	Pour comp	382	A	Casing	0.01	0.01	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
			383	A	Joint	0.04				
off white	Wood Brick Sheetrock Plaster (Metal) Concrete	Heater	384	C	Top	0.00	0.00	POS (NEG) INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
	Wood Brick Sheetrock Plaster Metal Concrete							POS NEG INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A
	Wood Brick Sheetrock Plaster Metal Concrete							POS NEG INC	FRICTION NON-FRICTION INTACT FAIR POOR	HR AR A ENCL A ENCP CA OSHA N/A

Criterion

Calibration Check Test Results

Client: The Oak Group, Inc.

Address: Lincoln Hall at The United States Military Academy at West Point, NY

Date: 10/23/18 **XRF Serial #:** 25357

Project Number: 182364

Inspector: Melissa Billingsley

Inspector Signature:

Lead Paint Standards Surface Lead mg/cm²	Start of Job 1st Calibration Check		2nd Calibration Check		3rd Calibration Check		4th Calibration Check	
	Reading #	Result	Reading #	Result	Reading #	Result	Reading #	Result
<0.01	1	0.0	151	0.0	274	0.0		
1.04 ± 0.06	2	1.0	152	1.0	275	1.0		
0.71 ± 0.08	3	0.7	153	0.7	276	0.7		
3.58 ± 0.39								
1.53 ± 0.09								
0.31 ± 0.02								
Detector Resolution	378.2							

Note: At least three (3) calibration samples should be taken before and after the inspection has been complete. In addition three (3) calibration samples should be taken at four (4) hour intervals.

Criterion

Calibration Check Test Results

Client: The Oak Group, Inc.

Address: Lincoln Hall at The United States Military Academy at West Point, NY

Date: 10/24/18 **XRF Serial #:** 25357

Project Number: 182364

Inspector: Melissa Billingsley

Inspector Signature: [signature]

Lead Paint Standards Surface Lead mg/cm²	Start of Job 1st Calibration Check		2nd Calibration Check		3rd Calibration Check		4th Calibration Check	
	Reading #	Result	Reading #	Result	Reading #	Result	Reading #	Result
<0.01	1	0.0	174	0.0	406	0.0		
1.04 ± 0.06	2	1.0	175	1.0	407	1.0		
0.71 ± 0.08	3	0.7	176	0.7	408	0.7		
3.58 ± 0.39								
1.53 ± 0.09								
0.31 ± 0.02								
Detector Resolution	377.7							

Note: At least three (3) calibration samples should be taken before and after the inspection has been complete. In addition three (3) calibration samples should be taken at four (4) hour intervals.

Criterion

Calibration Check Test Results

Client: The Oak Group, Inc.

Address: Lincoln Hall at The United States Military Academy at West Point, NY

Date: 10/25/18 **XRF Serial #:** 25357

Project Number: 182364

Inspector: Melissa Billingsley

Inspector Signature:

Lead Paint Standards Surface Lead mg/cm²	Start of Job 1st Calibration Check		2nd Calibration Check		3rd Calibration Check		4th Calibration Check	
	Reading #	Result	Reading #	Result	Reading #	Result	Reading #	Result
<0.01	1	0.0	226	0.0	404	0.0		
1.04 ± 0.06	2	1.0	227	1.0	405	1.0		
0.71 ± 0.08	3	0.7	228	0.7	406	0.7		
3.58 ± 0.39								
1.53 ± 0.09								
0.31 ± 0.02								
Detector Resolution	377.0							

Note: At least three (3) calibration samples should be taken before and after the inspection has been complete. In addition three (3) calibration samples should be taken at four (4) hour intervals.

United States Environmental Protection Agency

This is to certify that

Melissa Billingsley

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Risk Assessor

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires November 24, 2021

LBP-R-124044-1

Certification #

September 24, 2018

Issued On

Adrienne Priselac, Manager, Toxics Office

Land Division

the oak group inc. **622 Cooper Street Camden, NJ 08102 (856) 377-0060 www.oakgroup.net**
Mailing address: PO Box 2041 Voorhees, NJ 08043

15 November, 2018

Mr. Terry Allen
Mason and Hanger

Re: Radon Results Lincoln and Cullum Halls USMA

Via: Email

Mr. Allen,

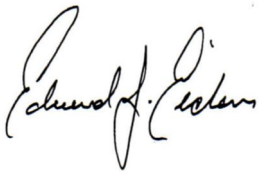
Pursuant to your request, Radon sampling was conducted for Lincoln and Cullum Halls located on Thayer Rd. Bldg USMA West Point, NY. Testing was performed by Mr. Kenneth Carr of Precision Inspections, LCC on October 23-25, 2018.

A total of 12 locations were tested within Lincoln Hall. Eleven test results were below the US EPA recommended threshold of 4pCi/L. One sample located in Room B-100 indicated a level of 4.6pCi/L.

A total of 6 locations were tested within Cullum Hall. Test results ranged from which are all below the US EPA recommended threshold of 4pCi/L.

Attached are the results of testing.

The OAK Group, Inc.



Eduard J. Eichen, CIH

West Point Military Academy
600 Thayer Road
West Point, NY 10996-1726

Building	Location	Test ID#	Results	Remarks
Cullum Hall	Lower basement/Rm 1A	7234034	<0.3 pCi/l	Blank
Cullum Hall	Lower basement/Rm 1A	7234035	<0.3 pCi/l	Duplicate
Cullum Hall	Lower basement/Rm 1A	7234031	<0.3 pCi/l	
Cullum Hall	Lower basement/Rm 3B	7234027	<0.3 pCi/l	
Cullum Hall	Lower basement/Corridor	7234030	<0.3 pCi/l	
Cullum Hall	Basement/Pantry	7234029	<0.3 pCi/l	
Cullum Hall	Basement/Chair room	7234028	<0.3 pCi/l	
Cullum Hall	Basement/Room 6	7234025	1.2 +/- 0.2 pCi/l	
Lincoln Hall	Mechanical section corridor	7234014	3.1 +/- 0.3 pCi/l	
Lincoln Hall	Room B201	7234023	0.8 +/- 0.2 pCi/l	
Lincoln Hall	Classroom corridor	7234024	0.9 +/- 0.3 pCi/l	
Lincoln Hall	Room B116	7234026	0.8 +/- 0.3 pCi/l	
Lincoln Hall	Room B106	7234019	<0.3 pCi/l	
Lincoln Hall	Room 109	7234020	<0.3 pCi/l	
Lincoln Hall	Room B-100	7234021	4.6 +/- 0.3 pCi/l	
Lincoln Hall	Room B-120	7234015	1.1 +/- 0.3 pCi/l	
Lincoln Hall	Room B-121	7234016	1.0 +/- 0.3 pCi/l	
Lincoln Hall	Room B-123	7234017	0.7 +/- 0.3 pCi/l	
Lincoln Hall	Room B-108	7234022	<0.3 pCi/l	
Lincoln Hall	Room B-103	7234018	1.1 +/- 0.3 pCi/l	

Air Chek
NRPP Lab ID: 101138 AL
NY ELAP Lab ID 11441
October 26, 2018

Radon Measurement Technician
Precision Inspections
Ken Carr
223 W 21st St Apt 4h
New York, NY 10011-3138
646-247-1867

Device Information
Pro Chek Activated Charcoal
Serial#: 7234016
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 10:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement 600 Thayer Rd B121 West Point, NY 10996-1726	7234016	2018-10-26	1.0 ± 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. The EPA indicates that there is little short-term risk with test results in this range (0.6 to 1.9 pCi/L). However, because radon levels fluctuate daily, as well as seasonally, you may want to retest during another season. Additionally, if you make any structural changes or start to use a lower level of the building more frequently, you should test again.

- **No tampering was observed during the radon test.**

The subject home described has been tested for the presence of radon gas according to US EPA short-term testing protocols. The test and analysis have been performed to comply with EPA's *Home Buyer's and Seller's Guide to Radon*. This report represents the average radon concentration at the time of sampling and at the specific location in the building. However, it must be noted that radon concentrations will vary from day to day and from season to season.

ATTENTION NEW YORK STATE RESIDENT
This test was analyzed by Air Chek, Inc, NY ELAP Lab ID 11441
For further technical advice and assistance contact:

Bureau of Environmental Radiation Protection
2 University Place
Albany, New York, 12203
or call 800-458-1158

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October 26, 2018

Radon Measurement Technician
Precision Inspections
Ken Carr
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New York, NY 10011-3138
646-247-1867

Device Information
Pro Chek Activated Charcoal
Serial#: 7234021
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 10:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement 600 Thayer Rd B100 West Point, NY 10996-1726	7234021	2018-10-26	4.6 ± 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. The EPA recommendation for test results in this range (4 to 8 pCi/L) is to conduct either a short- or long-term follow-up measurement. If, however, this is a follow-up (confirming) test, it is recommended that you take remedial action to reduce these radon levels.

- **No tampering was observed during the radon test.**

The subject home described has been tested for the presence of radon gas according to US EPA short-term testing protocols. The test and analysis have been performed to comply with EPA's *Home Buyer's and Seller's Guide to Radon*. This report represents the average radon concentration at the time of sampling and at the specific location in the building. However, it must be noted that radon concentrations will vary from day to day and from season to season.

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Device Information
Pro Chek Activated Charcoal
Serial#: 7234026
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 10:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement 600 Thayer Rd Rm B116 West Point, NY 10996-1726	7234026	2018-10-26	0.8 ± 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. The EPA indicates that there is little short-term risk with test results in this range (0.6 to 1.9 pCi/L). However, because radon levels fluctuate daily, as well as seasonally, you may want to retest during another season. Additionally, if you make any structural changes or start to use a lower level of the building more frequently, you should test again.

- **No tampering was observed during the radon test.**

The subject home described has been tested for the presence of radon gas according to US EPA short-term testing protocols. The test and analysis have been performed to comply with EPA's *Home Buyer's and Seller's Guide to Radon*. This report represents the average radon concentration at the time of sampling and at the specific location in the building. However, it must be noted that radon concentrations will vary from day to day and from season to season.

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Device Information
Pro Chek Activated Charcoal
Serial#: 7234015
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 10:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement 600 Thayer Rd B120 West Point, NY 10996-1726	7234015	2018-10-26	1.1 ± 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. The EPA indicates that there is little short-term risk with test results in this range (0.6 to 1.9 pCi/L). However, because radon levels fluctuate daily, as well as seasonally, you may want to retest during another season. Additionally, if you make any structural changes or start to use a lower level of the building more frequently, you should test again.

- **No tampering was observed during the radon test.**

The subject home described has been tested for the presence of radon gas according to US EPA short-term testing protocols. The test and analysis have been performed to comply with EPA's *Home Buyer's and Seller's Guide to Radon*. This report represents the average radon concentration at the time of sampling and at the specific location in the building. However, it must be noted that radon concentrations will vary from day to day and from season to season.

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Device Information
Pro Chek Activated Charcoal
Serial#: 7234018
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 10:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement 600 Thayer Rd B103 West Point, NY 10996-1726	7234018	2018-10-26	1.1 ± 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. The EPA indicates that there is little short-term risk with test results in this range (0.6 to 1.9 pCi/L). However, because radon levels fluctuate daily, as well as seasonally, you may want to retest during another season. Additionally, if you make any structural changes or start to use a lower level of the building more frequently, you should test again.

- **No tampering was observed during the radon test.**

The subject home described has been tested for the presence of radon gas according to US EPA short-term testing protocols. The test and analysis have been performed to comply with EPA's *Home Buyer's and Seller's Guide to Radon*. This report represents the average radon concentration at the time of sampling and at the specific location in the building. However, it must be noted that radon concentrations will vary from day to day and from season to season.

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Device Information
Pro Chek Activated Charcoal
Serial#: 7234014
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 9:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement B2 600 Thayer Rd West Point, NY 10996-1726	7234014	2018-10-26	3.1 ± 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. The EPA recommendation for results in this range (2.0 to 3.9 pCi/L) is to conduct further tests to determine the true annual average, ideally with a long-term test kit. If the result remains between 2 and 4 there is little short-term risk, but you should consider fixing your home. Additionally, if you make any structural changes or start to use a lower level of the building more frequently, you should test again.

- **No tampering was observed during the radon test.**

The subject home described has been tested for the presence of radon gas according to US EPA short-term testing protocols. The test and analysis have been performed to comply with EPA's *Home Buyer's and Seller's Guide to Radon*. This report represents the average radon concentration at the time of sampling and at the specific location in the building. However, it must be noted that radon concentrations will vary from day to day and from season to season.

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October 26, 2018

Radon Measurement Technician
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Device Information
Pro Chek Activated Charcoal
Serial#: 7234024
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 9:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement 600 Thayer Rd West Point, NY 10996-1726	7234024	2018-10-26	0.9 ± 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. The EPA indicates that there is little short-term risk with test results in this range (0.6 to 1.9 pCi/L). However, because radon levels fluctuate daily, as well as seasonally, you may want to retest during another season. Additionally, if you make any structural changes or start to use a lower level of the building more frequently, you should test again.

- **No tampering was observed during the radon test.**

The subject home described has been tested for the presence of radon gas according to US EPA short-term testing protocols. The test and analysis have been performed to comply with EPA's *Home Buyer's and Seller's Guide to Radon*. This report represents the average radon concentration at the time of sampling and at the specific location in the building. However, it must be noted that radon concentrations will vary from day to day and from season to season.

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Air Chek
NRPP Lab ID: 101138 AL
NY ELAP Lab ID 11441
October 26, 2018

Radon Measurement Technician
Precision Inspections
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646-247-1867

Device Information
Pro Chek Activated Charcoal
Serial#: 7234019
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 10:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement 600 Thayer Rd B106 West Point, NY 10996-1726	7234019	2018-10-26	< 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. Test results in this range(0.5 pCi/L or less) are, for all practical purposes, equivalent to the radon levels found in fresh air. However, if you make any structural changes or start to use a lower level of the building more frequently you should test again.

- **No tampering was observed during the radon test.**

The subject home described has been tested for the presence of radon gas according to US EPA short-term testing protocols. The test and analysis have been performed to comply with EPA's *Home Buyer's and Seller's Guide to Radon*. This report represents the average radon concentration at the time of sampling and at the specific location in the building. However, it must be noted that radon concentrations will vary from day to day and from season to season.

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Air Chek
NRPP Lab ID: 101138 AL
NY ELAP Lab ID 11441
October 26, 2018

Radon Measurement Technician
Precision Inspections
Ken Carr
223 W 21st St Apt 4h
New York, NY 10011-3138
646-247-1867

Device Information
Pro Chek Activated Charcoal
Serial#: 7234017
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 10:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement 600 Thayer Rd B123 West Point, NY 10996-1726	7234017	2018-10-26	0.7 ± 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. The EPA indicates that there is little short-term risk with test results in this range (0.6 to 1.9 pCi/L). However, because radon levels fluctuate daily, as well as seasonally, you may want to retest during another season. Additionally, if you make any structural changes or start to use a lower level of the building more frequently, you should test again.

- **No tampering was observed during the radon test.**

The subject home described has been tested for the presence of radon gas according to US EPA short-term testing protocols. The test and analysis have been performed to comply with EPA's *Home Buyer's and Seller's Guide to Radon*. This report represents the average radon concentration at the time of sampling and at the specific location in the building. However, it must be noted that radon concentrations will vary from day to day and from season to season.

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or call 800-458-1158

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Device Information
Pro Chek Activated Charcoal
Serial#: 7234023
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 9:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement B2 600 Thayer Rd B201 West Point, NY 10996-1726	7234023	2018-10-26	0.8 ± 0.2 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. The EPA indicates that there is little short-term risk with test results in this range (0.6 to 1.9 pCi/L). However, because radon levels fluctuate daily, as well as seasonally, you may want to retest during another season. Additionally, if you make any structural changes or start to use a lower level of the building more frequently, you should test again.

- **No tampering was observed during the radon test.**

The subject home described has been tested for the presence of radon gas according to US EPA short-term testing protocols. The test and analysis have been performed to comply with EPA's *Home Buyer's and Seller's Guide to Radon*. This report represents the average radon concentration at the time of sampling and at the specific location in the building. However, it must be noted that radon concentrations will vary from day to day and from season to season.

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Device Information
Pro Chek Activated Charcoal
Serial#: 7234022
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 10:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement 600 Thayer Rd B108 West Point, NY 10996-1726	7234022	2018-10-26	< 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. Test results in this range(0.5 pCi/L or less) are, for all practical purposes, equivalent to the radon levels found in fresh air. However, if you make any structural changes or start to use a lower level of the building more frequently you should test again.

- **No tampering was observed during the radon test.**

The subject home described has been tested for the presence of radon gas according to US EPA short-term testing protocols. The test and analysis have been performed to comply with EPA's *Home Buyer's and Seller's Guide to Radon*. This report represents the average radon concentration at the time of sampling and at the specific location in the building. However, it must be noted that radon concentrations will vary from day to day and from season to season.

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October 26, 2018

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Device Information
Pro Chek Activated Charcoal
Serial#: 7234020
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 10:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement 600 Thayer Rd B109 West Point, NY 10996-1726	7234020	2018-10-26	< 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. Test results in this range(0.5 pCi/L or less) are, for all practical purposes, equivalent to the radon levels found in fresh air. However, if you make any structural changes or start to use a lower level of the building more frequently you should test again.

- **No tampering was observed during the radon test.**

The subject home described has been tested for the presence of radon gas according to US EPA short-term testing protocols. The test and analysis have been performed to comply with EPA's *Home Buyer's and Seller's Guide to Radon*. This report represents the average radon concentration at the time of sampling and at the specific location in the building. However, it must be noted that radon concentrations will vary from day to day and from season to season.

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Your health risk

The primary health risk from long-term exposure to radon is lung cancer. The risk of developing a lung cancer from radon exposure depends both on how much radon is present and how long you are exposed to radon. The higher the radon level or the longer the time of exposure, even if the levels are relatively low, the greater the risk. Exposures up to 4 pCi/L may present some risk of contracting lung cancer to more sensitive occupants, especially children and those who live with smokers. The US Congress set as a goal the lowering of radon levels in buildings to equal the levels of outside air.

PERFORMING RADON TESTS FOR A REAL ESTATE TRANSACTION

US EPA protocols state that when using passive devices, such as activated charcoal tests, two short-term tests should be conducted, either together or sequentially, at the same location in the building. The tests should be averaged together and if the average is 4.0 pCi/L or higher, radon mitigation is recommended. Even if the average is below 4.0 pCi/L, the buyers should consider testing in a different season or deploy a long-term test device to assess their long-term risks. It is **highly recommended** that any property transaction tests be conducted by a non-interested third party. To locate a listed or certified radon tester, contact your state radon office or visit our website at http://www.neha-nrpp.org to download a list of NEHA-NRPP certified testers. You should also visit the EPA website to download a copy of EPA's Home Buyer's and Seller's Guide to Radon.

Radon Test Device Placement

The US EPA recommends that testing device(s) be placed in the lowest level of the home that could be used regularly, whether it is finished or unfinished. Conduct the test in any space that could be used by the buyer as a bedroom, play area, family room, den, exercise room, or workshop. Based on their client's intended use of the space, the qualified testing professional should identify the appropriate test location and inform their client (buyer). Do not test in a closet, stairway, hallway, crawl space or in an enclosed area of high humidity or high air velocity. An enclosed area may include a kitchen, bathroom, laundry room or furnace room.

Variations in Radon Levels

When tests are performed in different seasons or under different weather conditions, the initial screening and follow-up tests may vary considerably. Radon levels can vary significantly between seasons, so different values **are to be expected**. Even during normal weather, indoor radon levels may rise and fall by a factor of two on a daily cycle; for example, from 5 pCi/L to 10 pCi/L in 24 hours. During rapidly changing or stormy weather, the levels may change more dramatically. Because continual changes in radon levels are considered normal, expose the testing device for as long as is practical, while following the manufacturer's recommendations. This, of course, provides a better overall average of the measurement.

If you are comparing tests, or are averaging a series of tests, bear in mind that any radon test returns only the average of the levels present during a **specific period of time** at the **precise location** of the test. Conditions during a different test period or at a different location in the building are **expected to be different.**

Test results can also vary if the radon test instructions were not carefully followed. A laboratory measuring radon in samples taken outside the lab **must rely on the person conducting the test**. For example, the wrong starting or ending date of a test will significantly affect the calculated result. The location of each radon test can also influence the result. For example, a test placed in the blowing air stream of a fan is likely to collect more radon than it would under normal conditions. Also, three tests conducted in one home, but in three different rooms, **would be expected to have at least slightly different test results.**

Test results from a properly used activated charcoal test will more closely reflect the average radon concentrations over the last three to four days of the test period. This happens because the radon collected by the activated charcoal has a radioactive half-life of only four days. Thus, much of the radon collected early in a seven day test has already begun to decay prior to the conclusion of the test.

Retesting

It is important to understand that radon levels can change at some point in the future. Therefore, it is important to retest when there is occupancy by a new owner, before and after a new addition to the house, alterations that could alter ventilation patterns, if major cracks are noticed in foundation walls or the slab, you begin using a ground contact area of the home not previously tested, or even recent nearby construction blasting or earthquakes. EPA recommends that homes be retested every 2-3 years. If the home has been previously mitigated or alterations are made to the mitigation system, retesting should be done.

Mitigation

When radon mitigation is necessary, it is advisable that a state-licensed or nationally- certified contractor be used to design and install the mitigation system. For easy to read mitigation information, go to the US EPA website and download a copy of the Consumer's Guide to Radon Reduction.

For technical information, call (828) 684-0893. Office hours are Mon-Fri 8:30 to 5:30 EASTERN
You can reach us by Fax at (828) 684-8498 or write to Air Chek, Inc., Box 2000, Naples, NC 28760
Web Site: http://www.radon.com **Email to:** info@radon.com

West Point Military Academy
600 Thayer Road
West Point, NY 10996-1726

Building	Location	Test ID#	Results	Remarks
Cullum Hall	Lower basement/Rm 1A	7234034	<0.3 pCi/l	Blank
Cullum Hall	Lower basement/Rm 1A	7234035	<0.3 pCi/l	Duplicate
Cullum Hall	Lower basement/Rm 1A	7234031	<0.3 pCi/l	
Cullum Hall	Lower basement/Rm 3B	7234027	<0.3 pCi/l	
Cullum Hall	Lower basement/Corridor	7234030	<0.3 pCi/l	
Cullum Hall	Basement/Pantry	7234029	<0.3 pCi/l	
Cullum Hall	Basement/Chair room	7234028	<0.3 pCi/l	
Cullum Hall	Basement/Room 6	7234025	1.2 +/- 0.2 pCi/l	
Lincoln Hall	Mechanical section corridor	7234014	3.1 +/- 0.3 pCi/l	
Lincoln Hall	Room B201	7234023	0.8 +/- 0.2 pCi/l	
Lincoln Hall	Classroom corridor	7234024	0.9 +/- 0.3 pCi/l	
Lincoln Hall	Room B116	7234026	0.8 +/- 0.3 pCi/l	
Lincoln Hall	Room B106	7234019	<0.3 pCi/l	
Lincoln Hall	Room 109	7234020	<0.3 pCi/l	
Lincoln Hall	Room B-100	7234021	4.6 +/- 0.3 pCi/l	
Lincoln Hall	Room B-120	7234015	1.1 +/- 0.3 pCi/l	
Lincoln Hall	Room B-121	7234016	1.0 +/- 0.3 pCi/l	
Lincoln Hall	Room B-123	7234017	0.7 +/- 0.3 pCi/l	
Lincoln Hall	Room B-108	7234022	<0.3 pCi/l	
Lincoln Hall	Room B-103	7234018	1.1 +/- 0.3 pCi/l	

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NY ELAP Lab ID 11441
October 26, 2018

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646-247-1867

Device Information
Pro Chek Activated Charcoal
Serial#: 7234016
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 10:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement 600 Thayer Rd B121 West Point, NY 10996-1726	7234016	2018-10-26	1.0 ± 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. The EPA indicates that there is little short-term risk with test results in this range (0.6 to 1.9 pCi/L). However, because radon levels fluctuate daily, as well as seasonally, you may want to retest during another season. Additionally, if you make any structural changes or start to use a lower level of the building more frequently, you should test again.

- **No tampering was observed during the radon test.**

The subject home described has been tested for the presence of radon gas according to US EPA short-term testing protocols. The test and analysis have been performed to comply with EPA's *Home Buyer's and Seller's Guide to Radon*. This report represents the average radon concentration at the time of sampling and at the specific location in the building. However, it must be noted that radon concentrations will vary from day to day and from season to season.

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Device Information
Pro Chek Activated Charcoal
Serial#: 7234021
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 10:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement 600 Thayer Rd B100 West Point, NY 10996-1726	7234021	2018-10-26	4.6 ± 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. The EPA recommendation for test results in this range (4 to 8 pCi/L) is to conduct either a short- or long-term follow-up measurement. If, however, this is a follow-up (confirming) test, it is recommended that you take remedial action to reduce these radon levels.

- **No tampering was observed during the radon test.**

The subject home described has been tested for the presence of radon gas according to US EPA short-term testing protocols. The test and analysis have been performed to comply with EPA's *Home Buyer's and Seller's Guide to Radon*. This report represents the average radon concentration at the time of sampling and at the specific location in the building. However, it must be noted that radon concentrations will vary from day to day and from season to season.

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Device Information
Pro Chek Activated Charcoal
Serial#: 7234026
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 10:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement 600 Thayer Rd Rm B116 West Point, NY 10996-1726	7234026	2018-10-26	0.8 ± 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. The EPA indicates that there is little short-term risk with test results in this range (0.6 to 1.9 pCi/L). However, because radon levels fluctuate daily, as well as seasonally, you may want to retest during another season. Additionally, if you make any structural changes or start to use a lower level of the building more frequently, you should test again.

- **No tampering was observed during the radon test.**

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Device Information
Pro Chek Activated Charcoal
Serial#: 7234015
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 10:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement 600 Thayer Rd B120 West Point, NY 10996-1726	7234015	2018-10-26	1.1 ± 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. The EPA indicates that there is little short-term risk with test results in this range (0.6 to 1.9 pCi/L). However, because radon levels fluctuate daily, as well as seasonally, you may want to retest during another season. Additionally, if you make any structural changes or start to use a lower level of the building more frequently, you should test again.

- **No tampering was observed during the radon test.**

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Device Information
Pro Chek Activated Charcoal
Serial#: 7234018
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 10:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement 600 Thayer Rd B103 West Point, NY 10996-1726	7234018	2018-10-26	1.1 ± 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. The EPA indicates that there is little short-term risk with test results in this range (0.6 to 1.9 pCi/L). However, because radon levels fluctuate daily, as well as seasonally, you may want to retest during another season. Additionally, if you make any structural changes or start to use a lower level of the building more frequently, you should test again.

- **No tampering was observed during the radon test.**

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Air Chek
NRPP Lab ID: 101138 AL
NY ELAP Lab ID 11441
October 26, 2018

Radon Measurement Technician
Precision Inspections
Ken Carr
223 W 21st St Apt 4h
New York, NY 10011-3138
646-247-1867

Device Information
Pro Chek Activated Charcoal
Serial#: 7234014
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 9:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement B2 600 Thayer Rd West Point, NY 10996-1726	7234014	2018-10-26	3.1 ± 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. The EPA recommendation for results in this range (2.0 to 3.9 pCi/L) is to conduct further tests to determine the true annual average, ideally with a long-term test kit. If the result remains between 2 and 4 there is little short-term risk, but you should consider fixing your home. Additionally, if you make any structural changes or start to use a lower level of the building more frequently, you should test again.

- **No tampering was observed during the radon test.**

The subject home described has been tested for the presence of radon gas according to US EPA short-term testing protocols. The test and analysis have been performed to comply with EPA's *Home Buyer's and Seller's Guide to Radon*. This report represents the average radon concentration at the time of sampling and at the specific location in the building. However, it must be noted that radon concentrations will vary from day to day and from season to season.

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NY ELAP Lab ID 11441
October 26, 2018

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New York, NY 10011-3138
646-247-1867

Device Information
Pro Chek Activated Charcoal
Serial#: 7234024
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 9:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement 600 Thayer Rd West Point, NY 10996-1726	7234024	2018-10-26	0.9 ± 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. The EPA indicates that there is little short-term risk with test results in this range (0.6 to 1.9 pCi/L). However, because radon levels fluctuate daily, as well as seasonally, you may want to retest during another season. Additionally, if you make any structural changes or start to use a lower level of the building more frequently, you should test again.

- **No tampering was observed during the radon test.**

The subject home described has been tested for the presence of radon gas according to US EPA short-term testing protocols. The test and analysis have been performed to comply with EPA's *Home Buyer's and Seller's Guide to Radon*. This report represents the average radon concentration at the time of sampling and at the specific location in the building. However, it must be noted that radon concentrations will vary from day to day and from season to season.

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October 26, 2018

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646-247-1867

Device Information
Pro Chek Activated Charcoal
Serial#: 7234019
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 10:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement 600 Thayer Rd B106 West Point, NY 10996-1726	7234019	2018-10-26	< 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. Test results in this range(0.5 pCi/L or less) are, for all practical purposes, equivalent to the radon levels found in fresh air. However, if you make any structural changes or start to use a lower level of the building more frequently you should test again.

- **No tampering was observed during the radon test.**

The subject home described has been tested for the presence of radon gas according to US EPA short-term testing protocols. The test and analysis have been performed to comply with EPA's *Home Buyer's and Seller's Guide to Radon*. This report represents the average radon concentration at the time of sampling and at the specific location in the building. However, it must be noted that radon concentrations will vary from day to day and from season to season.

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646-247-1867

Device Information
Pro Chek Activated Charcoal
Serial#: 7234017
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 10:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement 600 Thayer Rd B123 West Point, NY 10996-1726	7234017	2018-10-26	0.7 ± 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. The EPA indicates that there is little short-term risk with test results in this range (0.6 to 1.9 pCi/L). However, because radon levels fluctuate daily, as well as seasonally, you may want to retest during another season. Additionally, if you make any structural changes or start to use a lower level of the building more frequently, you should test again.

- **No tampering was observed during the radon test.**

The subject home described has been tested for the presence of radon gas according to US EPA short-term testing protocols. The test and analysis have been performed to comply with EPA's *Home Buyer's and Seller's Guide to Radon*. This report represents the average radon concentration at the time of sampling and at the specific location in the building. However, it must be noted that radon concentrations will vary from day to day and from season to season.

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646-247-1867

Device Information
Pro Chek Activated Charcoal
Serial#: 7234023
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 9:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement B2 600 Thayer Rd B201 West Point, NY 10996-1726	7234023	2018-10-26	0.8 ± 0.2 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. The EPA indicates that there is little short-term risk with test results in this range (0.6 to 1.9 pCi/L). However, because radon levels fluctuate daily, as well as seasonally, you may want to retest during another season. Additionally, if you make any structural changes or start to use a lower level of the building more frequently, you should test again.

- **No tampering was observed during the radon test.**

The subject home described has been tested for the presence of radon gas according to US EPA short-term testing protocols. The test and analysis have been performed to comply with EPA's *Home Buyer's and Seller's Guide to Radon*. This report represents the average radon concentration at the time of sampling and at the specific location in the building. However, it must be noted that radon concentrations will vary from day to day and from season to season.

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Device Information
Pro Chek Activated Charcoal
Serial#: 7234022
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 10:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement 600 Thayer Rd B108 West Point, NY 10996-1726	7234022	2018-10-26	< 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. Test results in this range(0.5 pCi/L or less) are, for all practical purposes, equivalent to the radon levels found in fresh air. However, if you make any structural changes or start to use a lower level of the building more frequently you should test again.

- **No tampering was observed during the radon test.**

The subject home described has been tested for the presence of radon gas according to US EPA short-term testing protocols. The test and analysis have been performed to comply with EPA's *Home Buyer's and Seller's Guide to Radon*. This report represents the average radon concentration at the time of sampling and at the specific location in the building. However, it must be noted that radon concentrations will vary from day to day and from season to season.

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646-247-1867

Device Information
Pro Chek Activated Charcoal
Serial#: 7234020
Analyzed by: Air Chek

Initial Radon Test Information

Dates of Test: 2018-10-23 @ 10:00 am to 2018-10-25 @ 12:00 pm

Property Address	Test Number	Analysis Date	Result
Basement 600 Thayer Rd B109 West Point, NY 10996-1726	7234020	2018-10-26	< 0.3 pCi/l

Interpreting your Test Result

The US EPA action level for indoor radon is 4.0 pCi/L. Test results in this range(0.5 pCi/L or less) are, for all practical purposes, equivalent to the radon levels found in fresh air. However, if you make any structural changes or start to use a lower level of the building more frequently you should test again.

- **No tampering was observed during the radon test.**

The subject home described has been tested for the presence of radon gas according to US EPA short-term testing protocols. The test and analysis have been performed to comply with EPA's *Home Buyer's and Seller's Guide to Radon*. This report represents the average radon concentration at the time of sampling and at the specific location in the building. However, it must be noted that radon concentrations will vary from day to day and from season to season.

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Your health risk

The primary health risk from long-term exposure to radon is lung cancer. The risk of developing a lung cancer from radon exposure depends both on how much radon is present and how long you are exposed to radon. The higher the radon level or the longer the time of exposure, even if the levels are relatively low, the greater the risk. Exposures up to 4 pCi/L may present some risk of contracting lung cancer to more sensitive occupants, especially children and those who live with smokers. The US Congress set as a goal the lowering of radon levels in buildings to equal the levels of outside air.

PERFORMING RADON TESTS FOR A REAL ESTATE TRANSACTION

US EPA protocols state that when using passive devices, such as activated charcoal tests, two short-term tests should be conducted, either together or sequentially, at the same location in the building. The tests should be averaged together and if the average is 4.0 pCi/L or higher, radon mitigation is recommended. Even if the average is below 4.0 pCi/L, the buyers should consider testing in a different season or deploy a long-term test device to assess their long-term risks. It is **highly recommended** that any property transaction tests be conducted by a non-interested third party. To locate a listed or certified radon tester, contact your state radon office or visit our website at http://www.neha-nrpp.org to download a list of NEHA-NRPP certified testers. You should also visit the EPA website to download a copy of EPA's Home Buyer's and Seller's Guide to Radon.

Radon Test Device Placement

The US EPA recommends that testing device(s) be placed in the lowest level of the home that could be used regularly, whether it is finished or unfinished. Conduct the test in any space that could be used by the buyer as a bedroom, play area, family room, den, exercise room, or workshop. Based on their client's intended use of the space, the qualified testing professional should identify the appropriate test location and inform their client (buyer). Do not test in a closet, stairway, hallway, crawl space or in an enclosed area of high humidity or high air velocity. An enclosed area may include a kitchen, bathroom, laundry room or furnace room.

Variations in Radon Levels

When tests are performed in different seasons or under different weather conditions, the initial screening and follow-up tests may vary considerably. Radon levels can vary significantly between seasons, so different values **are to be expected**. Even during normal weather, indoor radon levels may rise and fall by a factor of two on a daily cycle; for example, from 5 pCi/L to 10 pCi/L in 24 hours. During rapidly changing or stormy weather, the levels may change more dramatically. Because continual changes in radon levels are considered normal, expose the testing device for as long as is practical, while following the manufacturer's recommendations. This, of course, provides a better overall average of the measurement.

If you are comparing tests, or are averaging a series of tests, bear in mind that any radon test returns only the average of the levels present during a **specific period of time** at the **precise location** of the test. Conditions during a different test period or at a different location in the building are **expected to be different.**

Test results can also vary if the radon test instructions were not carefully followed. A laboratory measuring radon in samples taken outside the lab **must rely on the person conducting the test**. For example, the wrong starting or ending date of a test will significantly affect the calculated result. The location of each radon test can also influence the result. For example, a test placed in the blowing air stream of a fan is likely to collect more radon than it would under normal conditions. Also, three tests conducted in one home, but in three different rooms, **would be expected to have at least slightly different test results.**

Test results from a properly used activated charcoal test will more closely reflect the average radon concentrations over the last three to four days of the test period. This happens because the radon collected by the activated charcoal has a radioactive half-life of only four days. Thus, much of the radon collected early in a seven day test has already begun to decay prior to the conclusion of the test.

Retesting

It is important to understand that radon levels can change at some point in the future. Therefore, it is important to retest when there is occupancy by a new owner, before and after a new addition to the house, alterations that could alter ventilation patterns, if major cracks are noticed in foundation walls or the slab, you begin using a ground contact area of the home not previously tested, or even recent nearby construction blasting or earthquakes. EPA recommends that homes be retested every 2-3 years. If the home has been previously mitigated or alterations are made to the mitigation system, retesting should be done.

Mitigation

When radon mitigation is necessary, it is advisable that a state-licensed or nationally- certified contractor be used to design and install the mitigation system. For easy to read mitigation information, go to the US EPA website and download a copy of the Consumer's Guide to Radon Reduction.

For technical information, call (828) 684-0893. Office hours are Mon-Fri 8:30 to 5:30 EASTERN
You can reach us by Fax at (828) 684-8498 or write to Air Chek, Inc., Box 2000, Naples, NC 28760
Web Site: http://www.radon.com **Email to:** info@radon.com

Universal Waste Survey Report

Lincoln Hall

USMA West Point NY

Prepared for: Mr. Terry Allen
Mason and Hanger

Prepared by: **the oak group, inc.** 622 Cooper Street Camden, NJ 08102 (856) 377-0060 www.oakgroup.net
Mailing address: PO Box 2041 Voorhees, NJ 08043

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1.1 Purpose

1.2 Personnel

1.3 Procedures

1.4 Conclusions

2.0 Inventory of Hazardous Materials

1.0 PROJECT OVERVIEW

1.0 PROJECT OVERVIEW

1.1 Purpose

A Universal Waste Inspection of Lincoln Hall at the United States Military Academy located in West Point, NY was perfromed. The purpose of the investigation was to assess the presence of polychlorinated biphenyl's (PCB's), mercury, freon and other universal wastes. The site inspection was performed on October 22, 2018.

Fluorescent light ballasts contain capacitors that could be filled with PCB-laden dielectric fluid. PCB's may also be found in other mechanical, electrical and hydraulic devices. Generally, if the ballasts are not marked "No PCB's", they are assumed to contain PCB's. Accordingly, they should be containerized (i.e. 55-gallon drums) for characterization and disposal in a Toxic Substances Control Act (TSCA)-approved landfill.

Fluorescent light tubes and thermostat switch bulbs contain mercury and should also be properly packaged (i.e. cardboard boxes) and transported to a recycling facility prior to any demolition activities.

Ionization smoke detectors or fire alarms may contain the radioactive element Americium-241. When these detectors are removed they should be checked for a radioactive symbol. If they are ionization type detectors, they should be disposed of as hazardous waste.

1.2 Personnel

The Universal Waste Inspection was performed by Ms. Melissa Billingsley.

1.3 Procedures

A. Inspection

Light ballasts were inspected for 'No PCB' labels. Fluorescent light tubes, containing mercury, were counted. The structures were inspected for any materials/equipment that could potentially contain hazardous substances.

1.4 Conclusions

A representative number of light ballasts were inspected. The light ballasts within Lincoln Hall did contain 'No PCB's' labels. If light ballasts are discovered that do not have the 'No PCBs' label they should be assumed to contain PCB's and be

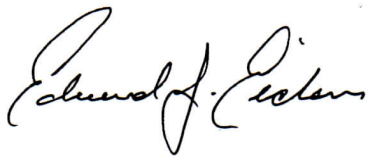
containerized (i.e. 55-gallon drums) for characterization and disposal in a Toxic Substances Control Act (TSCA)-approved landfill.

Mercury-containing fluorescent light tubes have been identified throughout the Lincoln Hall. Fluorescent light tubes can be packaged in cardboard boxes and disposed of at a recycling facility if they are to be removed.

Fire alarms were observed throughout the Lincoln Hall. Upon removal, the alarms should be checked for a radioactivity symbol. If they are determined to be ionization type detectors, they should be disposed of as hazardous waste.

Please refer to Section 2.0, Inventory of Universal Waste Materials, for specific quantities of universal waste.

If you should have any questions please do not hesitate to contact me at (856) 377-0060 or eje@oakgroupnet.



Eduard Eichen CIH

2.0 INVENTORY OF UNIVERSAL WASTE MATERIALS

2.0 Inventory of Universal Waste Materials

United States Military Academy
Lincoln Hall
West Point, NY

	Mercury-Containing Fluorescent Light Tubes (Linear Feet)	**Fire Alarms**
Location		
B3 Floor	56	2
B2 Floor	500	3
B1 Floor	800	2
1st Floor	1,100	3
2nd Floor	1,200	2
3rd Floor	620	3
4th Floor	600	2

*The listed amounts of each universal waste are estimates and should be confirmed by removal contractor.

SECTION 03 30 00

CAST-IN-PLACE CONCRETE
02/19

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 117	(2010; Errata 2011) Specifications for Tolerances for Concrete Construction and Materials and Commentary
ACI 121R	(2008) Guide for Concrete Construction Quality Systems in Conformance with ISO 9001
ACI 213R	(2014; E2017) Guide for Structural Lightweight-Aggregate Concrete
ACI 301	(2016) Specifications for Structural Concrete
ACI 302.1R	(2015) Guide for Concrete Floor and Slab Construction
ACI 304.2R	(2017) Guide to Placing Concrete by Pumping Methods
ACI 304R	(2000; R 2009) Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI 305R	(2010) Guide to Hot Weather Concreting
ACI 306.1	(1990; R 2002) Standard Specification for Cold Weather Concreting
ACI 306R	(2016) Guide to Cold Weather Concreting
ACI 308.1	(2011) Specification for Curing Concrete
ACI 347R	(2014; Errata 1 2017) Guide to Formwork for Concrete
ACI SP-2	(2007; Abstract: 10th Edition) ACI Manual of Concrete Inspection
ACI SP-15	(2011) Field Reference Manual: Standard Specifications for Structural Concrete ACI 301-05 with Selected ACI References

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4	(1995; R 2004) Basic Hardboard

AMERICAN WELDING SOCIETY (AWS)

AWS D1.4/D1.4M	(2011) Structural Welding Code - Reinforcing Steel

ASTM INTERNATIONAL (ASTM)

ASTM A934/A934M	(2016) Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A1044/A1044M	(2016a) Standard Specification for Steel Stud Assemblies for Shear Reinforcement of Concrete
ASTM C31/C31M	(2019a) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33/C33M	(2018) Standard Specification for Concrete Aggregates
ASTM C39/C39M	(2020) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C42/C42M	(2020) Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C78/C78M	(2018) Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C94/C94M	(2020) Standard Specification for Ready-Mixed Concrete
ASTM C138/C138M	(2017a) Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C143/C143M	(2020) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150/C150M	(2020) Standard Specification for Portland Cement
ASTM C172/C172M	(2017) Standard Practice for Sampling Freshly Mixed Concrete
ASTM C173/C173M	(2016) Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C231/C231M	(2017a) Standard Test Method for Air Content of Freshly Mixed Concrete by the

	Pressure Method
ASTM C260/C260M	(2010a; R 2016) Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C311/C311M	(2018) Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
ASTM C330/C330M	(2017a) Standard Specification for Lightweight Aggregates for Structural Concrete
ASTM C494/C494M	(2019) Standard Specification for Chemical Admixtures for Concrete
ASTM C567/C567M	(2019) Determining Density of Structural Lightweight Concrete
ASTM C595/C595M	(2020) Standard Specification for Blended Hydraulic Cements
ASTM C618	(2019) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C803/C803M	(2018) Standard Test Method for Penetration Resistance of Hardened Concrete
ASTM C845/C845M	(2018) Standard Specification for Expansive Hydraulic Cement
ASTM C873/C873M	(2015) Standard Test Method for Compressive Strength of Concrete Cylinders Cast in Place in Cylindrical Molds
ASTM C900	(2015) Standard Test Method for Pullout Strength of Hardened Concrete
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C989/C989M	(2018a) Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1012/C1012M	(2018b) Standard Test Method for Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate Solution
ASTM C1017/C1017M	(2013; E 2015) Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1074	(2011) Standard Practice for Estimating Concrete Strength by the Maturity Method
ASTM C1077	(2017) Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for

	Testing Agency Evaluation
ASTM C1107/C1107M	(2020) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C1157/C1157M	(2020) Standard Performance Specification for Hydraulic Cement
ASTM C1218/C1218M	(2020c) Standard Test Method for Water-Soluble Chloride in Mortar and Concrete
ASTM C1240	(2020) Standard Specification for Silica Fume Used in Cementitious Mixtures
ASTM C1260	(2014) Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1293	(2008; R 2015) Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction
ASTM C1567	(2013) Standard Test Method for Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
ASTM C1602/C1602M	(2018) Standard Specification for Mixing Water Used in Production of Hydraulic Cement Concrete
ASTM C1778	(2016) Standard Guide for Reducing the Risk of Deleterious Alkali-Aggregate Reaction in Concrete
ASTM D412	(2016) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D1751	(2004; E 2013; R 2013) Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D2240	(2015; E 2017) Standard Test Method for Rubber Property - Durometer Hardness
ASTM D2628	(1991; R 2016) Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements
ASTM D5759	(2012; R 2020) Characterization of Coal Fly Ash and Clean Coal Combustion Fly Ash for Potential Uses
ASTM D6690	(2015) Standard Specification for Joint and Crack Sealants, Hot Applied, for

	Concrete and Asphalt Pavements
ASTM E96/E96M	(2016) Standard Test Methods for Water Vapor Transmission of Materials
ASTM E329	(2020) Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
ASTM E1155	(2020) Standard Test Method for Determining Floor Flatness and Floor Levelness Numbers
ASTM E1643	(2018a) Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
ASTM E1745	(2017) Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs
CONCRETE REINFORCING STEEL INSTITUTE (CRSI)	
CRSI 10MSP	(2018) Manual of Standard Practice
CRSI RB4.1	(2016) Supports for Reinforcement Used in Concrete
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)	
NIST PS 1	(2009) DOC Voluntary Product Standard PS 1-07, Structural Plywood
SCIENTIFIC CERTIFICATION SYSTEMS (SCS)	
SCS	SCS Global Services (SCS) Indoor Advantage
SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)	
SCAQMD Rule 1113	(2016) Architectural Coatings
UNDERWRITERS LABORATORIES (UL)	
UL 2818	(2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 DEFINITIONS

a. "Cementitious material" as used herein must include all portland cement, pozzolan, fly ash, slag cement, and silica fume.

b. "Exposed to public view" means situated so that it can be seen from eye level from a public location after completion of the building. A public location is accessible to persons not responsible for operation or maintenance of the building.

c. "Chemical admixtures" are materials in the form of powder or fluids

that are added to the concrete to give it certain characteristics not obtainable with plain concrete mixes.

d. "Supplementary cementing materials" (SCM) include coal fly ash, silica fume, slag cement, natural or calcined pozzolans, and ultra-fine coal ash when used in such proportions to replace the portland cement that result in improvement to sustainability and durability and reduced cost.

e. "Design strength" (f'c) is the specified compressive strength of concrete at time(s) specified in this section to meet structural design criteria.

f. "Mass Concrete" is any concrete system that approaches a maximum temperature of 158 degrees F within the first 72 hours of placement. In addition, it includes all concrete elements with a section thickness of 3 feet or more regardless of temperature.

g. "Mixture proportioning" is the process of designing concrete mixture proportions to enable it to meet the strength, service life and constructability requirements of the project while minimizing the initial and life-cycle cost.

h. "Mixture proportions" are the masses or volumes of individual ingredients used to make a unit measure (cubic meter or cubic yard) of concrete.

i. "Pozzolan" is a siliceous or siliceous and aluminous material, which in itself possesses little or no cementitious value but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties.

j. "Workability (or consistence)" is the ability of a fresh (plastic) concrete mix to fill the form/mould properly with the desired work (vibration) and without reducing the concrete's quality. Workability depends on water content, chemical admixtures, aggregate (shape and size distribution), cementitious content and age (level of hydration).

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Concrete Curing Plan

Quality Control Plan; G

Quality Control Personnel Certifications; G

Quality Control Organizational Chart

Laboratory Accreditation; G

Form Removal Schedule; G

Maturity Method Data

SD-02 Shop Drawings

Formwork

Reinforcing Steel; G, AE

SD-03 Product Data

Recycled Content for Steel Reinforcement; S

Environmental Product Declarations (EPD) for Portland Cement, Slag, and Fly Ash; S

Semirigid Joint Filler

Joint Sealants

Expansion and Isolation Joint Filler

Formwork Materials

Recycled Aggregate Materials; S

Cementitious Materials; S

Vapor Retarder

Concrete Curing Materials

Reinforcement

Admixtures

Waterstops

Local/Regional Materials; S

Biodegradable Form Release Agent; S

Pumping Concrete

Nonshrink Grout

SD-05 Design Data

Concrete Mix Design; S

Formwork Calculations

SD-06 Test Reports

Concrete Mix Design; S

Fly Ash

Pozzolan

Slag Cement

Aggregates

Tolerance Report

Compressive Strength Tests; G

Unit Weight of Structural Concrete

Chloride Ion Concentration

Air Content

Slump Tests

Water

SD-07 Certificates

Reinforcing Bars

Welder Qualifications

Silica Fume Manufacturer's Representative

Indoor air quality for concrete curing compound; S

Indoor air quality for waterproofing sealer; S

Indoor air quality for form release agent; S

Safety Data Sheets

Field Testing Technician and Testing Agency

SD-08 Manufacturer's Instructions

Joint Sealants

Curing Compound

1.4 MODIFICATION OF REFERENCES

Accomplish work in accordance with ACI publications except as modified herein. Consider the advisory or recommended provisions to be mandatory. Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Contracting Officer.

1.5 DELIVERY, STORAGE, AND HANDLING

Follow ACI 301, ACI 304R and ASTM A934/A934M requirements and recommendations. Do not deliver concrete until vapor retarder, forms, reinforcement, embedded items, and chamfer strips are in place and ready for concrete placement. Do not store concrete curing compounds or sealers

with materials that have a high capacity to adsorb volatile organic compound (VOC) emissions. Do not store concrete curing compounds or sealers in occupied spaces.

1.5.1 Reinforcement

Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground to avoid excessive rusting. Protect from contaminants such as grease, oil, and dirt. Ensure bar sizes can be accurately identified after bundles are broken and tags removed.

1.6 QUALITY ASSURANCE

1.6.1 Design Data

1.6.1.1 Formwork Calculations

ACI 347R. Include design calculations indicating arrangement of forms, sizes and grades of supports (lumber), panels, and related components. Furnish drawings and calculations of shoring and re-shoring methods proposed for floor and roof slabs, spandrel beams, and other horizontal concrete members. Calculations must indicate concrete pressure with both live and dead loads, along with material types.

1.6.1.2 Concrete Mix Design

Sixty days minimum prior to concrete placement, submit a mix design for each strength and type of concrete. Submit a complete list of materials including type; brand; source and amount of cement, supplementary cementitious materials, and admixtures; and applicable reference specifications. Submit mill test and all other test for cement, supplementary cementitious materials, aggregates, and admixtures. Provide documentation of maximum nominal aggregate size, gradation analysis, percentage retained and passing sieve, and a graph of percentage retained verses sieve size. Provide mix proportion data using at least three different water-cementitious material ratios for each type of mixture, which produce a range of strength encompassing those required for each type of concrete required. If source material changes, resubmit mix proportion data using revised source material. Provide only materials that have been proven by trial mix studies to meet the requirements of this specification, unless otherwise approved in writing by the Contracting Officer. Indicate clearly in the submittal where each mix design is used when more than one mix design is submitted. Resubmit data on concrete components if the qualities or source of components changes. For previously approved concrete mix designs used within the past twelve months, the previous mix design may be re-submitted without further trial batch testing if accompanied by material test data conducted within the last six months. Obtain mix design approval from the contracting officer prior to concrete placement.

1.6.2 Shop Drawings

1.6.2.1 Formwork

Drawings showing details of formwork including, but not limited to; joints, supports, studding and shoring, and sequence of form and shoring removal. Indicate placement schedule, construction, location and method of forming control joints. Include locations of inserts, conduit, sleeves and other embedded items. Reproductions of contract drawings are

unacceptable. Submit form removal schedule indicating element and minimum length of time for form removal.

Design, fabricate, erect, support, brace, and maintain formwork so that it is able to support, without failure, all vertical and lateral loads that may reasonably be anticipated to be applied to the formwork.

1.6.2.2 Reinforcing Steel

Indicate bending diagrams, assembly diagrams, splicing and laps of bars, shapes, dimensions, and details of bar reinforcing, accessories, and concrete cover. Do not scale dimensions from structural drawings to determine lengths of reinforcing bars. Reproductions of contract drawings are unacceptable.

1.6.3 Control Submittals

1.6.3.1 Concrete Curing Plan

Submit proposed materials, methods and duration for curing concrete elements in accordance with ACI 308.1.

1.6.3.2 Pumping Concrete

Submit proposed materials and methods for pumping concrete. Submittal must include mix designs, pumping equipment including type of pump and size and material for pipe, and maximum length and height concrete is to be pumped.

1.6.3.3 Silica Fume Manufacturer's Representative

The manufacturer's representative must be present at mix plant to ensure proper mix, including high range water reducer, and batching methods during the first 3 days of concrete mix preparation and placement. After which the manufacturer's representative must designate a representative at the concrete producer's plant to ensure the concrete mix procedures meet the silica fume manufacturer's recommendations.

1.6.3.4 Indoor Air Quality Certifications

Provide coatings applied within the building interior certified to meet California Department of Public Health (CDPH) Standard Method, UL 2818 GREENGUARD Gold, or SCS Global Services Indoor Advantage Gold and VOC content requirements of California Air Resources Board (CARB) Suggested Control Measure for Architectural Coatings or SCAQMD Rule 1113. Submit product data for indoor air quality for concrete curing compound, indoor air quality for waterproofing sealer, and indoor air quality for form release agent.

1.6.3.5 Safety Data Sheets

Submit Safety Data Sheets (SDS) for all materials that are regulated for hazardous health effects. SDS must be readily accessible during each work shift to employees when they are at the construction site.

1.6.4 Test Reports

1.6.4.1 Fly Ash and Pozzolan

Submit test results in accordance with ASTM C618 for fly ash and pozzolan. Submit test results performed within 6 months of submittal date.

1.6.4.2 Slag Cement

Submit test results in accordance with ASTM C989/C989M for slag cement. Submit test results performed within 6 months of submittal date.

1.6.4.3 Aggregates

Submit test results in accordance with ASTM C33/C33M, or ASTM C330/C330M for lightweight aggregate, and ASTM C1293 or ASTM C1567 as required in the paragraph titled ALKALI-AGGREGATE REACTION.

1.6.5 Quality Control Plan

Develop and submit for approval a concrete quality control program in accordance with the guidelines of ACI 121R and as specified herein. The plan must include approved laboratories. Provide direct oversight for the concrete qualification program inclusive of associated sampling and testing. All quality control reports must be provided to the Contracting Officer, Quality Manager and Concrete Supplier. Maintain a copy of ACI SP-15 and CRSI 10MSP at project site.

1.6.6 Quality Control Personnel Certifications

The Contractor must submit for approval the responsibilities of the various quality control personnel, including the names and qualifications of the individuals in those positions and a quality control organizational chart defining the quality control hierarchy and the responsibility of the various positions. Quality control personnel must be employed by the Contractor.

Submit American Concrete Institute certification for the following:

a. CQC personnel responsible for inspection of concrete operations.

b. Lead Foreman or Journeyman of the Concrete Placing, Finishing, and Curing Crews.

c. Field Testing Technicians: ACI Concrete Field Testing Technician, Grade I.

1.6.6.1 Quality Manager Qualifications

The quality manager must hold a current license as a professional engineer in a U.S. state or territory with experience on at least five similar projects. Evidence of extraordinary proven experience may be considered by the Contracting Officer as sufficient to act as the Quality Manager.

1.6.6.2 Field Testing Technician and Testing Agency

Submit data on qualifications of proposed testing agency and technicians for approval by the Contracting Officer prior to performing testing on concrete.

a. Work on concrete under this contract must be performed by an ACI Concrete Field Testing Technician Grade 1 qualified in accordance with ACI SP-2 or equivalent. Equivalent certification programs must include requirements for written and performance examinations as stipulated in ACI SP-2.

b. Testing agencies that perform testing services on reinforcing steel must meet the requirements of ASTM E329.

c. Testing agencies that perform testing services on concrete materials must meet the requirements of ASTM C1077.

1.6.7 Laboratory Qualifications for Concrete Qualification Testing

The concrete testing laboratory must have the necessary equipment and experience to accomplish required testing. The laboratory must meet the requirements of ASTM C1077 and be Cement and Concrete Reference Laboratory (CCRL) inspected.

1.6.8 Laboratory Accreditation

Laboratory and testing facilities must be provided by and at the expense of the Contractor. The laboratories performing the tests must be accredited in accordance with ASTM C1077, including ASTM C78/C78M and ASTM C1260. The accreditation must be current and must include the required test methods, as specified. Furthermore, the testing must comply with the following requirements:

a. Aggregate Testing and Mix Proportioning: Aggregate testing and mixture proportioning studies must be performed by an accredited laboratory and under the direction of a registered professional engineer in a U.S. state or territory competent in concrete materials who is competent in concrete materials and must sign all reports and designs.

b. Acceptance Testing: Furnish all materials, labor, and facilities required for molding, curing, testing, and protecting test specimens at the site and in the laboratory. Furnish and maintain boxes or other facilities suitable for storing and curing the specimens at the site while in the mold within the temperature range stipulated by ASTM C31/C31M.

c. Contractor Quality Control: All sampling and testing must be performed by an approved, onsite, independent, accredited laboratory.

1.7 ENVIRONMENTAL REQUIREMENTS

Provide space ventilation according to material manufacturer recommendations, at a minimum, during and following installation of concrete curing compound and sealer. Maintain one of the following ventilation conditions during the curing period or for 72 hours after installation:

a. Supply 100 percent outside air 24 hours a day.

b. Supply airflow at a rate of 6 air changes per hour, when outside temperatures are between 55 degrees F and 84 degrees F and humidity is between 30 percent and 60 percent.

c. Supply airflow at a rate of 1.5 air changes per hour, when outside air conditions are not within the range stipulated above.

1.7.1 Submittals for Environmental Performance

a. Provide data indication the percentage of pre-consumer pozzolan (fly ash, slag cement) cement substitution as a percentage of the full product composite by weight.

b. Provide data indicating the percentage of pre-consumer and post-consumer recycled content aggregate.

c. Provide product data indicating the percentage of post-consumer recycled steel content in each type of steel reinforcement as a percentage of the full product composite by weight.

d. Provide product data stating the location where all products were manufactured

e. For projects using reusable formwork, provide data showing how formwork is reused.

f. Provide SDS product information data showing that form release agents meet any environmental performance goals such as using vegetable and soy based products.

g. Provide SDS product information data showing that concrete adhesives meet any environmental performance goals including low emitting, low volatile organic compound products.

1.8 SUSTAINABLE DESIGN REQUIREMENTS

1.8.1 Local/Regional Materials

Give preference to recycled content materials or products extracted, harvested, or recovered, as well as manufactured, within a 100 mile radius from the project site, if available from a minimum of three sources.See Section 01 33 29 SUSTAINABILITY REPORTING for cumulative total local material requirements. Concrete materials may be locally available. Submit documentation indicating distance between manufacturing facility and the project site. Indicate distance of raw material origin from the project site. Indicate relative dollar value of local/regional materials to total dollar value of products included in project.

1.8.2 Environmental Product Declarations (EPD) for Portland Cement, Slag, and Fly Ash

Provide one of the following EPD options including Product Category Rules (PCR) standard EN 15804 or ISO 21930.

a. Product-Specific Declaration

b. Product-Specific Type III EPD

c. Industry-Wide (Generic) EPD: Provide proof manufacturer is a participant.

1.9 QUALIFICATIONS FOR WELDING WORK

Welding procedures must be in accordance with AWS D1.4/D1.4M.

Verify that Welder qualifications are in accordance with AWS D1.4/D1.4M for welding of reinforcement or under an equivalent qualification test approved in advance. Welders are permitted to do only the type of welding for which each is specifically qualified.

PART 2 PRODUCTS

2.1 FORMWORK MATERIALS

a. Design formwork, shores, reshores, and backshores to support loads transmitted to them and to comply with applicable building code requirements.

b. Design formwork to withstand pressure resulting from placement and vibration of concrete and to maintain specified tolerances.

c. Design formwork to accommodate waterstop materials in joints at locations indicated in Contract Documents.

d. Provide temporary openings in formwork if needed to facilitate cleaning and inspection.

e. Design formwork joints to inhibit leakage of mortar.

f. Do not use earth cuts as forms for vertical or sloping surfaces.

g. Submit design calculations for formwork, shoring, reshoring, and backshoring. Design calculations must be signed and sealed by a licensed design engineer.

2.1.1 Wood Forms

Use lumber as specified in Section 06 10 00 ROUGH CARPENTRY and as follows. Provide lumber that is square edged or tongue-and-groove boards, free of raised grain, knotholes, or other surface defects. Provide plywood that complies with NIST PS 1, B-B concrete form panels or better or AHA A135.4, hardboard for smooth form lining.

2.1.1.1 Concrete Form Plywood (Standard Rough)

Provide plywood that conforms to NIST PS 1, B-B, concrete form, not less than 5/8-inch thick.

2.1.1.2 Overlaid Concrete Form Plywood (Standard Smooth)

Provide plywood that conforms to NIST PS 1, B-B, high density form overlay, not less than 5/8-inch thick.

2.1.2 Plastic Forms

Plastic lumber as specified in Section 06 10 00 ROUGH CARPENTRY. Provide plastic forms that contain a minimum of 50 percent post-consumer recycled content, or a minimum of 50 percent post-industrial recycled content.

2.1.3 Steel Forms

Provide steel form surfaces that do not contain irregularities, dents, or sags.

2.2 FORMWORK ACCESSORIES

a. Use commercially manufactured formwork accessories, including ties and hangers.

b. Form ties and accessories must not reduce the effective cover of the reinforcement.

2.2.1 Form Ties

a. Use form ties with ends or end fasteners that can be removed without damage to concrete.

b. Where indicated in Contract Documents, use form ties with integral water barrier plates or other acceptable positive water barriers in walls.

c. The breakback distance for ferrous ties must be at least 3/4 in. for Surface Finish-2.0 or Surface Finish-3.0, as defined in ACI 301.

d. If the breakback distance is less than 3/4 in., use coated or corrosion-resistant ties.

e. Submit manufacturer's data sheet on form ties.

2.2.2 Waterstops

Submit manufacturer's data sheet on waterstop materials and splices.

2.2.2.1 Hydrophilic Waterstop

Swellable strip type compound of polymer modified chloroprene rubber that swells upon contact with water must conform to the following requirements when tested in accordance to ASTM D412: Tensile strength 420 psi minimum; ultimate elongation 600 percent minimum. Hardness must be 50 minimum on the type A durometer and the volumetric expansion ratio in distilled water at 70 degrees F must be 3 to 1 minimum.

2.2.3 Biodegradable Form Release Agent

a. Provide form release agent that is colorless, biodegradable, and , with zero VOC content.

b. Provide product that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

c. Provide form release agent that reduces formwork moisture absorption, and does not contain diesel fuel, petroleum-based lubricating oils, waxes, or kerosene. Submit documentation indicating type of biobased material in product and biobased content. Indicate relative dollar value of biobased content products to total dollar value of products included in project.

d. Submit manufacturer's product data on formwork release agent for use on each form-facing material.

2.2.4 Chamfer Materials

Use lumber materials with dimensions of 3/4 x 3/4 in.

2.2.5 Other Embedded items

Use sleeves, inserts, anchors, and other embedded items of material and design indicated in Contract Documents.

2.3 CONCRETE MATERIALS

2.3.1 Cementitious Materials

2.3.1.1 Portland Cement

a. Unless otherwise specified, provide cement that conforms to ASTM C150/C150M Type II.

b. Use one brand and type of cement for formed concrete having exposed-to-view finished surfaces.

c. For portland cement manufactured in a kiln fueled by hazardous waste, maintain a record of source for each batch. Supplier must certify that no hazardous waste is used in the fuel mix or raw materials. Supplier must certify that the hazardous waste is neutralized by the manufacturing process and that no additional pollutants are discharged.

d. Submit information along with evidence demonstrating compliance with referenced standards. Submittals must include types of cementitious materials, manufacturing locations, shipping locations, and certificates showing compliance.

e. Cementitious materials must be stored and kept dry and free from contaminants.

2.3.1.2 Fly Ash

a. ASTM C618, Class F or Class C.

b. Fly ash content must be a minimum of 40 percent by weight of cementitious material, provided the fly ash does not reduce the amount of cement in the concrete mix below the minimum requirements of local building codes. Where the use of fly ash cannot meet the minimum level, provide the maximum amount of fly ash permittable that meets the code requirements for cement content. Report the chemical analysis of the fly ash in accordance with ASTM C311/C311M. Evaluate and classify fly ash in accordance with ASTM D5759.

2.3.1.3 Slag cement

ASTM C989/C989M, Grade 100 . Slag content must be a minimum of 50 percent by weight of cementitious material.

2.3.1.4 Silica Fume

Silica fume must conform to ASTM C1240, including the optional limits on

reactivity with cement alkalis. Silica fume may be furnished as a dry, densified material or as slurry. Proper mixing is essential to accomplish proper distribution of the silica fume and avoid agglomerated silica fume which can react with the alkali in the cement resulting in premature and extensive concrete damage. Supervision at the batch plant, finishing, and curing is essential. Provide at the Contractor's expense the services of a manufacturer's technical representative, experienced in mixing, proportioning, placement procedures, and curing of concrete containing silica fume. This representative must be present on the project prior to and during at least the first 4 days of concrete production and placement using silica fume. A High Range Water Reducing admixture (HRWRA) must be used with silica fume.

2.3.1.5 Other Supplementary Cementitious Materials

Natural pozzolan must be raw or calcined and conform to ASTM C618, Class N, including the optional requirements for uniformity and effectiveness in controlling ASR and must have an ignition loss not exceeding 3 percent. Class N pozzolan for use in mitigating ASR must have a Calcium Oxide (CaO) content of less than 13 percent and total equivalent alkali content less than 3 percent.

Ultra Fine Fly Ash (UFFA) and Ultra Fine Pozzolan (UFP) must conform to ASTM C618, Class F or N, and the following additional requirements:

a. The strength activity index at 28 days of age must be at least 95 percent of the control specimens.

b. The average particle size must not exceed 6 microns.

c. The sum of $SiO_2 + Al_2O_3 + Fe_2O_3$ must be greater than 77 percent.

2.3.2 Water

a. Water or ice must comply with the requirements of ASTM C1602/C1602M.

b. Minimize the amount of water in the mix. Improve workability by adjusting the grading of the aggregate and using admixture rather than by adding water.

c. Water must be potable ; free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances deleterious to concrete.

d. Protect mixing water and ice from contamination during storage and delivery.

e. Submit test report showing water complies with ASTM C1602/C1602M.

2.3.3 Aggregate

2.3.3.1 Normal-Weight Aggregate

a. Aggregates must conform to ASTM C33/C33M unless otherwise specified in the Contract Documents or approved by the contracting officer.

b. Aggregates used in concrete must be obtained from the same sources and have the same size range as aggregates used in concrete represented by submitted field test records or used in trial mixtures.

c. Store and handle aggregate in a manner that will avoid segregation and prevents contamination by other materials or other sizes of aggregates. Store aggregates in locations that will permit them to drain freely. Do not use aggregates that contain frozen lumps.

d. Submit types, pit or quarry locations, producers' names, aggregate supplier statement of compliance with ASTM C33/C33M, and ASTM C1293 expansion data not more than 18 months old.

2.3.3.2 Lightweight Aggregate

Lightweight aggregate in accordance with ASTM C330/C330M.

2.3.3.3 Recycled Aggregate Materials

Use a minimum of 25 percent recycled aggregate, depending on local availability and conforming to requirements of the mix design.

2.3.4 Admixtures

a. Chemical admixtures must conform to ASTM C494/C494M.

b. Air-entraining admixtures must conform to ASTM C260/C260M.

c. Chemical admixtures for use in producing flowing concrete must conform to ASTM C1017/C1017M.

d. Do not use calcium chloride admixtures.

e. Admixtures used in concrete must be the same as those used in the concrete represented by submitted field test records or used in trial mixtures.

f. Protect stored admixtures against contamination, evaporation, or damage.

g. To ensure uniform distribution of constituents, provide agitating equipment for admixtures used in the form of suspensions or unstable solutions. Protect liquid admixtures from freezing and from temperature changes that would adversely affect their characteristics.

h. Submit types, brand names, producers' names, manufacturer's technical data sheets, and certificates showing compliance with standards required herein.

2.4 MISCELLANEOUS MATERIALS

2.4.1 Concrete Curing Materials

Provide concrete curing material in accordance with ACI 301 Section 5 and ACI 308.1 Section 2. Submit product data for concrete curing compounds. Submit manufactures instructions for placement of curing compound.

2.4.2 Nonshrink Grout

Nonshrink grout in accordance with ASTM C1107/C1107M.

2.4.3 Expansion and Isolation Joint Filler

ASTM D1751.

2.4.4 Semirigid Joint Filler

Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80, or aromatic polyurea with a Type A shore durometer hardness range of 90 to 95 per ASTM D2240.

2.4.5 Joint Sealants

Submit manufacturer's product data, indicating VOC content.

2.4.5.1 Horizontal Surfaces, 3 Percent Slope, Maximum

ASTM D6690 or ASTM C920, Type M, Class 25, Use T.

2.4.5.2 Vertical Surfaces Greater Than 3 Percent Slope

ASTM C920, Type M, Grade NS, Class 25, Use T..

2.4.5.3 Preformed Polychloroprene Elastomeric Type

ASTM D2628.

2.4.6 Vapor Retarder

ASTM E1745 Class A polyethylene sheeting, minimum 10 mil thickness or other equivalent material with a maximum permeance rating of 0.04 perms per ASTM E96/E96M.

Consider plastic vapor retarders and adhesives with a high recycled content, low toxicity low VOC (Volatile Organic Compounds) levels.

2.5 CONCRETE MIX DESIGN

2.5.1 Properties and Requirements

a. Use materials and material combinations listed in this section and the contract documents.

b. Cementitious material content must be adequate for concrete to satisfy the specified requirements for strength, w/cm, durability, and finishability described in this section and the contract documents.

c. Selected target slump must meet the requirements this section, the contract documents, and must not exceed 9 in. Concrete must not show visible signs of segregation.

d. The target slump must be enforced for the duration of the project. Determine the slump by ASTM C143/C143M. Slump tolerances must meet the requirements of ACI 117.

e. The nominal maximum size of coarse aggregate for a mixture must not exceed three-fourths of the minimum clear spacing between reinforcement, one-fifth of the narrowest dimension between sides of forms, or one-third of the thickness of slabs or toppings.

f. Concrete must be air entrained for members assigned to Exposure Class F1, F2, or F3. The total air content must be in accordance with the requirements of the paragraph titled DURABILITY.

g. Measure air content at the point of delivery in accordance with ASTM C173/C173M or ASTM C231/C231M.

h. Concrete for slabs to receive a hard-troweled finish must not contain an air-entraining admixture or have a total air content greater than 3 percent.

i. Concrete properties and requirements for each portion of the structure are specified in the table below. Refer to the paragraph titled DURABILITY for more details on exposure categories and their requirements.

	Minimum *f'c* psi	**Exposure Categories^**	**Miscellaneous Requirements**
Footings	As indicated on the drawings.	S0; C0; W2; F0	
Foundation walls	As indicated on the drawings.	S0; C2; W1; F2	
Elevated slabs	As indicated on the drawings.	S0; C0; W0; F1	
Interior Slabs-on-ground	As indicated on the drawings.	S0; C0; W0; F0	
Concrete filled metal deck	As indicated on the drawings.	S0; C0; W0; F0	Max. density of 110 (pounds per cubic foot)
Sidewalks, curbs, ramps, exterior stairs, exterior equipment pads, site retaining walls, topping slabs	As indicated on the drawings.	S0; C2; W2; F3	

2.5.2 Durability

2.5.2.1 Alkali-Aggregate Reaction

Do not use any aggregate susceptible to alkali-carbonate reaction (ACR). Use one of the three options below for qualifying concrete mixtures to reduce the potential of alkali-silica reaction (ASR):

a. For each aggregate used in concrete, the expansion result determined in accordance with ASTM C1293 must not exceed 0.04 percent at one year.

b. For each aggregate used in concrete, the expansion result of the aggregate and cementitious materials combination determined in accordance with ASTM C1567 must not exceed 0.10 percent at an age of 16 days.

c. Alkali content in concrete (LBA) must not exceed 4 pounds per cubic yard for moderately reactive aggregate or 3 pounds per cubic yard for highly reactive aggregate. Reactivity must be determined by testing in accordance with ASTM C1293 and categorized in accordance with ASTM C1778. Alkali content is calculated as follows:
LBA = (cement content, pounds per cubic yard) × (equivalent alkali content of portland cement in percent/100 percent)

2.5.2.2 Freezing and Thawing Resistance

a. Provide concrete meeting the following requirements based on exposure class assigned to members for freezing-and-thawing exposure in Contract Documents:

Exposure class	**Maximum *w/cm****	**Minimum *f'c*, psi**	**Air content**	**Additional Requirements**
F0	N/A	2500	N/A	
F1	0.55	3500	Depends on aggregate size	N/A
F2	0.45	4500	Depends on aggregate size	See limits on maximum cementitious material by mass
F3	0.40	5000	Depends on aggregate size	See limits on maximum cementitious material by mass

Exposure class	Maximum *w/cm**	Minimum *f'c*, psi	Air content	Additional Requirements
F3 plain concrete	0.45	4500	Depends on aggregate size	See limits on maximum cementitious material by mass

*The maximum *w/cm* limits do not apply to lightweight concrete.

b. Concrete must be air entrained for members assigned to Exposure Class F1, F2, or F3. The total air content must meet the requirements of the following table:

Nominal maximum aggregate size, in.	Total air content, percent*^	
	Exposure Class F2 and F3	Exposure Class F1
3/8	7.5	6.0
1/2	7.0	5.5
3/4	6.0	5.0
1	6.0	4.5
1-1/2	5.5	4.5
2	5.0	4.0
3	5.5	3.5

*Tolerance on air content as delivered must be plus/minus 1.5 percent. ^For f'c greater than 5000 psi, reducing air content by 1.0 percentage point is acceptable.

c. Submit documentation verifying compliance with specified requirements.

d. For sections of the structure that are assigned Exposure Class F3, submit certification on cement composition verifying that concrete mixture meets the requirements of the following table:

Cementitious material	Maximum percent of total cementitious material by mass*
Fly ash or other pozzolans conforming to ASTM C618	25
Slag cement conforming to ASTM C989/C989M	50

Cementitious material	Maximum percent of total cementitious material by mass*
Silica fume conforming to ASTM C1240	10
Total of fly ash or other pozzolans, slag cement, and silica fume	50^
Total of fly ash or other pozzolans and silica fume	35^

*Total cementitious material also includes ASTM C150/C150M, ASTM C595/C595M, ASTM C845/C845M, and ASTM C1157/C1157M cement. The maximum percentages above must include:
i. Fly ash or other pozzolans present in ASTM C1157/C1157M or ASTM C595/C595M Type IP blended cement.
ii. Slag cement present in ASTM C1157/C1157M or ASTM C595/C595M Type IS blended cement.
iii. Silica fume conforming to ASTM C1240 present in ASTM C1157/C1157M or ASTM C595/C595M Type IP blended cement.
^Fly ash or other pozzolans and silica fume must constitute no more than 25 percent and 10 percent, respectively, of the total mass of the cementitious materials.

2.5.2.3 Corrosion and Chloride Content

a. Provide concrete meeting the requirements of the following table based on the exposure class assigned to members requiring protection against reinforcement corrosion in Contract Documents.

b. Submit documentation verifying compliance with specified requirements.

c. Water-soluble chloride ion content contributed from constituents including water, aggregates, cementitious materials, and admixtures must be determined for the concrete mixture by ASTM C1218/C1218M at age between 28 and 42 days.

d. The maximum water-soluble chloride ion (Cl-) content in concrete, percent by mass of cement is as follows:

Exposure class	Maximum *w/cm**	Minimum f'c, psi	Maximum water-soluble chloride ion (CL-) content in concrete, percent by mass of cement
Reinforced concrete			
C0	N/A	2500	1.00
C1	N/A	2500	0.30
C2	0.4	5000	0.15
Prestressed concrete			
C0	N/A	2500	0.06

Exposure class	Maximum *w/cm**	Minimum f'c, psi	Maximum water-soluble chloride ion (CL-) content in concrete, percent by mass of cement
C1	N/A	2500	0.06
C2	0.4	5000	0.06

*The maximum w/cm limits do not apply to lightweight concrete.

2.5.2.4 Sulfate Resistance

a. Provide concrete meeting the requirements of the following table based on the exposure class assigned to members for sulfate exposure.

Exposure class	Maximum w/cm	Minimum f'c, psi	Required cementitious materials-types			Calcium chloride admixture
			ASTM C150/C150M	ASTM C595/C595M	ASTM C1157/C1157M	
S0	N/A	2500	N/A	N/A	N/A	No restrictions
S1	0.50	4000	II*^	IP(MS); IS(<70)(MS); IT(MS)	MS	No restrictions
S2	0.45	4500	IV^	IP(HS); IS(<70)(HS); IT(HS)	HS	Not permitted
S3	0.45	4500	V + pozzolan or slag cement**	IP(HS)+ pozzolan or slag cement^; IS (<70)(HS) + pozzolan or slag cement^; IT (HS) + pozzolan or slag cement**	HS + pozzolan or slag cement**	Not permitted

* For seawater exposure, other types of portland cements with tricalcium aluminate (C3A) contents up to 10 percent are acceptable if the w/cm does not exceed 0.40.
** The amount of the specific source of the pozzolan or slag cement to be used shall be at least the amount determined by test or service record to improve sulfate resistance when used in concrete containing Type V cement. Alternatively, the amount of the specific source of the pozzolan or slag used shall not be less than the amount tested in accordance with ASTM C1012/C1012M and meeting the requirements maximum expansion requirements listed herein.
^ Other available types of cement, such as Type III or Type I, are

acceptable in exposure classes S1 or S2 if the C3A contents are less than 8 or 5 percent, respectively.

b. The maximum w/cm limits for sulfate exposure do not apply to lightweight concrete.

c. Alternative combinations of cementitious materials of those listed in this paragraph are acceptable if they meet the maximum expansion requirements listed in the following table:

Exposure class	**Maximum expansion when tested using ASTM C1012/C1012M**		
	At 6 months	**At 6 months**	**At 18 months**
S1	0.10 percent	N/A	N/A
S2	0.05 percent	0.10 percent^	N/A
S3	N/A	N/A	0.10 percent

^The 12-month expansion limit applies only when the measured expansion exceeds the 6-month maximum expansion limit.

2.5.2.5 Concrete Temperature

The temperature of concrete as delivered must not exceed 95°F .

2.5.2.6 Concrete permeability

a. Provide concrete meeting the requirements of the following table based on exposure class assigned to members requiring low permeability in the Contract Documents.

Exposure class	**Maximum *w/cm****	**Minimum f'c, psi**	**Additional minimum requirements**
W0	N/A	2500	None
W1	0.5	4000	None

*The maximum w/cm limits do not apply to lightweight concrete.

b. Submit documentation verifying compliance with specified requirements.

2.5.3 Trial Mixtures

Trial mixtures must be in accordance to ACI 301.

2.5.4 Ready-Mix Concrete

Provide concrete that meets the requirements of ASTM C94/C94M.

Ready-mixed concrete manufacturer must provide duplicate delivery tickets

with each load of concrete delivered. Provide delivery tickets with the following information in addition to that required by ASTM C94/C94M:

a. Type and brand cement

b. Cement and supplementary cementitious materials content in 94-pound bags per cubic yard of concrete

c. Maximum size of aggregate

d. Amount and brand name of admixtures

e. Total water content expressed by water cementitious material ratio

2.6 REINFORCEMENT

a. Bend reinforcement cold. Fabricate reinforcement in accordance with fabricating tolerances of ACI 117.

b. When handling and storing coated reinforcement, use equipment and methods that do not damage the coating. If stored outdoors for more than 2 months, cover coated reinforcement with opaque protective material.

c. Submit manufacturer's certified test report for reinforcement.

d. Submit placing drawings showing fabrication dimensions and placement locations of reinforcement and reinforcement supports. Placing drawings must indicate locations of splices, lengths of lap splices, and details of mechanical and welded splices.

e. Submit request with locations and details of splices not indicated in Contract Documents.

f. Submit request to place column dowels without using templates.

g. Submit request for field cutting, including location and type of bar to be cut and reason field cutting is required.

2.6.1 Reinforcing Bars

a. As indicated on the drawings.

b. Recycled Content for Steel Reinforcement: Provide reinforcing bars that contain a minimum of 75 percent recycled content. See Section 01 33 29 SUSTAINABILITY REPORTING for cumulative total recycled content requirements.

c. Submit mill certificates for reinforcing bars.

2.6.1.1 Headed Shear Stud Reinforcement

Headed studs and headed stud assemblies must conform to ASTM A1044/A1044M.

2.6.2 Welded wire reinforcement

a. As indicated on the drawings.

2.6.3 Reinforcing Bar Supports

a. Provide reinforcement support types within structure as required by Contract Documents. Reinforcement supports must conform to CRSI RB4.1. Submit description of reinforcement supports and materials for fastening coated reinforcement if not in conformance with CRSI RB4.1.

b. Legs of supports in contact with formwork must be hot-dip galvanized, or plastic coated after fabrication, or stainless-steel bar supports.

PART 3 EXECUTION

3.1 EXAMINATION

a. Do not begin installation until substrates have been properly constructed; verify that substrates are level.

b. If substrate preparation is the responsibility of another installer, notify Contracting Officer of unsatisfactory preparation before processing.

c. Check field dimensions before beginning installation. If dimensions vary too much from design dimensions for proper installation, notify Contracting Officer and wait for instructions before beginning installation.

3.2 PREPARATION

Determine quantity of concrete needed and minimize the production of excess concrete. Designate locations or uses for potential excess concrete before the concrete is poured.

3.2.1 General

a. Surfaces against which concrete is to be placed must be free of debris, loose material, standing water, snow, ice, and other deleterious substances before start of concrete placing.

b. Remove standing water without washing over freshly deposited concrete. Divert flow of water through side drains provided for such purpose.

3.2.2 Subgrade Under Foundations and Footings

a. When subgrade material is semi-porous and dry, sprinkle subgrade surface with water as required to eliminate suction at the time concrete is deposited, or seal subgrade surface by covering surface with specified vapor retarder.

b. When subgrade material is porous, seal subgrade surface by covering surface with specified vapor retarder.

3.2.3 Subgrade Under Slabs on Ground

a. Before construction of slabs on ground, have underground work on pipes and conduits completed and approved.

b. Previously constructed subgrade or fill must be cleaned of foreign materials

c. Finish surface of capillary water barrier under interior slabs on ground must not show deviation in excess of 1/4 inch when tested with a 10-foot straightedge parallel with and at right angles to building lines.

d. Finished surface of subgrade or fill under exterior slabs on ground must not be more than 0.02-foot above or 0.10-foot below elevation indicated.

3.2.4 Edge Forms and Screed Strips for Slabs

a. Set edge forms or bulkheads and intermediate screed strips for slabs to obtain indicated elevations and contours in finished slab surface and must be strong enough to support vibrating bridge screeds or roller pipe screeds if nature of specified slab finish requires use of such equipment.

b. Align concrete surface to elevation of screed strips by use of strike-off templates or approved compacting-type screeds.

3.2.5 Reinforcement and Other Embedded Items

a. Secure reinforcement, joint materials, and other embedded materials in position, inspected, and approved before start of concrete placing.

b. When concrete is placed, reinforcement must be free of materials deleterious to bond. Reinforcement with rust, mill scale, or a combination of both will be considered satisfactory, provided minimum nominal dimensions, nominal weight, and minimum average height of deformations of a hand-wire-brushed test specimen are not less than applicable ASTM specification requirements.

3.3 FORMS

a. Provide forms, shoring, and scaffolding for concrete placement. Set forms mortar-tight and true to line and grade.

b. Chamfer above grade exposed joints, edges, and external corners of concrete 0.75 inch. Place chamfer strips in corners of formwork to produce beveled edges on permanently exposed surfaces.

c. Provide formwork with clean-out openings to permit inspection and removal of debris.

d. Inspect formwork and remove foreign material before concrete is placed.

e. At construction joints, lap form-facing materials over the concrete of previous placement. Ensure formwork is placed against hardened concrete so offsets at construction joints conform to specified tolerances.

f. Provide positive means of adjustment (such as wedges or jacks) of shores and struts. Do not make adjustments in formwork after concrete has reached initial setting. Brace formwork to resist lateral deflection and lateral instability.

g. Fasten form wedges in place after final adjustment of forms and before concrete placement.

h. Provide anchoring and bracing to control upward and lateral movement of formwork system.

i. Construct formwork for openings to facilitate removal and to produce opening dimensions as specified and within tolerances.

j. Provide runways for moving equipment. Support runways directly on formwork or structural members. Do not support runways on reinforcement. Loading applied by runways must not exceed capacity of formwork or structural members.

k. Position and support expansion joint materials, waterstops, and other embedded items to prevent displacement. Fill voids in sleeves, inserts, and anchor slots temporarily with removable material to prevent concrete entry into voids.

l. Clean surfaces of formwork and embedded materials of mortar, grout, and foreign materials before concrete placement.

3.3.1 Coating

a. Cover formwork surfaces with an acceptable material that inhibits bond with concrete.

b. If formwork release agent is used, apply to formwork surfaces in accordance with manufacturer's recommendations before placing reinforcement. Remove excess release agent on formwork prior to concrete placement.

c. Do not allow formwork release agent to contact reinforcement or hardened concrete against which fresh concrete is to be placed.

3.3.2 Reshoring

a. Do not allow structural members to be loaded with combined dead and construction loads in excess of loads indicated in the accepted procedure.

b. Install and remove reshores or backshores in accordance with accepted procedure.

c. For floors supporting shores under newly placed concrete, either leave original supporting shores in place, or install reshores or backshores. Shoring system and supporting slabs must resist anticipated loads. Locate reshores and backshores directly under a shore position or as indicated on formwork shop drawings.

d. In multistory buildings, place reshoring or backshoring over a sufficient number of stories to distribute weight of newly placed concrete, forms, and construction live loads.

3.3.3 Reuse

a. Reuse forms providing the structural integrity of concrete and the aesthetics of exposed concrete are not compromised.

b. Wood forms must not be clogged with paste and must be capable of absorbing high water-cementitious material ratio paste.

c. Remove leaked mortar from formwork joints before reuse.

3.3.4 Forms for Standard Rough Form Finish

Provide formwork in accordance with ACI 301 Section 5 with a surface finish, SF-1.0, for formed surfaces that are to be concealed by other construction.

3.3.5 Forms for Standard Smooth Form Finish

Provide formwork in accordance with ACI 301 Section 5 with a surface finish, SF-3.0, for formed surfaces that are exposed to view. Do not provide mockup of concrete surface appearance and texture.

3.3.6 Form Ties

a. For post-tensioned structures, do not remove formwork supports until stressing records have been accepted by the Contracting Officer.

b. After ends or end fasteners of form ties have been removed, repair tie holes in accordance with ACI 301 Section 5 requirements.

3.3.7 Forms for Concrete Pan Joist Construction

Pan-form units for one-way or two-way concrete joist and slab construction must be factory-fabricated units of the approximate section indicated. Units must consist of steel or molded fiberglass concrete form pans. Closure units must be furnished as required.

3.3.8 Tolerances for Form Construction

a. Construct formwork so concrete surfaces conform to tolerances in ACI 117.

b. Position and secure sleeves, inserts, anchors, and other embedded items such that embedded items are positioned within ACI 117 tolerances.

c. To maintain specified elevation and thickness within tolerances, install formwork to compensate for deflection and anticipated settlement in formwork during concrete placement. Set formwork and intermediate screed strips for slabs to produce designated elevation, camber, and contour of finished surface before formwork removal. If specified finish requires use of vibrating screeds or roller pipe screeds, ensure that edge forms and screed strips are strong enough to support such equipment.

3.3.9 Removal of Forms and Supports

a. If vertical formed surfaces require finishing, remove forms as soon as removal operations will not damage concrete.

b. Remove top forms on sloping surfaces of concrete as soon as removal will not allow concrete to sag. Perform repairs and finishing operations required. If forms are removed before end of specified curing period, provide curing and protection.

c. Do not damage concrete during removal of vertical formwork for columns, walls, and sides of beams. Perform needed repair and

finishing operations required on vertical surfaces. If forms are removed before end of specified curing period, provide curing and protection.

d. Leave formwork and shoring in place to support construction loads and weight of concrete in beams, slabs, and other structural members until in-place required strength of concrete is reached.

e. Form-facing material and horizontal facing support members may be removed before in-place concrete reaches specified compressive strength if shores and other supports are designed to allow facing removal without deflection of supported slab or member.

3.3.10 Strength of Concrete Required for Removal of Formwork

If removal of formwork, reshoring, or backshoring is based on concrete reaching a specified in-place strength, mold and field-cure cylinders in accordance with ASTM C31/C31M. Test cylinders in accordance with ASTM C39/C39M. Alternatively, use one or more of the methods listed herein to evaluate in-place concrete strength for formwork removal.

a. Tests of cast-in-place cylinders in accordance with ASTM C873/C873M. This option is limited to slabs with concrete depths from 5 to 12 in.

b. Penetration resistance in accordance with ASTM C803/C803M.

c. Pullout strength in accordance with ASTM C900.

d. Maturity method in accordance with ASTM C1074. Submit maturity method data using project materials and concrete mix proportions used on the project to demonstrate the correlation between maturity and compressive strength of laboratory cured test specimens to the Contracting Officer.

3.4 WATERSTOP INSTALLATION AND SPLICES

a. Provide waterstops in construction joints as indicated.

b. Install formwork to accommodate waterstop materials. Locate waterstops in joints where indicated in Contract Documents. Minimize number of splices in waterstop. Splice waterstops in accordance with manufacturer's written instructions. Install factory-manufactured premolded mitered corners.

c. Install waterstops to form a continuous diaphragm in each joint. Make adequate provisions to support and protect waterstops during progress of work. Protect waterstops protruding from joints from damage.

3.4.1 Hydrophilic Waterstop

Miter cut ends to be joined with sharp knife or shears. The ends must be adhered with adhesive.

3.5 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS

a. Unless otherwise specified, placing reinforcement and miscellaneous materials must be in accordance to ACI 301. Provide bars, welded wire reinforcement, wire ties, supports, and other devices necessary to install and secure reinforcement.

b. Reinforcement must not have rust, scale, oil, grease, clay, or foreign substances that would reduce the bond. Rusting of reinforcement is a basis of rejection if the effective cross-sectional area or the nominal weight per unit length has been reduced. Remove loose rust prior to placing steel. Tack welding is prohibited.

3.5.1 General

Provide details of reinforcement that are in accordance with the Contract Documents.

3.5.2 Vapor Retarder

a. Install in accordance with ASTM E1643. Provide beneath the on-grade concrete floor slab. Use the greatest widths and lengths practicable to eliminate joints wherever possible. Lap joints a minimum of 12 inches and tape.

b. Remove torn, punctured, or damaged vapor retarder material and provide with new vapor retarder prior to placing concrete. Concrete placement must not damage vapor retarder . Place a 2 inch layer of clean concrete sand on vapor retarder before placing concrete.

3.5.3 Perimeter Insulation

Install perimeter insulation at locations indicated. Adhesive must be used where insulation is applied to the interior surface of foundation walls and may be used for exterior application.

3.5.4 Reinforcement Supports

Provide reinforcement support in accordance with CRSI RB4.1 and ACI 301 Section 3 requirements. Supports for coated or galvanized bars must also be coated with electrically compatible material for a distance of at least 2 inches beyond the point of contact with the bars.

3.5.5 Splicing

As indicated in the Contract Documents. For splices not indicated follow ACI 301. Do not splice at points of maximum stress. Overlap welded wire reinforcement the spacing of the cross wires, plus 2 inches.

3.5.6 Setting Miscellaneous Material

Place and secure anchors and bolts, pipe sleeves, conduits, and other such items in position before concrete placement and support against displacement. Plumb anchor bolts and check location and elevation. Temporarily fill voids in sleeves with readily removable material to prevent the entry of concrete.

3.5.7 Fabrication

Shop fabricate reinforcing bars to conform to shapes and dimensions indicated for reinforcement, and as follows:

a. Provide fabrication tolerances that are in accordance with ACI 117.

b. Provide hooks and bends that are in accordance with the Contract Documents.

Reinforcement must be bent cold to shapes as indicated. Bending must be done in the shop. Rebending of a reinforcing bar that has been bent incorrectly is not be permitted. Bending must be in accordance with standard approved practice and by approved machine methods.

Deliver reinforcing bars bundled, tagged, and marked. Tags must be metal with bar size, length, mark, and other information pressed in by machine. Marks must correspond with those used on the placing drawings.

Do not use reinforcement that has any of the following defects:

a. Bar lengths, depths, and bends beyond specified fabrication tolerances

b. Bends or kinks not indicated on drawings or approved shop drawings

c. Bars with reduced cross-section due to rusting or other cause

Replace defective reinforcement with new reinforcement having required shape, form, and cross-section area.

3.5.8 Placing Reinforcement

Place reinforcement in accordance with ACI 301.

For slabs on grade (over earth or over capillary water barrier) and for footing reinforcement, support bars or welded wire reinforcement on precast concrete blocks, spaced at intervals required by size of reinforcement, to keep reinforcement the minimum height specified above the underside of slab or footing.

For slabs other than on grade, supports for which any portion is less than 1 inch from concrete surfaces that are exposed to view or to be painted must be of precast concrete units, plastic-coated steel, or stainless steel protected bar supports. Precast concrete units must be wedge shaped, not larger than 3-1/2 by 3-1/2 inches, and of thickness equal to that indicated for concrete protection of reinforcement. Provide precast units that have cast-in galvanized tie wire hooked for anchorage and blend with concrete surfaces after finishing is completed.

Provide reinforcement that is supported and secured together to prevent displacement by construction loads or by placing of wet concrete, and as follows:

a. Provide supports for reinforcing bars that are sufficient in number and have sufficient strength to carry the reinforcement they support, and in accordance with ACI 301 and CRSI 10MSP. Do not use supports to support runways for concrete conveying equipment and similar construction loads.

b. Equip supports on ground and similar surfaces with sand-plates.

c. Support welded wire reinforcement as required for reinforcing bars.

d. Secure reinforcements to supports by means of tie wire. Wire must be black, soft iron wire, not less than 16 gage.

e. Reinforcement must be accurately placed, securely tied at intersections, and held in position during placing of concrete by spacers, chairs, or other approved supports. Point wire-tie ends away from the form. Unless otherwise indicated, numbers, type, and spacing of supports must conform to the Contract Documents.

f. Bending of reinforcing bars partially embedded in concrete is permitted only as specified in the Contract Documents.

3.5.9 Spacing of Reinforcing Bars

a. Spacing must be as indicated in the Contract Documents.

b. Reinforcing bars may be relocated to avoid interference with other reinforcement, or with conduit, pipe, or other embedded items. If any reinforcing bar is moved a distance exceeding one bar diameter or specified placing tolerance, resulting rearrangement of reinforcement is subject to preapproval by the Contracting Officer.

3.5.10 Concrete Protection for Reinforcement

Additional concrete protection must be in accordance with the Contract Documents.

3.6 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE

In accordance with ASTM C94/C94M, ACI 301, ACI 302.1R and ACI 304R, except as modified herein. Batching equipment must be such that the concrete ingredients are consistently measured within the following tolerances: 1 percent for cement and water, 2 percent for aggregate, and 3 percent for admixtures. Furnish mandatory batch ticket information for each load of ready mix concrete.

3.6.1 Measuring

Make measurements at intervals as specified in paragraphs SAMPLING and TESTING.

3.6.2 Mixing

a. Mix concrete in accordance with ASTM C94/C94M, ACI 301 and ACI 304R.

b. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Place concrete within 90 minutes of either addition of mixing water to cement and aggregates or addition of cement to aggregates if the air temperature is less than 84 degrees F.

c. Reduce mixing time and place concrete within 60 minutes if the air temperature is greater than 84 degrees F except as follows: if set retarding admixture is used and slump requirements can be met, limit for placing concrete may remain at 90 minutes. Additional water may be added, provided that both the specified maximum slump and submitted water-cementitious material ratio are not exceeded and the required concrete strength is still met. When additional water is added, an additional 30 revolutions of the mixer at mixing speed is required.

d. If the entrained air content falls below the specified limit, add a sufficient quantity of admixture to bring the entrained air content

within the specified limits. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixture throughout the batch. Do not reconstitute concrete that has begun to solidify.

e. When fibers are used, add fibers together with the aggregates and never as the first component in the mixer. Fibers must be dispensed into the mixing system using appropriate dispensing equipment and procedure as recommended by the manufacturer.

3.6.3 Transporting

Transport concrete from the mixer to the forms as rapidly as practicable. Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete which has segregated in transporting and dispose of as directed.

3.7 PLACING CONCRETE

Place concrete in accordance with ACI 301 Section 5.

3.7.1 Footing Placement

Concrete for footings may be placed in excavations without forms upon inspection and approval by the Contracting Officer. Excavation width must be a minimum of 4 inches greater than indicated.

3.7.2 Pumping

ACI 304R and ACI 304.2R. Pumping must not result in separation or loss of materials nor cause interruptions sufficient to permit loss of plasticity between successive increments. Loss of slump in pumping equipment must not exceed 2 inches at discharge/placement. Do not convey concrete through pipe made of aluminum or aluminum alloy. Avoid rapid changes in pipe sizes. Limit maximum size of course aggregate to 33 percent of the diameter of the pipe. Limit maximum size of well-rounded aggregate to 40 percent of the pipe diameter. Take samples for testing at both the point of delivery to the pump and at the discharge end.

3.7.2.1 Pumping Lightweight Concrete

In accordance with ACI 213R unless otherwise specified. Presoak or presaturate aggregates.

3.7.3 Cold Weather

Cold weather concrete must meet the requirements of ACI 306.1 unless otherwise specified. Do not allow concrete temperature to decrease below 50 degrees F. Obtain approval prior to placing concrete when the ambient temperature is below 40 degrees F or when concrete is likely to be subjected to freezing temperatures within 24 hours. Cover concrete and provide sufficient heat to maintain 50 degrees F minimum adjacent to both the formwork and the structure while curing. Limit the rate of cooling to 37 degrees F in any 1 hour and 50 degrees F per 24 hours after heat application.

3.7.4 Hot Weather

Hot weather concrete must meet the requirements of ACI 301 unless otherwise specified. Maintain required concrete temperature using Figure

4.2 in ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment, and water hauling equipment, where job site is remote to water source, to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of either liquid membrane curing compound or impervious sheets. For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete is set.

3.7.5 Bonding

Surfaces of set concrete at joints, must be roughened and cleaned of laitance, coatings, loose particles, and foreign matter. Roughen surfaces in a manner that exposes the aggregate uniformly and does not leave laitance, loosened particles of aggregate, nor damaged concrete at the surface.

Obtain bonding of fresh concrete that has set as follows:

a. At joints between footings and walls or columns, between walls or columns and the beams or slabs they support, and elsewhere unless otherwise specified; roughened and cleaned surface of set concrete must be dampened, but not saturated, immediately prior to placing of fresh concrete.

b. At joints in exposed-to-view work; at vertical joints in walls; at joints near midpoint of span in girders, beams, supported slabs, other structural members; in work designed to contain liquids; the roughened and cleaned surface of set concrete must be dampened but not saturated and covered with a cement grout coating.

c. Provide cement grout that consists of equal parts of portland cement and fine aggregate by weight with not more than 6 gallons of water per sack of cement. Apply cement grout with a stiff broom or brush to a minimum thickness of 1/16 inch. Deposit fresh concrete before cement grout has attained its initial set.

3.8 WASTE MANAGEMENT

Provide as specified in the Waste Management Plan and as follows.

3.8.1 Mixing Equipment

Before concrete pours, designate Contractor-owned site meeting environmental standards for cleaning out concrete mixing trucks. Minimize water used to wash equipment.

3.8.2 Hardened, Cured Waste Concrete

Crush and reuse hardened, cured waste concrete as fill or as a base course for pavement.

3.8.3 Reinforcing Steel

Collect reinforcing steel and place in designated area for recycling.

3.8.4 Other Waste

Identify concrete manufacturer's or supplier's policy for collection or return of construction waste, unused material, deconstruction waste, and/or packaging material.

3.9 SURFACE FINISHES EXCEPT FLOOR, SLAB, AND PAVEMENT FINISHES

3.9.1 Defects

Repair surface defects in accordance with ACI 301 Section 5.

3.9.2 Not Against Forms (Top of Walls)

Surfaces not otherwise specified must be finished with wood floats to even surfaces. Finish must match adjacent finishes.

3.9.3 Formed Surfaces

3.9.3.1 Tolerances

Tolerances in accordance with ACI 117 and as indicated.

3.9.3.2 As-Cast Rough Form

Provide for surfaces not exposed to public view a surface finish SF-1.0. Patch holes and defects in accordance with ACI 301.

3.9.3.3 Standard Smooth Finish

Provide for surfaces exposed to public view a surface finish SF-3.0. Patch holes and defects in accordance with ACI 301.

3.10 FLOOR, SLAB, AND PAVEMENT FINISHES AND MISCELLANEOUS CONSTRUCTION

In accordance with ACI 301 and ACI 302.1R, unless otherwise specified. Slope floors uniformly to drains where drains are provided. Depress the concrete base slab where quarry tile and ceramic tile are indicated. Steel trowel and fine-broom finish concrete slabs that are to receive quarry tile, ceramic tile, or paver tile. Where straightedge measurements are specified, Contractor must provide straightedge.

3.10.1 Finish

Place, consolidate, and immediately strike off concrete to obtain proper contour, grade, and elevation before bleedwater appears. Permit concrete to attain a set sufficient for floating and supporting the weight of the finisher and equipment. If bleedwater is present prior to floating the surface, drag the excess water off or remove by absorption with porous materials. Do not use dry cement to absorb bleedwater.

3.10.1.1 Scratched

Use for surfaces intended to receive bonded applied cementitious applications. Finish concrete in accordance with ACI 301 Section 5 for a

scratched finish.

3.10.1.2 Floated

Use for surfaces to receive roofing, waterproofing membranes, sand bed terrazzo, and exterior slabs where not otherwise specified. Finish concrete in accordance with ACI 301 Section 5 for a floated finish.

3.10.1.3 Concrete Containing Silica Fume

Finish using magnesium floats or darbies.

3.10.1.4 Steel Troweled

Use for floors intended as walking surfaces, and for reception of floor coverings. Finish concrete in accordance with ACI 301 Section 5 for a steel troweled finish.

3.10.1.5 Broomed

Use on surfaces of exterior walks, platforms, patios, and ramps, unless otherwise indicated. Finish concrete in accordance with ACI 301 Section 5 for a broomed finish.

3.10.2 Flat Floor Finishes

ACI 302.1R. Construct in accordance with one of the methods recommended in Table 7.15.3, "Typical Composite Ff/FL Values for Various Construction Methods." ACI 117 for tolerance tested by ASTM E1155.

a. Specified Conventional Value:

Floor Flatness (Ff) 20 13 minimum
Floor Levelness (FL) 15 10 minimum

3.10.2.1 Measurement of Floor Tolerances

Test slab within 24 hours of the final troweling. Provide tests to Contracting Officer within 12 hours after collecting the data. Floor flatness inspector is required to provide a tolerance report which must include:

a. Key plan showing location of data collected.

b. Results required by ASTM E1155.

3.10.2.2 Remedies for Out of Tolerance Work

Contractor is required to repair and retest any floors not meeting specified tolerances. Prior to repair, Contractor must submit and receive approval for the proposed repair, including product data from any materials proposed. Repairs must not result in damage to structural integrity of the floor. For floors exposed to public view, repairs must prevent any uneven or unusual coloring of the surface.

3.10.3 Concrete Walks

Provide 4 inches thick minimum. Provide contraction joints spaced every 5 linear feet unless otherwise indicated. Cut contraction joints 1 inch

deep, or one fourth the slab thickness whichever is deeper, with a jointing tool after the surface has been finished. Provide 0.5 inch thick transverse expansion joints at changes in direction where sidewalk abuts curb, steps, rigid pavement, or other similar structures; space expansion joints every 50 feet maximum. Give walks a broomed finish. Unless indicated otherwise, provide a transverse slope of 1/48. Limit variation in cross section to 1/4 inch in 5 feet.

3.10.4 Pits and Trenches

Place bottoms and walls monolithically or provide waterstops and keys.

3.10.5 Curbs and Gutters

Provide contraction joints spaced every 10 feet maximum unless otherwise indicated. Cut contraction joints 3/4 inch deep with a jointing tool after the surface has been finished. Provide expansion joints 1/2 inch thick and spaced every 100 feet maximum unless otherwise indicated. Perform pavement finish.

3.10.6 Splash Blocks

Provide at outlets of downspouts emptying at grade. Splash blocks may be precast concrete, and must be 24 inches long, 12 inches wide and 4 inches thick, unless otherwise indicated, with smooth-finished countersunk dishes sloped to drain away from the building.

3.11 JOINTS

3.11.1 Construction Joints

Make and locate joints not indicated so as not to impair strength and appearance of the structure, as approved. Joints must be perpendicular to main reinforcement. Reinforcement must be continued and developed across construction joints. Locate construction joints as follows:

3.11.1.1 Maximum Allowable Construction Joint Spacing

a. In walls at not more than 60 feet in any horizontal direction.

b. In slabs on ground, so as to divide slab into areas not in excess of 1,200 square feet.

3.11.1.2 Construction Joints for Constructability Purposes

a. In walls, at top of footing; at top of slabs on ground; at top and bottom of door and window openings or where required to conform to architectural details; and at underside of deepest beam or girder framing into wall.

b. In columns or piers, at top of footing; at top of slabs on ground; and at underside of deepest beam or girder framing into column or pier.

c. Near midpoint of spans for supported slabs, beams, and girders unless a beam intersects a girder at the center, in which case construction joints in girder must offset a distance equal to twice the width of the beam. Make transfer of shear through construction joint by use of inclined reinforcement.

Provide keyways at least 1-1/2-inches deep in construction joints in walls and slabs and between walls and footings; approved bulkheads may be used for slabs.

3.11.2 Isolation Joints in Slabs on Ground

a. Provide joints at points of contact between slabs on ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated.

b. Fill joints with premolded joint filler strips 1/2 inch thick, extending full slab depth. Install filler strips at proper level below finish floor elevation with a slightly tapered, dress-and-oiled wood strip temporarily secured to top of filler strip to form a groove not less than 3/4 inch in depth where joint is sealed with sealing compound and not less than 1/4 inch in depth where joint sealing is not required. Remove wood strip after concrete has set. Contractor must clean groove of foreign matter and loose particles after surface has dried.

3.11.3 Contraction Joints in Slabs on Ground

a. Provide joints to form panels as indicated.

b. Sawcut contraction joints into slab on ground in accordance with ACI 301 Section 5.

c. Sawcutting will be limited to within 12 hours after set.

3.11.4 Joint Filling

a. Prepare, clean, and install joint filler according to manufacturer's written instructions.

b. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.

c. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

d. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.12 CURING AND PROTECTION

Curing and protection in accordance with ACI 301 Section 5, unless otherwise specified. Begin curing immediately following form removal. Avoid damage to concrete from vibration created by blasting, pile driving, movement of equipment in the vicinity, disturbance of formwork or protruding reinforcement, and any other activity resulting in ground vibrations. Protect concrete from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until the expiration of the specified curing period. Do not use membrane-forming compound on surfaces where appearance would be objectionable, on any surface to be painted, where coverings are to be bonded to the concrete, or on concrete to which other concrete is to be bonded. If forms are removed prior to the

expiration of the curing period, provide another curing procedure specified herein for the remaining portion of the curing period. Provide moist curing for those areas receiving liquid chemical sealer, hardener, or epoxy coating. Allow curing compound/sealer installations to cure prior to the installation of materials that adsorb VOCs.

3.12.1 Requirements for Type III, High-Early-Strength Portland Cement

The curing periods are required to be not less than one-fourth of those specified for portland cement, but in no case less than 72 hours.

3.12.2 Curing Periods

ACI 301 Section 5, except 10 days for retaining walls, pavement or chimneys. Begin curing immediately after placement. Protect concrete from premature drying, excessively hot temperatures, and mechanical injury; and maintain minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing are subject to approval by the Contracting Officer.

3.12.3 Curing Formed Surfaces

Accomplish curing of formed surfaces, including undersurfaces of girders, beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed before end of curing period, accomplish final curing of formed surfaces by any of the curing methods specified above, as applicable.

3.12.4 Curing Unformed Surfaces

a. Accomplish initial curing of unformed surfaces, such as monolithic slabs, floor topping, and other flat surfaces, by membrane curing.

3.12.5 Temperature of Concrete During Curing

When temperature of atmosphere is 41 degrees F and below, maintain temperature of concrete at not less than 55 degrees F throughout concrete curing period or 45 degrees F when the curing period is measured by maturity. When necessary, make arrangements before start of concrete placing for heating, covering, insulation, or housing as required to maintain specified temperature and moisture conditions for concrete during curing period.

When the temperature of atmosphere is 80 degrees F and above or during other climatic conditions which cause too rapid drying of concrete, make arrangements before start of concrete placing for installation of wind breaks, of shading, and for fog spraying, wet sprinkling, or moisture-retaining covering of light color as required to protect concrete during curing period.

Changes in temperature of concrete must be uniform and not exceed 37 degrees F in any 1 hour nor 80 degrees F in any 24-hour period.

3.12.6 Protection from Mechanical Injury

During curing period, protect concrete from damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive

vibration and from damage caused by rain or running water.

3.12.7 Protection After Curing

Protect finished concrete surfaces from damage by construction operations.

3.13 FIELD QUALITY CONTROL

3.13.1 Sampling

ASTM C172/C172M. Collect samples of fresh concrete to perform tests specified. ASTM C31/C31M for making test specimens.

3.13.2 Testing

3.13.2.1 Slump Tests

ASTM C143/C143M. Take concrete samples during concrete placement/discharge. The maximum slump may be increased as specified with the addition of an approved admixture provided that the water-cementitious material ratio is not exceeded. Perform tests at commencement of concrete placement, when test cylinders are made, and for each batch (minimum) or every 20 cubic yards (maximum) of concrete.

3.13.2.2 Temperature Tests

Test the concrete delivered and the concrete in the forms. Perform tests in hot or cold weather conditions (below 50 degrees F and above 80 degrees F) for each batch (minimum) or every 20 cubic yards (maximum) of concrete, until the specified temperature is obtained, and whenever test cylinders and slump tests are made.

3.13.2.3 Compressive Strength Tests

ASTM C39/C39M. Make six 6 inch by 12 inch test cylinders for each set of tests in accordance with ASTM C31/C31M, ASTM C172/C172M and applicable requirements of ACI 305R and ACI 306R. Take precautions to prevent evaporation and loss of water from the specimen. Test two cylinders at 7 days, two cylinders at 28 days, two cylinders at 56 days and hold two cylinder in reserve. Take samples for strength tests of each mix design of concrete placed each day not less than once a day, nor less than once for each 100 cubic yards of concrete for the first 500 cubic yards, then every 500 cubic yards thereafter, nor less than once for each 5400 square feet of surface area for slabs or walls. For the entire project, take no less than five sets of samples and perform strength tests for each mix design of concrete placed. Each strength test result must be the average of two cylinders from the same concrete sample tested at 28 days56 days. Concrete compressive tests must meet the requirements of this section, the Contract Document, and ACI 301. Retest locations represented by erratic core strengths. Where retest does not meet concrete compressive strength requirements submit a mitigation or remediation plan for review and approval by the contracting officer. Repair core holes with nonshrink grout. Match color and finish of adjacent concrete.

3.13.2.4 Air Content

ASTM C173/C173M or ASTM C231/C231M for normal weight concrete and ASTM C173/C173M for lightweight concrete. Test air-entrained concrete for air content at the same frequency as specified for slump tests.

3.13.2.5 Unit Weight of Structural Concrete

ASTM C567/C567M and ASTM C138/C138M. Determine unit weight of lightweight and normal weight concrete. Perform test for every 20 cubic yards maximum.

3.13.2.6 Chloride Ion Concentration

Chloride ion concentration must meet the requirements of the paragraph titled CORROSION AND CHLORIDE CONTENT. Determine water soluble ion concentration in accordance with ASTM C1218/C1218M. Perform test once for each mix design.

3.13.2.7 Strength of Concrete Structure

The strength of the concrete structure will be considered to be deficient if any of the following conditions are identified:

a. Failure to meet compressive strength tests as evaluated.

b. Reinforcement not conforming to requirements specified.

c. Concrete which differs from required dimensions or location in such a manner as to reduce strength.

d. Concrete curing and protection of concrete against extremes of temperature during curing, not conforming to requirements specified.

e. Concrete subjected to damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration.

f. Poor workmanship likely to result in deficient strength.

Where the strength of the concrete structure is considered deficient submit a mitigation or remediation plan for review and approval by the contracting officer.

3.13.2.8 Non-Conforming Materials

Factors that indicate that there are non-conforming materials include (but not limited to) excessive compressive strength, inadequate compressive strength, excessive slump, excessive voids and honeycombing, concrete delivery records that indicate excessive time between mixing and placement, or excessive water was added to the mixture during delivery and placement. Any of these indicators alone are sufficient reason for the Contracting Officer to request additional sampling and testing.

Investigations into non-conforming materials must be conducted at the Contractor's expense. The Contractor must be responsible for the investigation and must make written recommendations to adequately mitigate or remediate the non-conforming material. The Contracting Officer may accept, accept with reduced payment, require mitigation, or require removal and replacement of non-conforming material at no additional cost to the Government.

3.13.2.9 Testing Concrete Structure for Strength

When there is evidence that strength of concrete structure in place does not meet specification requirements or there are non-conforming materials,

make cores drilled from hardened concrete for compressive strength determination in accordance with ASTM C42/C42M, and as follows:

a. Take at least three representative cores from each member or area of concrete-in-place that is considered potentially deficient. Location of cores will be determined by the Contracting Officer.

b. Test cores after moisture conditioning in accordance with ASTM C42/C42M if concrete they represent is more than superficially wet under service.

c. Air dry cores, (60 to 80 degrees F with relative humidity less than 60 percent) for 7 days before test and test dry if concrete they represent is dry under service conditions.

d. Strength of cores from each member or area are considered satisfactory if their average is equal to or greater than 85 percent of the 28-day design compressive strength of the class of concrete.

e. Core specimens will be taken and tested by the Government. If the results of core-boring tests indicate that the concrete as placed does not conform to the drawings and specification, the cost of such tests and restoration required must be borne by the Contractor.

Fill core holes solid with patching mortar and finished to match adjacent concrete surfaces.

Correct concrete work that is found inadequate by core tests in a manner approved by the Contracting Officer.

3.14 REPAIR, REHABILITATION AND REMOVAL

Before the Contracting Officer accepts the structure the Contractor must inspect the structure for cracks, damage and substandard concrete placements that may adversely affect the service life of the structure. A report documenting these defects must be prepared which includes recommendations for repair, removal or remediation must be submitted to the Contracting Officer for approval before any corrective work is accomplished.

3.14.1 Crack Repair

Prior to final acceptance, all cracks in excess of 0.02 inches wide must be documented and repaired. The proposed method and materials to repair the cracks must be submitted to the Contracting Officer for approval. The proposal must address the amount of movement expected in the crack due to temperature changes and loading.

3.14.2 Repair of Weak Surfaces

Weak surfaces are defined as mortar-rich, rain-damaged, uncured, or containing exposed voids or deleterious materials. Concrete surfaces with weak surfaces less than 1/4 inch thick must be diamond ground to remove the weak surface. Surfaces containing weak surfaces greater than 1/4 inch thick must be removed and replaced or mitigated in a manner acceptable to

the Contracting Officer.

3.14.3 Failure of Quality Assurance Test Results

Proposed mitigation efforts by the Contractor must be approved by the Contracting Officer prior to proceeding.

-- End of Section --

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SECTION 03 42 13.00 10

PLANT-PRECAST CONCRETE PRODUCTS FOR BELOW GRADE CONSTRUCTION
05/16

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 211.1	(1991; R 2009) Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete
ACI 211.2	(1998; R 2004) Standard Practice for Selecting Proportions for Structural Lightweight Concrete
ACI 305R	(2010) Guide to Hot Weather Concreting
ACI 306.1	(1990; R 2002) Standard Specification for Cold Weather Concreting
ACI 318	(2014; Errata 1-2 2014; Errata 3-5 2015; Errata 6 2016; Errata 7-9 2017) Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary (ACI 318R-14)

AMERICAN CONCRETE PIPE ASSOCIATION (ACPA)

ACPA 01-102	(2000) Concrete Pipe Handbook
ACPA 01-110	(1984) Design Manual for Sulfide and Corrosion Prediction and Control
ACPA QPC	(202016) QCast Plant Certification Manual

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2020) Structural Welding Code - Steel
AWS D1.4/D1.4M	(2011) Structural Welding Code - Reinforcing Steel

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A153/A153M	(2016a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A615/A615M	(2020) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A706/A706M	(2016) Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A767/A767M	(2016) Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
ASTM A775/A775M	(2017) Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A884/A884M	(2019) Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
ASTM A1064/A1064M	(2017) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C31/C31M	(2019a) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C39/C39M	(2020) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C138/C138M	(2017a) Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
ASTM C143/C143M	(2020) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C171	(2016) Standard Specification for Sheet Materials for Curing Concrete
ASTM C173/C173M	(2016) Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C192/C192M	(2019) Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM C231/C231M	(2017a) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C309	(2011) Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C443	(2020) Standard Specification for Joints

	for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C857	(2016) Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
ASTM C858	(2010; E 2012) Standard Specification for Underground Precast Concrete Utility Structures
ASTM C877	(2008) External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections
ASTM C891	(2019) Installation of Underground Precast Concrete Utility Structures
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C923	(2008; R 2013; E 2016) Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
ASTM C990	(2009; R 2014) Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM C1064/C1064M	(2017) Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
ASTM C1107/C1107M	(2020) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C1116/C1116M	(2010a; R 2015) Standard Specification for Fiber-Reinforced Concrete
ASTM C1244	(2011; R 2017) Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
ASTM C1478	(2019) Standard Specification for Storm Drain Resilient Connectors Between Reinforced Concrete Storm Sewer Structures, Pipes and Laterals

CSA GROUP (CSA)

CSA A23.4	(2016; Errata 2016) Precast Concrete - Materials and Construction

NATIONAL PRECAST CONCRETE ASSOCIATION (NPCA)

NPCA QC Manual	(2017) Quality Control Manual for Precast and Prestressed Concrete Plants

1.2 SUBMITTALS

All submittals are the responsibility of the precast concrete producer. Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Quality Control Procedures

SD-02 Shop Drawings

Standard Precast Units; G
Custom-Made Precast Units; G
Special Finishes

SD-03 Product Data

Standard Precast Units
Proprietary Precast Units
Embedded Items
Accessories
Environmental Product Declarations (EPD) for Portland Cement, Slag, and Fly Ash; S

SD-05 Design Data

Design Calculations; G
Concrete Mix Proportions

SD-06 Test Reports

Test Reports

SD-07 Certificates

Quality Control Procedures

SD-11 Closeout Submittals

Recycled content for fly ash and pozzolan; S
Recycled content for Ground Iron Blast-Furnace Slag; S
Recycled content for Silica Fume; S
Recycled content for Synthetic Fiber Reinforcement; S
Recycled content for steel; S

1.3 QUALITY ASSURANCE

Demonstrate adherence to the standards set forth in NPCA QC Manual or ACPA QPC. Meet requirements written in the subparagraphs below.

1.3.1 NPCA and ACPA Plant Certification

The precast concrete producer must be certified by the National Precast Concrete Association's or the American Concrete Pipe Association's Plant Certification Program prior to and during production of the products for this project.

1.3.2 Qualifications, Quality Control and Inspection

1.3.2.1 Qualifications

Select a precast concrete producer that has been in the business of producing precast concrete units similar to those specified for a minimum of 3 years. The precast concrete producer must maintain a permanent quality control department or retain an independent testing agency on a continuing basis.

1.3.2.2 Quality Control Procedures

Submit quality control procedures established by the precast manufacturer in accordance with NPCA QC Manual and ACPA QPC. Show that the following QC tests are performed as required and in accordance with the ASTM standards indicated.

1.3.2.2.1 Slump

Perform a slump test for each 150 cu yd of concrete produced, or once a day, whichever comes first. Perform slump tests in accordance with ASTM C143/C143M.

1.3.2.2.2 Temperature

Measure the temperature of fresh concrete when slump or air content tests are made and when compressive test specimens are made in accordance with ASTM C1064/C1064M.

1.3.2.2.3 Compressive Strength

Make at least four compressive strength specimens for each 150 cubic yards of concrete of each mix in accordance with the following Standards: ASTM C31/C31M, ASTM C192/C192M, ASTM C39/C39M.

1.3.2.2.4 Air Content

Perform tests for air content on air-entrained, wet-cast concrete for each 150 cu yd of concrete, but not less often than once each day when air-entrained concrete is used. Determine the air content in accordance with either ASTM C231/C231M or ASTM C173/C173M for normal weight aggregates and ASTM C173/C173M for lightweight aggregates.

1.3.2.2.5 Unit Weight

Perform tests for unit weight a minimum of once per week to verify the yield of batch mixes. Perform unit weight tests for each 100 cu yd of lightweight concrete in accordance with ASTM C138/C138M.

1.3.2.3 Inspection

The Contracting Officer may place an inspector in the plant when the units

covered by this specification are being manufactured. The burden of payment for plant inspection will be clearly detailed in the specification. The precast concrete producer must give notice 14 days prior to the time the units will be available for plant inspection. Neither the exercise nor waiver of inspection at the plant will affect the Government's right to enforce contractual provisions after units are transported or erected.

1.3.2.4 Test Reports

Submit the following:

1.3.2.4.1 Material Certifications or Laboratory Test Reports

Include mill tests and all other test data, for portland cement, blended cement, pozzolans, ground granulated blast furnace slag, silica fume, aggregate, admixtures, and curing compound proposed for use on this project.

1.3.2.4.2 Mix Test

Submit reports showing that the mix has been successfully tested to produce concrete with the properties specified and will be suitable for the job conditions. Such tests may include compressive strength, flexural strength, plastic or hardened air content, freeze thaw durability, abrasion and absorption. Clearly detail in the specifications special tests for precast concrete or cast-in items.

1.3.2.4.3 Self-Consolidating Concrete

Submit sufficient documentation, when the use of self-consolidating concrete (SCC) is proposed, showing a minimum of 30-days production track records demonstrating that SCC is appropriate for casting of the product.

1.3.2.4.4 In-Plant QA/QC Inspection Reports

Submit inspection reports upon the request of the Contracting Officer.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

Deliver precast units to the site in accordance with the delivery schedule to avoid excessive build-up of units in storage at the site. Upon delivery to the jobsite, all precast concrete units will be inspected by the Contracting Officer for quality and final acceptance.

1.4.2 Storage

Store units off the ground or in a manner that minimizes potential damage.

1.4.3 Handling

Handle, transport, and store products in a manner to minimize damage. Lifting devices or holes must be consistent with industry standards. Perform lifting with methods or devices intended for this purpose as indicated on shop drawings.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Furnish precast concrete units designed and fabricated by an experienced and acceptable precast concrete manufacturer who has been, for at least three years, regularly and continuously engaged in the manufacture of precast concrete work similar to that indicated on the drawings. Coordinate precast work with the work of other trades. Below grade structures must comply with ASTM C858.

2.1.1 Standard Precast Units

Design standard precast concrete units to withstand indicated design load conditions in accordance with applicable industry design standards ACI 318, ASTM C857. Design must also consider stresses induced during handling, shipping and installation as to avoid product cracking or other handling damage. Indicate design loads for precast concrete units on the shop drawings. Submit drawings for standard precast concrete units furnished by the precast concrete producer for approval by the Contracting Officer. These drawings must demonstrate that the applicable industry design standards have been met. Include installation and construction information on shop drawings. Include details of steel reinforcement size and placement as well as supporting design calculations, if appropriate. Produce precast concrete units in accordance with the approved drawings. Submit cut sheets, for standard precast concrete units, showing conformance to project drawings and requirements, and to applicable industry design standards listed in this specification.

2.1.2 Custom-Made Precast Units

Submit design calculations for custom-made precast units, prepared and sealed by a registered professional engineer, for approval prior to fabrication. Include in the calculations the analysis of units for lifting stresses and the sizing of lifting devices. Submit drawings furnished by the precast concrete producer for approval by the Contracting Officer. Show on these drawings complete design, installation, and construction information in such detail as to enable the Contracting Officer to determine the adequacy of the proposed units for the intended purpose. Include details of steel reinforcement size and placement as well as supporting design calculations, if appropriate. Produce precast concrete units in accordance with the approved drawings.

2.1.3 Proprietary Precast Units

Products manufactured under franchise arrangements must conform to all the requirements specified by the franchiser. Items not included in the franchise specification, but included in this specification, must conform to the requirements in this specification. Submit standard plans or informative literature, for proprietary precast concrete units. Make available supporting calculations and design details upon request. Provide sufficient information as to demonstrate that such products will perform the intended task.

2.1.4 Joints and Sealants

Provide joints and sealants between adjacent units of the type and configuration indicated on shop drawings meeting specified design and performance requirements.

2.1.5 Concrete Mix Design

2.1.5.1 Concrete Mix Proportions

Base selection of proportions for concrete on the methodology presented in ACI 211.1 for normal weight concrete and ACI 211.2 for lightweight concrete. Develop the concrete proportions using the same type and brand of cement, the same type and brand of pozzolan, the same type and gradation of aggregates, and the same type and brand of admixture that will be used in the manufacture of precast concrete units for the project. Do not use calcium chloride in precast concrete containing reinforcing steel or other embedded metal items. At a minimum of thirty days prior to precast concrete unit manufacturing, the precast concrete producer will submit a mix design and proportions for each strength and type of concrete that will be used. Furnish a complete list of materials, including quantity, type, brand and applicable data sheets for all mix design constituents as well as applicable reference specifications. The use of self-consolidating concrete is permitted, provided that mix design proportions and constituents meet the requirements of this specification.

2.1.5.2 Concrete Strength

Provide precast concrete units with a 28-day compressive strength (f'c) psi as indicated in the contract drawings.

2.1.5.3 Water-to-Cement Ratio

Where exposed to freezing and thawing, furnish concrete containing entrained air and with a water-cementitious ratio of 0.45 or less. Where not exposed to freezing, but required to have a low permeability, furnish concrete with a water-cementitious ratio of 0.48 or less. Where exposed to deicer salts, brackish water, or seawater, furnish concrete with a water-cementitious ratio of 0.40 or less, for corrosion protection.

2.1.5.4 Air Content

The air content of concrete that will be exposed to freezing conditions must be within the limits given below.

	AIR CONTENT PERCENT	
NOMINAL MAXIMUM AGGREGATE SIZE	EXPOSURE CLASS F1	EXPOSURE CLASSES F2 and F3
3/8 inch	6.0	7.5
1/2 inch	5.5	7.0
3/4 inch	5.0	6.0
1.0 inch	4.5	6.0
1.5 inch	4.5	5.5

	AIR CONTENT PERCENT	
NOMINAL MAXIMUM AGGREGATE SIZE	EXPOSURE CLASS F1	EXPOSURE CLASSES F2 and F3
Note: For specified compressive strengths greater than 5000 psi, air content may be reduced 1 percent		

2.1.5.5 Corrosion Control for Sanitary Sewer Systems

Follow design recommendations outlined in Chapter 7 of ACPA 01-102 or the ACPA 01-110 when hydrogen sulfide is indicated as a potential problem.

2.2 MATERIALS

Except as otherwise specified in the following paragraphs, conform material to Section 03 30 00 CAST-IN-PLACE CONCRETE.

2.2.1 Material Sustainability Criteria

For products in this section, where applicable and to extent allowed by performance criteria, provide and document the following in accordance with Section 01 33 29 SUSTAINABILITY REQUIREMENTS:

a. Recycled content for fly ash and pozzolan
b. Recycled content for Ground Iron Blast-Furnace Slag
c. Recycled content for Silica Fume
d. Recycled content for Synthetic Fiber Reinforcement
e. Recycled content for steel, 75 percent minimum
f. Environmental Product Declarations (EPD) for Portland Cement, Slag, and Fly Ash: Provide one of the following EPD options including Product Category Rules (PCR) standard EN 15804 or ISO 21930.

    1. Product-Specific Declaration

    2. Product-Specific Type III EPD

    3. Industry-Wide (Generic) EPD: Provide proof manufacturer is a participant.

2.2.2 Pigments

Non-fading and lime-resistant

2.2.3 Reinforcement

2.2.3.1 Reinforcing Bars

a. Deformed Billet-steel: ASTM A615/A615M

b. Deformed Low-alloy steel: ASTM A706/A706M

2.2.3.2 Reinforcing Wire

a. Plain Wire: ASTM A1064/A1064M

b. Deformed Wire: ASTM A1064/A1064M

2.2.3.3 Welded Wire Reinforcement

a. Plain Wire: ASTM A1064/A1064M

b. Deformed Wire: ASTM A1064/A1064M

2.2.3.4 Epoxy Coated Reinforcement

a. Reinforcing Bars: ASTM A775/A775M

b. Wires and Welded Wire: ASTM A884/A884M

2.2.3.5 Galvanized Reinforcement

Provide galvanized reinforcement conforming to ASTM A767/A767M.

2.2.4 Inserts and Embedded Metal

All items embedded in concrete must be of the type required for the intended task, and meet the following standards.

a. Structural Steel Plates, Angles, etc.: ASTM A36/A36M

b. Hot-dipped Galvanized: ASTM A153/A153M

c. Proprietary Items: In accordance with manufacturers published literature

2.2.5 Accessories

Submit proper installation instructions and relevant product data for items including, but not limited to, sealants, gaskets, connectors, steps, cable racks and other items installed before or after delivery.

a. Rubber Gaskets for Circular Concrete Sewer Pipe and Culvert Pipe: ASTM C443.

b. External Sealing Bands for Noncircular Sewer, Storm Drain and Culvert Pipe: ASTM C877.

c. Preformed Flexible Joint Sealants for Concrete Pipe, Manholes, and Manufactured Box Sections: ASTM C990.

d. Elastomeric Joint Sealants: ASTM C920

2.2.6 Pipe Entry Connectors

Pipe entry connectors must conform to ASTM C923 or ASTM C1478.

2.2.7 Grout

Nonshrink Grout must conform to ASTM C1107/C1107M. Cementitious grout must be a mixture of portland cement, sand, and water. Proportion one part cement to approximately 2.5 parts sand, with the amount of water based on placement method. Provide air entrainment for grout exposed to the weather.

PART 3 EXECUTION

3.1 FABRICATION AND PLACEMENT

Perform fabrication in accordance with NPCA QC Manual or ACPA QPC unless specified otherwise.

3.1.1 Forms

Use forms, for manufacturing precast concrete products, of the type and design consistent with industry standards and practices. They should be capable of consistently providing uniform products and dimensions. Construct forms so that the forces and vibrations to which the forms will be subjected can cause no product damage. Clean forms of concrete build-up after each use. Apply form release agents according to the manufacturers recommendations and do not allow to build up on the form casting surfaces.

3.1.2 Reinforcement

Follow applicable ASTM Standard or ACI 318 for placement and splicing. Fabricate cages of reinforcement either by tying the bars, wires or welded wire reinforcement into rigid assemblies or by welding, where permissible, in accordance with AWS D1.4/D1.4M. Position reinforcing as specified by the design and so that the concrete cover conforms to requirements. The tolerance on concrete cover must be one-third of that specified but not more than 1/2 inch. Provide concrete cover not less than 1/2 inch. Take positive means to assure that the reinforcement does not move significantly during the casting operations.

3.1.3 Embedded Items

Position embedded items at locations specified in the design documents. Perform welding in accordance with AWS D1.1/D1.1M when necessary. Hold rigidly in place inserts, plates, weldments, lifting devices and other items to be imbedded in precast concrete products so that they do not move significantly during casting operations. Submit product data sheets and proper installation instruction for anchors, lifting inserts and other devices. Clearly indicate the products dimensions and safe working load.

3.1.4 Synthetic Fiber Reinforced Concrete

Add fiber reinforcement to the concrete mix at the batch plant in accordance with the applicable sections of ASTM C1116/C1116M and the recommendations of the manufacturer. Use a minimum of 1.5 pounds of fibers per cubic yard of concrete.

3.2 CONCRETE

3.2.1 Concrete Mixing

Mixing operations must produce batch-to-batch uniformity of strength, consistency, and appearance.

3.2.2 Concrete Placing

Deposit concrete into forms as near to its final location as practical. Keep the free fall of the concrete to a minimum. Consolidate concrete in such a manner that segregation of the concrete is minimized and

honeycombed areas are kept to a minimum. Use vibrators to consolidate concrete with frequencies and amplitudes sufficient to produce well consolidated concrete.

3.2.2.1 Cold Weather Concreting

Perform cold weather concreting in accordance with ACI 306.1.

a. Provide adequate equipment for heating concrete materials and protecting concrete during freezing or near-freezing weather.

b. All concrete materials, reinforcement, forms, fillers, and ground with which concrete is to come in contact must be free from frost.

c. Do not use frozen materials or materials containing ice.

d. In cold weather the temperature of concrete at the time of placing must not be below 45 degrees F. Discard concrete that freezes before its compressive strength reaches 500 psi.

3.2.2.2 Hot Weather Concreting

Follow recommendations for hot weather concreting in ACI 305R. During hot weather, give proper attention to constituents, production methods, handling, placing, protection, and curing to prevent excessive concrete temperatures or water evaporation that could impair required strength or serviceability of the member or structure. The temperature of concrete at the time of placing must not exceed 90 degrees F.

3.2.3 Concrete Curing

Commence curing immediately following the initial set and completion of surface finishing.

3.2.3.1 Curing by Moisture Retention

Prevent moisture evaporation from exposed surfaces until adequate strength for stripping is reached by one of the following methods:

a. Cover with polyethylene sheets a minimum of 6 mils thick in accordance with ASTM C171.

b. Cover with burlap or other absorptive material and keep continually moist.

c. Use a membrane-curing compound, conforming to ASTM C309 and applied at a rate not less than 200 square ft/gallon, or in accordance with manufacturers' recommendations.

3.2.3.2 Curing with Heat and Moisture

Do not subject concrete to steam or hot air until after the concrete has attained its initial set. Apply steam, if used, within a suitable enclosure, which permits free circulation of the steam in accordance with CSA A23.4. If hot air is used for curing, take precautions to prevent moisture loss from the concrete. The temperature of the concrete must not be permitted to exceed 150 degrees F. These requirements do not apply to products cured with steam under pressure in an autoclave.

3.2.4 Surface Finish

Finish unformed surfaces of wet-cast precast concrete products as specified. If no finishing procedure is specified, finish such surfaces using a strike-off to level the concrete with the top of the form.

3.2.4.1 Formed Non-Architectural Surfaces

Cast surfaces against approved forms following industry practices in cleaning forms, designing concrete mixes, placing and curing concrete. Normal color variations, form joint marks, small surface holes caused by air bubbles, and minor chips and spalls will be accepted but no major imperfections, honeycombs or other major defects will be permitted.

3.2.4.2 Unformed Surfaces

Finish unformed surfaces with a vibrating screed, or by hand with a float. Normal color variations, minor indentations, minor chips and spalls will be accepted. Major imperfections, honeycombs, or other major defects are not permitted.

3.2.4.3 Special Finishes

Troweled, broom or other finishes must be according to the requirements of project documents and performed in accordance with industry standards or supplier specifications. Submit finishes for approval when required by the project documents. The sample finishes must be approved prior to the start of production.

3.2.5 Stripping Products from Forms

Do not remove products from the forms until the concrete reaches the compressive strength for stripping required by the design. If no such requirement exists, products may be removed from the forms after the final set of concrete provided that stripping damage is minimal.

3.2.6 Patching and Repair

No repair is required to formed surfaces that are relatively free of air voids and honeycombed areas, unless the surfaces are required by the design to be finished.

3.2.6.1 Repairing Minor Defects

Defects that will not impair the functional use or expected life of a precast concrete product may be repaired by any method that does not impair the product.

3.2.6.2 Repairing Honeycombed Areas

When honeycombed areas are to be repaired, remove all loose material and cut back the areas into essentially horizontal or vertical planes to a depth at which coarse aggregate particles break under chipping rather than being dislodged. Use proprietary repair materials in accordance with the manufacturer's instructions. If a proprietary repair material is not used, saturate the area with water. Immediately prior to repair, the area should be damp, but free of excess water. Apply a cement-sand grout or an approved bonding agent to the chipped surfaces, followed immediately by consolidating an appropriate repair material into the cavity.

3.2.6.3 Repairing Major Defects

Evaluate, by qualified personnel, defects in precast concrete products which impair the functional use or the expected life of products to determine if repairs are feasible and, if so, to establish the repair procedure.

3.2.7 Shipping Products

Do not ship products until they are at least five days old, unless it can be shown that the concrete strength has reached at least 75 percent of the specified 28-day strength, or that damage will not result, impairing the performance of the product.

3.3 INSTALLATION

3.3.1 Site Access

It is the Contractor's responsibility to provide adequate access to the site to facilitate hauling, storage and proper handling of the precast concrete products.

3.3.2 General Requirements

a. Install precast concrete products to the lines and grades shown in the contract documents or otherwise specified.

b. Lift products by suitable lifting devices at points provided by the precast concrete producer.

c. Install products in accordance with the precast concrete producer's instructions. In the absence of such instructions, install underground utility structures in accordance with ASTM C891. Install pipe and manhole sections in accordance with the procedures outlined by the American Concrete Pipe Association.

d. Field modifications to the product will relieve the precast producer of liability even if such modifications result in the failure of the product.

3.3.3 Water Tightness

Where water tightness is a necessary performance characteristic of the precast concrete product's end use, watertight joints, connectors and inserts should be used to ensure the integrity of the entire system.

3.4 FIELD QUALITY CONTROL

3.4.1 Site Tests

When water tightness testing is required for an underground product, use one of the following methods:

3.4.2 Vacuum Testing

Prior to backfill vacuum test system according to ASTM C1244.

3.4.3 Water Testing

Perform water testing according to the contract documents and precast concrete producer's recommendations.

-- End of Section --

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SECTION 03 45 00

PRECAST ARCHITECTURAL CONCRETE
05/16

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 211.1	(1991; R 2009) Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete
ACI 211.2	(1998; R 2004) Standard Practice for Selecting Proportions for Structural Lightweight Concrete
ACI 214R	(2011) Evaluation of Strength Test Results of Concrete
ACI 216.1	(2014) Code Requirements for Determining Fire Resistance of Concrete and Masonry Construction Assemblies
ACI 301	(2016) Specifications for Structural Concrete
ACI 304R	(2000; R 2009) Guide for Measuring, Mixing, Transporting, and Placing Concrete
ACI 305R	(2010) Guide to Hot Weather Concreting
ACI 306.1	(1990; R 2002) Standard Specification for Cold Weather Concreting
ACI 318	(2014; Errata 1-2 2014; Errata 3-5 2015; Errata 6 2016; Errata 7-9 2017) Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary (ACI 318R-14)
ACI 318M	(2014; ERTA 2015) Building Code Requirements for Structural Concrete & Commentary
ACI SP-66	(2004) ACI Detailing Manual

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108/A118/A136.1	(2019) American National Standard Specifications for theInstallation of Ceramic Tile

ANSI A118.7 (2010) American National Standard Specifications for High Performance Cement Grouts for Tile Installation

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7-16 (2017; Errata 2018; Supp 1 2018) Minimum Design Loads and Associated Criteria for Buildings and Other Structures

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B18.21.1 (2009; R 2016) Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series)

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2020) Structural Welding Code - Steel

AWS D1.4/D1.4M (2011) Structural Welding Code - Reinforcing Steel

AWS D1.6/D1.6M (2017) Structural Welding Code-Stainless Steel

ASTM INTERNATIONAL (ASTM)

ASTM A27/A27M (2020) Standard Specification for Steel Castings, Carbon, for General Application

ASTM A36/A36M (2019) Standard Specification for Carbon Structural Steel

ASTM A47/A47M (1999; R 2018; E 2018) Standard Specification for Ferritic Malleable Iron Castings

ASTM A153/A153M (2016a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A283/A283M (2013) Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates

ASTM A416/A416M (2018) Standard Specification for Low-Relaxation, Seven-Wire for Prestressed Concrete

ASTM A449 (2014) Standard Specification for Hex Cap Screws, Bolts, and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use

ASTM A563 (2015) Standard Specification for Carbon and Alloy Steel Nuts

ASTM A615/A615M (2020) Standard Specification for Deformed

	and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A1064/A1064M	(2017) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C31/C31M	(2019a) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33/C33M	(2018) Standard Specification for Concrete Aggregates
ASTM C39/C39M	(2020) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C42/C42M	(2020) Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C67/C67M	(2020) Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile
ASTM C78/C78M	(2018) Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C94/C94M	(2020) Standard Specification for Ready-Mixed Concrete
ASTM C143/C143M	(2020) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C144	(2018) Standard Specification for Aggregate for Masonry Mortar
ASTM C150/C150M	(2020) Standard Specification for Portland Cement
ASTM C172/C172M	(2017) Standard Practice for Sampling Freshly Mixed Concrete
ASTM C185	(2020) Standard Test Method for Air Content of Hydraulic Cement Mortar
ASTM C231/C231M	(2017a) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260/C260M	(2010a; R 2016) Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C311/C311M	(2018) Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
ASTM C494/C494M	(2019) Standard Specification for Chemical

	Admixtures for Concrete
ASTM C618	(2019) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C650	(2004; R 2014) Standard Test Method for Resistance of Ceramic Tile to Chemical Substances
ASTM C666/C666M	(2015) Resistance of Concrete to Rapid Freezing and Thawing
ASTM C989/C989M	(2018a) Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1077	(2017) Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1107/C1107M	(2020) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C1218/C1218M	(2020c) Standard Test Method for Water-Soluble Chloride in Mortar and Concrete
ASTM C1240	(2020) Standard Specification for Silica Fume Used in Cementitious Mixtures
ASTM C1602/C1602M	(2018) Standard Specification for Mixing Water Used in Production of Hydraulic Cement Concrete
ASTM D635	(2018) Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
ASTM D746	(2014) Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
ASTM D1056	(2014) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D1149	(2007; R 2012) Standard Test Method for Rubber Deterioration - Surface Ozone Cracking in a Chamber
ASTM D5759	(2012; R 2020) Characterization of Coal Fly Ash and Clean Coal Combustion Fly Ash for Potential Uses
ASTM E329	(2020) Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

ASTM E488/E488M	(2015) Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
ASTM E543	(2015) Standard Practice for Agencies Performing Non-Destructive Testing

PRECAST/PRESTRESSED CONCRETE INSTITUTE (PCI)

PCI MNL-117	(2013) Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products, 3rd Edition
PCI MNL-120	(2010) PCI Design Handbook - Precast and Prestressed Concrete, 6th Edition
PCI MNL-122	(2007) Architectural Precast Concrete, 3rd Edition
PCI MNL-124	(2011) Design for Fire Resistance of Precast Prestressed Concrete, Third Edition

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Pre-Installation Meeting

SD-02 Shop Drawings

Precast Drawings; G, AE

SD-03 Product Data

Cast-In Embedded Items And Connectors; G, RO

Connection Devices; G, RO

Admixtures

Gasket

Thin Brick Veneer; ; G, AE

Environmental Product Declarations (EPD) for Portland Cement, Slag, and Fly Ash; S

SD-04 Samples

Concrete Wall Panel Surface Finish; G, AE

Brick Color Chips; G, AE

Form Liner

Full Size Sample Wall Panel

SD-05 Design Data

Design Calculations; G, AE

Contractor-Furnished Mix Design; G, RO

Concrete Mix Design for Repair of Surface Defects; G

SD-06 Test Reports

Strength Tests; G, RO

Slump

Air Content

Test for Concrete Materials

Water

Testing Precast Units for Strength

SD-07 Certificates

Manufacturer's Qualifications; G, RO

Fabricator Quality Certifications

Erector Certification

Erector's Post Audit Declaration

SD-08 Manufacturer's Instructions

Installation; G, RO

Cleaning; G, RO

Thin Brick

SD-11 Closeout Submittals

Concrete Batch Ticket Information; G, RO

Recycled Content for Fly Ash and Pozzolan; S

Recycled Content for Ground Iron Blast-Furnace Slag; S

Recycled Content for Silica Fume; S

Recycled content for steel; S

1.3 MODIFICATION OF REFERENCES

In the referenced ACI and PCI publications, consider the advisory provisions to be mandatory. Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Contracting Officer.

1.4 GENERAL REQUIREMENTS

Precast concrete units must be designed and fabricated by an experienced and certified precast concrete manufacturer. The manufacturer needs to have been regularly and continuously engaged in the manufacture of precast concrete work similar to that indicated on the drawings for at least 3 years. The Contractor must submit a statement detailing the Manufacturer's Qualifications. Coordinate precast work with the work of other trades.

1.5 DESIGN

1.5.1 Standards and Loads

Precast unit design must conform to ASCE 7-16, ACI 318 and PCI MNL-122. Indicate design loads for precast concrete on the drawings. A differential temperature of 192 degrees F, between interior and exterior faces of the units, must be considered in the design. Stresses due to restrained volume change caused by shrinkage and temperature differential, handling, transportation and erection must be accounted for in the design.

1.5.2 Connections

Connection of units to other members, or to other units must be of the type and configuration indicated. The design and sizing of connections for all design loads will be completed by the Contractor.

1.5.3 Concrete Proportion

Base the selection of proportions for concrete on the methodology presented in ACI 211.1 for normal weight concrete and ACI 211.2 for lightweight concrete. Develop the concrete proportion using the same type and brand of cement, the same type and gradation of aggregates, and the same type and brand of admixture that will be used in the manufacture of precast concrete units for the project. Do not use calcium chloride in precast concrete and admixtures containing chloride ions, nitrates, or other substances that are corrosive will not be used in prestressed concrete.

1.5.4 Design Calculations

Calculations for design of members, connections and embedments not shown must be made by a registered professional engineer experienced in the design of precast architectural concrete. Calculation will include the analysis of member for lifting stresses and the sizing of the lifting inserts. Submit calculations for review and approval prior to fabrication, signed and sealed by the registered design professional who prepared the design.

1.6 DELIVERY, STORAGE, AND HANDLING

Deliver packaged materials, except for wall panels, to the project site in

the original, unbroken packages or containers, each bearing a label clearly identifying manufacturer's name, brand name, weight or volume, and other pertinent information. Store packaged materials, and materials in containers, in a weathertight and dry place until ready for use.

Store products in manufacturer's unopened packaging in dry storage area, with ambient temperature between 30 degrees F and 120 degrees F, until installation.

1.7 STORAGE AND INSPECTION AT MANUFACTURER'S PLANT

Protect precast units temporarily stored at the manufacturer's plant from damage in accordance with PCI MNL-117 and PCI MNL-122. Immediately prior to shipment to the jobsite, all precast concrete units must be inspected for quality to insure all precast units conform to the requirements specified. Inspection for quality will include, but will not be limited to, the following elements: color, texture, dimensional tolerances, chipping, cracking, staining, warping and honeycombing. Replace or repair all defective precast concrete units as approved.

1.8 PLANT INSPECTION

Precast units must be inspected by the QC representative prior to being transported to the job site. The Contractor is to give notice 14 days prior to the time the units will be available for plant inspection. Neither the exercise nor waiver of inspection at the plant will affect the Government's right to enforce contractual provisions after units are transported or erected.

1.8.1 Fabricator Quality Certifications

Plants must be certified by the PCI Plant Certification Program for Group A, Category A1, or Architectural Precast Association (APA) certification or National Precast Concrete Association (NPCA). When plants are not currently enrolled in one of the three certification programs listed above then they must provide a product quality control system in accordance with PCI MNL-117 and perform concrete and aggregate quality control testing using an approved, independent commercial testing laboratory.

1.9 ERECTOR CERTIFICATION

Erector with erecting organization and all erecting crews certified and designated by PCI's Certificate of Compliance to erect Category A (Architectural Systems) for non-load, S2 (Complex Structural Systems) for load-bearing members.

1.10 ERECTOR QUALIFICATIONS

A precast erector that is not certified by PCI who retains a PCI-Certified Field Auditor, at the erector's expense, to conduct a field audit of a project in the same category as this project prior to start of precast concrete erection and must submit the Erector's Post Audit Declaration to be considered qualified.

1.11 CONCRETE SAMPLING AND TESTING

1.11.1 Test for Concrete Materials

Sample and test concrete materials proposed for use in the work in

accordance with PCI MNL-117.

Submit reports for each material sampled and tested prior to the start of work. Reports must contain the project name and number, date, name of Contractor, name of precast unit manufacturer, name of concrete testing service, source of concrete aggregates, generic name of aggregate, and values specified.

1.11.2 Quality Control Testing DuringFabrication

Sample and test concrete for quality control during fabrication as follows:

REQUIREMENT	TEST METHOD	NUMBER OF TESTS
Sampling fresh concrete	ASTM C172/C172M except modified for slump per ASTM C94/C94M	As required for each test
Slump test	ASTM C143/C143M	One for each concrete load at point of discharge and one for each set of compressive strength tests
Air Content by pressure method	ASTM C231/C231M	One for each set of compressive strength tests
Compressive test specimens	ASTM C31/C31M	One set of six specimens for each Compressive Strength test, one set per day or for every 20 cubic yards of concrete placed, whichever is greater.

Compression test specimens may be either standard 6 by 12 inch cylinders or 4-inch cubes. Cubes may be molded individually or cut from slabs. Preparation and testing of cube specimens must be as nearly consistent with the test methods specified as possible, with the exception that the concrete will be placed in a single layer.

Curing of compression test specimens must be the same as the curing method used for the precast concrete wall panels until panels are stripped of forms and then standard moist cure will continue.

REQUIREMENT	TEST METHOD	NUMBER OF TESTS
Concrete temperature		Each time a set of compression test specimens is made
Compressive strength tests	ASTM C39/C39M	One set of facing strength tests mix and one set of backing mix for every ten panels or fraction thereof cast in any one day; two specimens in each set tested at 7 calendar days; three specimens in each set tested at 28 calendar days, and one specimen in each set retained in reserve for testing if required

Evaluate compression test results at 28 days in accordance with ACI 214R using a coefficient of variation of 20 percent. Evaluate the strength of concrete by averaging the test results (two specimens) of standard cylinders tested at 28 days. Not more than 20 percent of the individual tests can have an average compressive strength less than the specified ultimate compressive strength. Submit test reports on the same day that tests are made.

Reports for Compressive Strength tests need to contain the project name and number, date of concrete placement, name of Contractor, name of precast concrete wall panel manufacturer, name of concrete testing service, panel identification letter and number, use of concrete mixture (facing or backing), design compressive strength at 28 calendar days, concrete-mix proportions and materials, and compressive breaking strength and type of break.

If 4-inch cubes are used for compressive strength specimens, average strength of the cubes at any test age must be multiplied by the factor of 0.8 to arrive at an estimate of the corresponding 6 by 12 inch cylinder strength. Report both of these values .

1.12 QUALITY ASSURANCE

1.12.1 Fabricator Qualifications

A firm that complies with the following requirements and is experienced in producing architectural precast concrete units similar to those indicated for this Project and with a record of successful in-service performance.

a. Assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

b. Professional Engineer Qualifications: A professional engineer who is licensed in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.

Engineering services are defined as those performed for installations of architectural pre-cast concrete that are similar to those indicated for this Project in material, design, and extent.

c. Participates in PCI's Plant Certification program at the time of bidding and is designated a PCI-Certified plant for Group A, Category A1 - Architectural Cladding and Load bearing Units.

d. Has sufficient production capacity to produce required units without delaying the Work.

e. Certification shall be maintained throughout the production of the pre-cast concrete units. Production shall immediately stop if at any time the fabricator’s certification is revoked, regardless of the status of completion of contracted work. Production will not be allowed to re-start until the necessary corrections are made and certification has been re-established. In the event certification(s) can not be re-established in a timely manner, causing project delays, the fabricator, at no additional cost, will contract out the remainder of the units to be manufactured at a PCI certified plant.

f. Is registered with and approved by authorities having jurisdiction.

1.12.2 Testing Agency Qualifications

An independent accredited testing agency acceptable to authorities having jurisdiction, qualified according to ASTM C1077, ASTM E329 and ASTM E543 to conduct the testing indicated.

1.12.3 Design Standards

Comply with ACI 318 (ACI 318M) and design recommendations of PCI MNL-120, PCI Design Handbook - Precast and Prestressed Concrete, applicable to types of architectural precast concrete units indicated.

1.12.4 Quality-Control Standard

For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL-117, Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products.

1.12.5 Welding

Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code – Steel"; AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel" and AWS D1.6/D1.6M Structural Welding Code-Stainless Steel”.

1.12.6 Fire Resistance

Where indicated, provide architectural precast concrete units whose fire resistance satisfy the fire resistance ratings of the Contract Documents and meets the prescriptive requirements of the governing code or has been calculated according to PCI MNL-124, Design for Fire Resistance of Precast Concrete) (ACI 216.1/TMS 0216.1, Standard Method for Determining Fire Resistance of Concrete and Masonry Construction Assemblies and is acceptable to authorities having jurisdiction.

1.12.7 Sample Panels

After sample approval and before fabricating architectural precast concrete units, produce a minimum of two sample panels approximately (16 ft2 1.5 m2) in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.

a. Locate panels where indicated in Contract Document or, if not indicated, as directed by Architect.

b. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.

c. After acceptance of repair technique, maintain one sample panel at the fabricator’s plant and one at the Project site in an undisturbed condition as a standard for judging the completed Work.

d. Demolish and remove sample panels when directed.

1.12.8 Range Sample Panels

After sample panel approval and before fabricating architectural precast concrete units, produce a minimum of three samples, approximately (16 ft2 1.5 m2) in area, representing anticipated range of each color and texture on Project’s units. Maintain samples at the fabricator’s plant as color and texture acceptability reference.

1.12.9 Precast Drawings

Submit precast drawings with the following information:

a. Precast dimensions, cross-section, and edge details; location, size, and type of reinforcement, including reinforcement necessary for safe handling and erection of precast units and other embedded items. Comply with ACI SP-66.

b. Layout, dimensions, and identification of each precast unit, corresponding to installation sequence.

c. Setting drawings, instructions, and directions for installation of concrete inserts.

d. Location and details of anchorage devices and lifting devices embedded in panels, and connection details to building framing system.

e. Location of embedded brick work including joint locations, joint widths, brick coursing, brick coursing alignment across panel joints and reveal and false-joint locations and dimensions.

1.12.10 Concrete Wall Panel Surface Finish Sample

Submit a concrete wall panel sample 12 inches by 12 inches by approximately 1 1/2 inches in thickness, to illustrate quality, color, and texture of both exposed-to-view surface finish and finish of panel surfaces that will be concealed by other construction. Obtain approval prior to submission of sample panels.

After approval of the surface, Contractor must provide one full size sample Wall Panel. Approved sample may be used in construction when properly identified.

1.12.11 Required Records

ASTM C94/C94M. Submit mandatory batch ticket information for each load of ready-mixed concrete.

1.12.12 Pre-Installation Meeting

Hold a meeting at the job site with representative of the manufacturer and the applicator prior to application of water repellents and all other trades that may be effected by work of this section. Notify the Contracting Officer at least 3 days in advance of the time of the meeting.

1.13 TOLERANCES

Dimensions of the finished panel, at the time of erection in the structure, must conform to the tolerances for precast, non-prestressed elements in PCI MNL-117, unless otherwise specified by the Architect.

PART 2 PRODUCTS

2.1 CONCRETE

2.1.1 Contractor-Furnished Mix Design

ACI 211.1 and ACI 301. The Contractor must submit the mix design report giving the maximum nominal coarse aggregate size, the proportions of all ingredients and the type and amount of any admixtures that will be used in the manufacture of each strength and type of concrete, a minimum of sixty days prior to commencing operations. Provide mix proportion data using at least three different water-cementitious material ratios for each type of mixture, which produce a range of strength encompassing those required for each type of concrete required. Plot a curve for each concrete mixture, showing the relationships between water-cementitious material ratios and compressive strengths. Maximum permissible water-cementitious material ratio must be that value not exceeding the maximum water-cementitious material ratio specified, indicated by the curve to produce a design minimum laboratory compressive strength at 28 calendar days not less than that specified. The mix design report is to contain the project name and number, date, name of Contractor, name of precast concrete wall panel manufacturer, name of concrete testing service, use of concrete mixture (facing or backing), source of concrete aggregates for each mixture. Submit certified copies of laboratory test reports, including mill tests and all other test data, for portland cement, blended cement, pozzolan, ground granulated blast furnace slag, silica fume, and aggregates. The statement must be accompanied by test results from an approved testing laboratory, certifying that the proportions selected will produce concrete of the properties required. Make no substitutions without additional tests to verify that the concrete properties are satisfactory. Concrete must have a 28-day compressive strength of 5,000 psi. Air content of plastic concrete must be between 4 and 6 percent air by volume. Provide a dosage of air entraining agent which will produce 19 plus or minus 3 percent air in a 1 to 4 by weight standard sand mortar in accordance ASTM C185.

If, the compressive strength falls below that specified, adjust the mix proportions and water content and make necessary changes in the temperature, moisture, and curing procedures to secure the specified strength. Notify the Contracting Officer of all changes.

2.1.2 Backing Mixture

Provide the approved mix design.

2.2 MATERIALS

2.2.1 Material Sustainability Criteria

For products in this section, where applicable and to extent allowed by performance criteria, provide and document the following in accordance with Section 01 33 29 SUSTAINABILITY REQUIREMENTS:

a. Recycled content for fly ash and pozzolan
b. Recycled content for Ground Iron Blast-Furnace Slag
c. Recycled content for Silica Fume
d. Recycled content for steel, minimum 25 percent post-consumer
e. Environmental Product Declarations (EPD) for Portland Cement, Slag, and Fly Ash: Provide one of the following EPD options including Product Category Rules (PCR) standard EN 15804 or ISO 21930.

    1. Product-Specific Declaration

    2. Product-Specific Type III EPD

    3. Industry-Wide (Generic) EPD: Provide proof manufacturer is a participant.

2.2.2 Fine Aggregates

ASTM C33/C33M. The optional method of reducing the No. 50 and No. 100 sieve aggregates does not apply. The restriction to use only fine aggregates that do not contain any materials that are deleteriously reactive with alkalis in cement does apply.

2.2.3 Coarse Aggregate

ASTM C33/C33M, Size No. 57, Class 5S. The restriction to use only coarse aggregates that do not contain any materials that are deleteriously reactive with alkalis in cement does apply. Aggregate must not contain slag or crushed concrete.

2.2.4 Cementitious Materials

For exposed concrete, use one manufacturer and one source for each type of cement, ground slag, fly ash, and pozzolan.

2.2.4.1 Fly Ash

ASTM C618, Class F, except that the maximum allowable loss on ignition must not exceed 6 percent. Class F fly ash for use in mitigating Alkali-Silica Reactivity must have a Calcium Oxide (CaO) content of less than 8 percent and a total equivalent alkali content less than 1.5 percent.

Fly ash content must be a minimum of 35 percent by weight of cementitious

material, provided the fly ash does not reduce the amount of cement in the concrete mix below the minimum requirements of local building codes. Where the use of fly ash cannot meet the minimum level, provide the maximum amount of fly ash permittable that meets the code requirements for cement content. Report the chemical analysis of the fly ash in accordance with ASTM C311/C311M. Evaluate and classify fly ash in accordance with ASTM D5759.

2.2.4.2 Raw or Calcined Natural Pozzolan

Natural pozzolan must be raw or calcined and conform to ASTM C618, Class N, including the optional requirements for uniformity and effectiveness in controlling Alkali-Silica reaction and must have an ignition loss not exceeding 3 percent. Class N pozzolan for use in mitigating Alkali-Silica Reactivity must have a Calcium Oxide (CaO) content of less than 13 percent and total equivalent alkali content less than 3 percent.

2.2.4.3 Ultra Fine Fly Ash and Ultra Fine Pozzolan

Ultra Fine Fly Ash (UFFA) and Ultra Fine Pozzolan (UFP) must conform to ASTM C618, Class F or N, and the following additional requirements:

a. The strength activity index at 28 days of age must be at least 95 percent of the control specimens.

b. The average particle size must not exceed 6 microns.

c. The sum of SiO2 + Al2O3 + Fe2O3 must be greater than 77 percent.

2.2.4.4 Ground Granulated Blast-Furnace Slag

ASTM C989/C989M, Grade 120. Slag content must be a minimum of 50 percent by weight of cementitious material.

2.2.4.5 Silica Fume

Silica fume must conform to ASTM C1240, including the optional limits on reactivity with cement alkalis. Silica fume may be furnished as a dry, densified material or as slurry. Proper mixing is essential to accomplish proper distribution of the silica fume and avoid agglomerated silica fume which can react with the alkali in the cement resulting in premature and extensive concrete damage. Supervision at the batch plant, finishing, and curing is essential. Provide at the Contractor's expense the services of a manufacturer's technical representative, experienced in mixing, proportioning, placement procedures, and curing of concrete containing silica fume. This representative must be present on the project prior to and during at least the first 4 days of concrete production and placement using silica fume. A High Range Water Reducer (HRWR) must be used with silica fume.

2.2.4.6 Portland Cement

Provide cement that conforms to ASTM C150/C150M, Type III, with tri-calcium aluminates (C3A) content less than 10 percent and a maximum cement-alkali content of 0.80 percent Na2Oe (sodium oxide) equivalent. Use one brand and type of cement for formed concrete having exposed-to-view finished surfaces.

Supplier must certify that no hazardous waste is used in the fuel mix or

raw materials. Supplier must certify that the hazardous waste is neutralized by the manufacturing process and that no additional pollutants are discharged.

2.2.5 Admixtures

ASTM C260/C260M for air-entraining admixtures. Other admixtures: ASTM C494/C494M. Certify that admixtures are free of chlorides.

2.2.6 Water

Water must comply with the requirements of ASTM C1602/C1602M. Minimize the amount of water in the mix. Improve workability by adjusting the grading rather than by adding water. Water must be potable; free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances deleterious to concrete. Submit test report showing water complies with ASTM C1602/C1602M.

2.2.7 Reinforcement

All exposed steel must be phosphate treated, primed, and coated to prevent rust.

2.2.7.1 Reinforcing Bars

ACI 301 unless otherwise specified. ASTM A615/A615M, Grade 60.

2.2.7.2 Welded Wire Reinforcement

ASTM A1064/A1064M.

2.2.7.3 Supports for Concrete Reinforcement

Include bolsters, chairs, spacers, and other devices necessary for proper spacing, supporting, and fastening in place in accordance with PCI MNL-117.

2.2.8 Prestressing Strands

Prestressing strands need to conform to ASTM A416/A416M Grade 270.

2.2.9 Tie Wire

Tie wire must be soft monel or 18-8 stainless steel.

2.2.10 Plates, Angles, Anchors and Embedment

ASTM A36/A36M, ferrous metal plate connectors for attachment to the structural framing using manufacturer standard construction procedures. Headed studs will use 60,000 psi steel with construction conforming to AWS D1.1/D1.1M, Type B. Deformed bar anchors must conform to ASTM A1064/A1064M. Coat steel items, other than stainless, with a rust-inhibiting paint or provide hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.

Furnish and install anchors, inserts, lifting devices, and other accessories which are to be embedded in the precast units in accordance with the approved detail drawings. Embedded items must be accurately positioned in their designed location, and have sufficient anchorage and embedment to satisfy design requirements.

2.2.11 Form Release Agent

Release agent must be manufacturer's standard non-staining type.

2.2.12 Grout

Packaged, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107/C1107M, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C1218/C1218M.

2.3 CAST-IN EMBEDDED ITEMS AND CONNECTORS

2.3.1 Inserts

2.3.1.1 Threaded-Type Concrete Inserts

ASTM A47/A47M, Grade 32510 or 35018, or may be medium strength cast steel conforming to ASTM A27/A27M, Grade U-60-30. Provide galvanized ferrous casting having enlarged base with two nailing lugs minimum length less than the thickness of panel less 3/4 inch, and internally threaded to receive 3/4 inch diameter machine bolt. Ferrous castings must be ferritic malleable iron. Provide inserts hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.

2.3.1.2 Wedge-Type Concrete Inserts

Provide galvanized, box-type ferrous castings with integral anchor loop at back of box to accept 3/4 inch diameter bolts having special wedge-shaped head. Provide ferrous castings ASTM A47/A47M, Grade 32510 or 35018, ferritic malleable iron or ASTM A27/A27M, Grade U-60-30, medium-strength cast steel. Provide inserts hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.

2.3.1.3 Slotted-Type Concrete Inserts

Provide pressed steel plate, welded construction, box type with slot to receive 3/4 inch diameter square head bolt, and provide lateral adjustment of bolt. Length of insert body, less anchorage lugs, must be 4 1/2 inches minimum. Provide insert with knockout cover. Steel plate must be 1/8 inch minimum thickness, ASTM A283/A283M, Grade C. Provide inserts hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.

2.3.2 Connection Devices

2.3.2.1 Clip Angles

ASTM A36/A36M steel, galvanized after fabrication in accordance with ASTM A153/A153M.

2.3.2.2 Ferrous Casting Clamps

ASTM A47/A47M, Grade 32510 or Grade 35018 malleable iron or cast steel, or ASTM A27/A27M, Grade 60-30, cast steel casting, hot-dip galvanized in accordance with ASTM A153/A153M.

2.3.2.3 Threaded Fasteners

Provide galvanized machine bolts, washers and, when required, nuts.

a. Bolts: ASTM A449, 3/4 inch diameter machine bolts with hexagon head.

b. Washers: ASME B18.21.1, medium or heavy lock-spring washers.

c. Nuts: ASTM A563, Grade C, heavy, hexagon-type nuts.

d. Square Nuts: ASTM A563, Grade A, plain, square-type nuts where required for slotted-type concrete inserts.

2.4 PRECAST ELEMENT FABRICATION

2.4.1 Formwork and Fabrication Tolerances

Provide forms and form-facing materials of wood, metal, plastic, or other approved material to produce concrete having the specified finish. Construct forms mortar-tight and of sufficient strength to withstand all pressures due to concrete placing operations and temperature changes. Brace and stiffen against deformation. Provide form liners where required to produce indicated finish. Provide dimensional tolerances per PCI MNL-117.

2.4.2 Reinforcement

ACI 301. Place reinforcing bars and welded wire reinforcement. Secure in position with tie wires, bar supports, and spacers.

2.4.3 Preparation for Placing Concrete

Remove hardened concrete, excess form parting compound, standing water, ice, snow, or other deleterious substances from form interiors and reinforcement before concrete placement. Secure reinforcement and embedded items.

2.4.4 Concrete Mixing and Conveying

2.4.4.1 Batch Plant, Mixer, Mixing, and Measuring of Materials

ASTM C94/C94M.

2.4.4.2 Conveying

Prevent segregation and loss of materials.

2.4.5 Concrete Placing

ACI 304R. Deposit concrete in the forms continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the precast concrete units. Place concrete at a constant temperature of between 50 and 90 degrees F throughout fabrication of each unit. Make temperature of forms or molds the same as or close to the concrete temperature. For hot or cold weather, use methods recommended by ACI 305R and ACI 306.1. Vibrate and consolidate concrete to prevent segregation

and to produce a high-density concrete free of honeycomb and rock pockets. When specified, the exposed-to-view facing mixture is required to be a minimum thickness of 3/4 inches. Place backing mixture before facing mixture attains initial set.

2.4.6 Identification Markings

Permanently mark each precast unit to indicate pick-up points, location, orientation in the building, and date of casting. Identification markings need to correlate with approved detail drawings. Do not locate in exposed-to-view finished surfaces.

2.4.7 Finishing

2.4.7.1 Unformed Concealed Surfaces (Standard Smooth Finish)

Provide a trowel finish. Level surface with a straightedge, and strike off. After surface water has disappeared, float and trowel surface. Provide smooth finished surface, free of trowel marks, and uniform in texture and appearance.

2.4.7.2 Other Surfaces

Provide precast panel finish with thin set brick and cast stone as indicated. Surfaces of precast units not exposed to view or not otherwise indicated to be finished are to be finished in accordance with ACI 301 for a Surface Finish of 1.0.

2.4.8 Curing

Provide moist or steam curing or curing compound. Do not remove precast units from forms; prevent moisture loss and maintain 50 degrees F minimum for at least 24 hours after finishing. Maintain precast units in a surface damp condition at 50 degrees F minimum until concrete has attained 75 percent minimum of the design compressive strength. Do not use steam curing with wood forms or in connection with chemically retarded exposed aggregate surfaces.

2.4.9 Repair of Surface Defects

Cut out defective areas to solid concrete, with edges of cuts perpendicular to the surface of the concrete, and clean thoroughly. Dampen area to be patched and brush-coat with nonshrink grout or bonding agent. Patch the surface in accordance with procedures previously submitted by the Contractor and approved by the Contracting Officer. Where exposed to view, the patches, when dry, needs to be indistinguishable from the surrounding surfaces.

2.4.9.1 Smooth, Concealed Surfaces

Acceptable defective area will be limited to holes left by rods and other temporary inserts, and to honeycomb or rock pockets of 1/4 inch diameter maximum. Remove fins and other projections on the surfaces.

2.4.9.2 Exposed-to-View Surfaces

The combined area of acceptable defective areas must not exceed 0.2 percent of the exposed-to-view surface area and will be limited to holes of 1/4 inch diameter maximum.

2.4.10 Stripping

Do not remove precast concrete units from forms until units develop sufficient strength to safely strip the formwork and to remove the precast concrete units from the forms to prevent damage to the units from overstress or chipping.

2.4.11 Built-In Anchorage Devices

Accurately position and securely anchor all anchorage devices. Openings in anchorage devices must be filled temporarily to prevent entry of concrete.

2.4.12 Lifting Devices

Lifting devices must be provided, and designed for a safety factor of 4, which includes 100 percent impact. Do not use brittle material.

2.4.13 Finishing for Formed Surfaces

Upon removal of forms, repair and patch defective areas. Where the finished surface will be exposed to view, the combined area of defective areas must not exceed 0.2 percent of the surface and will be limited to honeycomb or rock pockets not deep enough to expose the reinforcement. Where the finished surface will be concealed by other construction, defective areas are limited to holes left by the rods and other temporary inserts and honeycomb or rock pockets not deep enough to expose the reinforcement. Defective areas must be cut out to solid concrete, cleaned, and patched with grout. Where concrete surface will be exposed to view, the patches, when dry, must be indistinguishable from the surrounding surfaces.

2.5 JOINT MATERIALS

Gasket must be elastomeric material, premolded to cross section indicated.

Material must be a vulcanized closed-cell expanded chloroprene conforming to ASTM D1056, Grade No. 2A2, with the following additional properties:

Brittleness temperature will be minus 40 degrees F when tested in accordance with ASTM D746.

Flammability resistance needs to be self-extinguishing when tested in accordance with ASTM D635.

Resistance to ozone must be "no cracks" after exposure of a sample, at 20 percent elongation, to an ozone concentration of 100 parts per million of air by volume in air for 100 hours at 104 degrees F when tested in accordance with ASTM D1149.

2.6 MISCELLANEOUS ARCHITECTURAL PRECAST CONCRETE SYSTEMS

2.6.1 Thin Brick Veneer

Not less than 1/2 inch or more than 1 inch thick, and as follows:

1. Dimensional Tolerances: Plus 0 inch or minus 1/16 inch for any dimension 8 inches or less and plus 0 inch or minus 3/32 inch for any

dimension more than 8 inches.

2. Out-of-Square Tolerance: Plus or minus 1/16 inch.

3. Warpage Tolerance: Plus 0 inch or minus 1/16 inch.

4. Variation of Shape from Specified Angle: Plus or minus one degree.

5. Modulus of Rupture: Not less than 250 psi when tested according to ASTM C67/C67M.

6. Tensile Bond Strength: Not less than 150 psi when tested before and after freeze-thaw test according to ASTM E488/E488M as modified: Adhere a steel plate with a welded rod on a single thin-brick face with epoxy for each test.

7. 24-Hour Cold-Water Absorption: Not more than 6 percent when tested according to ASTM C67/C67M.

8. Freeze-Thaw Resistance: No detectable disintegration or separation after 300 freezing-and-thawing cycles when tested according to ASTM C666/C666M, Method B.

9. Chemical Resistance: Tested according to ASTM C650 and rated "not affected."

10. Efflorescence: Tested according to ASTM C67/C67M and rated "not effloresced."

11. Surface Coating: Thin brick with colors or textures applied as coatings must withstand 50 cycles of freezing and thawing; ASTM C67/C67M with no observable difference in applied finish when viewed from 10 feet.

12. Back Surface Texture: Scored, combed, wire roughened, ribbed, keybacked, or dovetailed.

13. Face Size: 3-5/8 inches high by 7-5/8 inches long.

Submit the following for thin brick veneer:

a. Brick Color chips representing color and size of each brick type to be used.

b. Form Liner Samples representing all brick inlay form liners which will be used.

c. Bond breaker sample on brick chip representing bond breaker which will be used.

d. Printed product data and installation instructions for brick inlay form liner system, and brick.

2.6.1.1 Sand-Cement Mortar

Portland cement, ASTM C150/C150M, Type I, and clean, natural sand, ASTM C144. Mix at ratio of 1 part cement to 4 parts sand, by volume, with minimum water required for placement.

2.6.1.2 Pointing Grout

Packaged, polymer-modified, sanded grout complying with ANSI A118.7.

2.6.1.3 Thin Brick Facing

a. Place form liner templates accurately to provide grid for thin-brick facings. Provide solid backing and supports to maintain stability of liners while placing thin bricks and during concrete placement.

b. Securely place thin-brick units face down into form liner pockets and place concrete backing mixture.
c. Completely fill joint cavities between thin-brick units with sand-cement mortar, and place precast concrete backing mixture while sand-cement mortar is still fluid enough to ensure bond.

d. Mix and install pointing grout according to ANSI A108/A118/A136.1. Completely fill joint cavities between thin-brick units with pointing grout, and compress into place without spreading grout onto faces of thin-brick units. Remove excess grout immediately to prevent staining of thin brick.

PART 3 EXECUTION

3.1 PREPARATION

Deliver anchorage devices to the site in time to be installed before the start of concrete placing or during steel erection. Contractor must provide setting drawings, instructions, and directions for the installation of anchorage devices.

3.2 EXAMINATION

Do not begin installation until supporting structures have been properly prepared.

Verify that all parts of the supporting structure are complete and ready to receive the precast units and that site conditions are conducive to proper installation.

If support structure is the responsibility of another installer, notify Contracting Officer of unsatisfactory preparation before proceeding.

3.3 INSTALLATION

Install precast concrete units and accessories in accordance with approve detail drawings and descriptive data, and as specified below.

3.3.1 Building Framing System

Provide supporting members, including anchorage items attached to or embedded in building structural elements, prior to placement of precast units.

3.3.2 Concrete Strength at Time of Precast Unit Installation

Do not install precast units until concrete has attained the minimum laboratory compressive strength at 28 calendar days specified.

Do not install precast units before 28 calendar days from the date of casting unless approval has been obtained to make one compressive strength test, ASTM C39/C39M, and one flexural strength test using simple beam with third-point loading, ASTM C78/C78M, on field cured concrete test specimens, ASTM C31/C31M, for each individual precast unit to determine the strength of the concrete.

3.3.3 Erection

rect precast units in accordance with the detail drawings and without damage to other units or to adjacent members. Set units true to alignment and level, with joints properly spaced and aligned both vertically and horizontally. Erection tolerances must be in accordance with the requirements of PCI MNL-117 and PCI MNL-122. As units are being erected, shims and wedges will be placed as required to maintain correct alignment. After final attachment, grout precast units as shown. After erection, clean and touch-up welds and abraded surfaces of steel with a zinc-rich paint. Welds must be made by a certified welder in accordance with the manufacturer's erection drawings. Finish pickup points, boxouts, inserts, and similar items to match adjacent areas after erection. Erection of precast units must be supervised and performed by workmen skilled in this type of work. Welding and the qualifications of welders must be in accordance with AWS D1.1/D1.1M.

3.3.4 Erection Tolerances

Erect architectural precast concrete units level, plumb, square and in alignment without exceeding the noncumulative erection tolerances of PCI MNL-117, Appendix I.

3.3.5 Joints

Joint widths between precast units will be as specified unless otherwise indicated.

3.3.5.1 Joint Sealing

Joint sealing will be as specified in Section 07 92 00 JOINT SEALANTS.

3.3.6 Protection

Protect exposed-to-view facing from staining and other damage from subsequent operations. Do not allow laitance to penetrate, stain, or harden on exposed surfaces.

3.4 DEFECTIVE WORK

Repair precast concrete units damaged during erection as soon after occurrence as possible or replaced, as directed, using approved procedures. All repairs to precast concrete units must match the adjacent surfaces in color and texture, as approved. Unless otherwise approved, repair procedures will conform to PCI MNL-117.

3.5 JOINTS AND GASKETS

Joints between precast units must be the width indicated and within limits of installation tolerances.

Install gaskets in joints as indicated, continuous throughout the joint

length, and compressed at least 25 percent by volume.

3.6 INSPECTION AND ACCEPTANCE PROVISIONS

3.6.1 Dimensional Tolerances

Precast units having dimensions outside the limits for fabrication tolerances will be rejected.

3.6.2 Surface Finish Requirements

Precast units will be rejected for the following surface finish deficiencies:

Exposed-to-view surfaces that do not match the color, aggregate size and distribution, and texture of the approved sample

Exposed-to-view surfaces that contain defects that affect the appearance of the finish, such as cracks, spalls, honeycomb, rock pockets, or stains and discoloration of aggregate or matrix that cannot be removed by cleaning

Concealed surfaces that contain cracks in excess of 0.01 inch wide, cracks that penetrate to the reinforcement regardless of width, honeycomb, rock pockets, and spalls except minor breakage at corners and edges

3.6.3 Strength of Precast Units

Strength of precast concrete units will be considered potentially deficient if the units fail to comply with the requirements that control the strength of the units, including the following conditions:

Failure to meet compressive strength tests

Reinforcement not conforming to the requirements specified

Concrete curing and protection of precast units against extremes of temperature during curing not conforming to the requirements specified

Precast units damaged during handling and erection

3.6.4 Testing Precast Units for Strength

When there is evidence that the strength of precast concrete units does not meet specification requirements, cores drilled from hardened concrete for compressive strength determination must be made in accordance with ASTM C42/C42M and as follows:

Take at least three representative cores from the precast-concrete units that are considered potentially deficient.

Test cores with the saturated surface dry.

Strength of cores will be considered satisfactory if their average is equal to or greater than 90 percent of the 28-day design compressive strength of 6 by 12 inch cylinders.

Submit test reports on the same day that tests are made. Reports must

contain the project name and number, date, name of contractor, name of precast concrete wall units manufacturer, name of concrete-testing service, identification letter and number of units represented by core tests, nominal maximum size of aggregate, design compressive strength of concrete at 28 calendar days, compressive breaking strength and type of break, length of core test specimen before capping, compressive strength after correcting for length diameter ratio, direction of application of the load on the core test specimen with respect to the horizontal plane of the concrete as placed, and the moisture condition of the core test specimen at time of testing.

If the results of the core tests are unsatisfactory or if core tests are impractical to obtain, a static load tests of a precast unit will be evaluated in accordance with ACI 318.

Replace precast units used for core tests or static load tests with units that meet the requirements of this section.

3.7 SAMPLING AND TESTING

3.7.1 Rejection

Precast units in place may be rejected for any one of the following product defects or installation deficiencies remaining after repairs and cleaning have been accomplished. "Visible" means visible to a person with normal eyesight when viewed from a distance of 20 feet in broad daylight.

a. Nonconformance to specified tolerances.

b. Air voids (bugholes or blowholes) larger than 3/8 inch diameter.

c. Visible casting lines.

d. Visible from joints.

e. Visible irregularities.

f. Visible stains on precast unit surfaces.

g. Visible differences between precast unit and approved sample.

h. Visible non-uniformity of textures or color.

i. Visible areas of backup concrete bleeding through the facing concrete.

j. Visible foreign material embedded in the face.

k. Visible repairs.

l. Visible reinforcement shadow lines.

m. Visible cracks.

n. Precast units that are damaged during construction operations.

3.7.2 Field Quality Control

Perform field inspection of precast unit connections. Notify the

Contracting Officer in writing of defective welds, bolts, nuts and washers within 7 working days of the date of inspection. All defective connections or welds are to be removed and re-welded or repaired as required by the Contracting Officer.

3.7.2.1 Welded Connection Visual Inspection

AWS D1.1/D1.1M, furnish the services of AWS-certified welding inspector for erection inspections. Welding inspector must visually inspect all welds and identify all defective welds.

3.8 CLEANING

Clean exposed-to-view surfaces of precast units thoroughly with detergent and water; use a brush to remove foreign matter. Remove stains that remain after washing in accordance with recommendations of the precast manufacturer. Surfaces must be clean and uniform in color. Include precast concrete wall panel manufacturer's written recommendations for installation and cleaning.

-- End of Section --

SECTION 04 03 00

CONSERVATION TREATMENT FOR PERIOD MASONRY
11/17

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH 0100	(2015; Suppl 2002-2016) Documentation of the Threshold Limit Values and Biological Exposure Indices

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM C10	(2019) Standard Specification for Natural Cement
ASTM C67/C67M	(2020) Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile
ASTM C144	(2018) Standard Specification for Aggregate for Masonry Mortar
ASTM C150/C150M	(2020) Standard Specification for Portland Cement
ASTM C207	(2018) Standard Specification for Hydrated Lime for Masonry Purposes
ASTM C216	(2019) Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale)
ASTM C979/C979M	(2016) Standard Specification for Pigments for Integrally Colored Concrete
ASTM C1196	(2014) Standard Test Method for In Situ Compressive Stress Within Solid Unit Masonry Esitmated Using Flatjack Measurements
ASTM C1197	(2014) Standard Test Method for In Situ Measurement of Masonry Deformability Properties Using the Flatjack Method
ASTM C1324	(2020) Standard Test Method for Examination and Analysis of Hardened

	Masonry Mortar
ASTM C1531	(2015) Standard Test Methods for In Situ Measurement of Masonry Mortar Joint Shear Strength Index
ASTM C1601	(2014) Standard Test Method for Field Measurement of Water Penetration of Masonry Wall Surfaces
ASTM C1713	(2012) Standard Specification for Mortars for the Repair of Historic Masonry
ASTM E96/E96M	(2016) Standard Test Methods for Water Vapor Transmission of Materials
ASTM E2260	(2012) Standard Guide for Repointing (Tuckpointing) Historic Masonry
ASTM E2659	(2018) Standard Practice for Certificate Programs

NATIONAL PARK SERVICE (NPS)

NPS Hist Prop	(2017) National Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings
NPS TPS Brief 1	(2000) Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings
NPS TPS Brief 2	(1998) Repointing Mortar Joints in Historic Masonry Buildings

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

GSA HPTP 07656-01	Installing Lead Stone Flashing to Protect Masonry Joints

1.2 DEFINITIONS

Terms are defined below as applicable to this project.

1.2.1 Aggregates

The sand component of mortar.

1.2.2 Binder

The component of mortar that binds together the aggregate particles into a cohesive material.

1.2.3 Lime Crack Injection

A repair method in which restoration grout material is injected into small cracks ranging in width from hairline to 1/8 in by use of needle or

syringe.

1.2.4 Dutchman

A repair method in which deteriorated stone is removed in part and replaced with salvaged, harvested or new stone to make a seamless patch.

1.2.5 In situ

A term referencing a repair procedure in which the masonry units and mortar remain in place and are repaired without removal from the wall system

1.2.6 Joint Sealant

A flexible, chemical product that is used to create a weather-tight seal at the boundary of masonry units with other units or dissimilar materials.

1.2.7 Lead Flashing

An extruded lead material that is inserted into joints to assist in precluding water entry into the masonry.

1.2.8 Mockup

Specific area on the building approved by Contracting Officer to demonstrate the ability to apply, match and install specified materials.

1.2.9 Mortar

A mixture of binders, aggregates, and pigments used for reconstruction, repointing or stucco applications.

1.2.10 New Elements

New, non-historic materials added to masonry structures to aid in their ability to resist loads (typically seismic) or to resist water infiltration.

1.2.11 Patch

The use of substitute repair materials to treat damaged or deteriorated masonry units in situ.

1.2.12 Remediate

An intervention of a historic masonry structure and its component materials with the intent to maintain the original fabric to the greatest extent possible.

1.2.13 Remove

Specifically for historic masonry materials, the term means to detach an item from existing construction to the limits indicated.

1.2.14 Replace

To reinstall an item in its original position (or where indicated) after remedial treatment, or to duplicate and reinstall an entire item with new

material; with the original item serving as the pattern for creating the duplicate.

1.2.15 Repoint

To remove existing mortar joints to the specified depth and replace with a mortar that matches in color, texture, and performance with water vapor transmission, bond, hardness, and flexibility compatible with original mortar, as assessed in accordance with ASTM C1713.

1.2.16 Test Panel

Specific area on the building approved by the Contracting Officer to demonstrate individual applicator competency and workmanship proficiency prior to the start of restoration work.

1.2.17 Wall System

A term used to address the fact that masonry structures are comprised of different materials but function holistically, requiring that all restoration and cleaning process take into account the implications of the treatment to the adjacent materials and the building as a whole.

1.2.18 Masonry Treatment Requirement (MTR)

Defined treatments that are required by the specification (contract) documents for project specific repairs to masonry.

1.2.19 Saturated Surface Dry (SSD)

Condition of the wall surface after water has been applied sufficient to saturate more than the surface, then allowed to dry until the surface is dry but the body of the masonry still has moisture.

1.3 ADMINISTRATIVE REQUIREMENTS

1.3.1 Pre-Installation Meeting

Prior to beginning the work of this Section, convene a meeting with the Contracting Officer's Representative(s) to review the requirements of the Quality Control Plan, Project Training Program, installation procedures, location of required mockup areas, and all job conditions and processes. All subcontracting firms involved with this work must participate in this meeting.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Quality Control Plan; G

Project Training Program; G

Qualifications; G

SD-02 Shop Drawings; G

Photographic Documentation

SD-03 Product Data

Qualifications

Cleaning and Restoration Methods; G

Cleaning Materials; G

Repair Materials; G

Replacement Mortar; G

Mortar Mix; G

SD-04 Samples

Mock-ups; G

Repair Materials; G

SD-06 Test Reports

Testing and Matching

SD-07 Certificates

Repair Materials

1.5 QUALITY CONTROL

1.5.1 Quality Control Plan

Prior to beginning restoration and cleaning work, submit a written Quality Control Plan. Do not proceed without written approval of the Quality Control Plan. At a minimum, include the following items in the Quality Control Plan:

a. Describe methods of dust containment during the work specific to the work of this section.

b. Describe the methods of protecting surrounding masonry, windows, doors, roof, and building trim as well as surrounding landscape. Provide drawings of protection when requested.

c. Describe the work procedures, materials, and proposed tools to use for each Masonry Treatment Requirement (MTR) specified.

d. Describe the sequence of each MTR.

e. Describe how each MTR sequence and the overall construction schedule changes with weather variations and how completed work will be

protected.

f. Describe the methods for surveying original layout and collecting datum points and plumb lines for rebuilding masonry.

g. Describe the methods for shoring and providing a safe working environment.

h. Describe the methods for select deconstruction of individual masonry units and tools/methods for cleaning the masonry for reuse.

i. Describe the method and approach to mortar joint removal.

j. Describe the method and approach for assuring repair material compatibility with original materials.

k. Describe the method and approach to cleaning mortar, coating, smears and old patching materials from the masonry surfaces.

l. Describe, in detail, the procedures relating to techniques and tools proposed for masonry matching.

m. Describe the complete masonry removal and matching procedures; include equipment, approach, length of time the masonry will be out of the wall, documentation on mapping the location, and where (on-site or in shop) the masonry units will be repaired.

n. Describe the procedure for matching of different colors at different locations.

o. Describe the procedure for mixing and matching of repair materials.

p. Describe the methods and system by which the use of reclaimed masonry units can be utilized.

q. Describe the methods for setting masonry back into its original position and maintaining the original bond patterns and joint width.

r. Describe the methods of transition points where replacement/preservation work will meet the original historic work.

s. Describe the on-site project training program. Provide the opportunity for workers to be trained in each masonry treatment requirement (MTR) as work proceeds.

t. Describe how effluent will be collected and disposed of during the cleaning process in accordance with federal, state, and local regulations.

1.5.2 Qualifications

1.5.2.1 Historic Masonry Consultant

a. Secure the services of a historic masonry consultant with a minimum of 10 years experience applying NPS Hist Prop as they relate to the work in this section.

b. Submit a resume that describes five relevant projects within that period and include how NPS Hist Prop was applied to the work of

similar scope and scale and what jurisdiction or agency was involved in approving the work..

c. The consultant's services include:

(1) Investigating the condition of the masonry materials and mortar.

(2) Arranging for material analysis in the laboratory

(3) Recommending appropriate cleaning methods and materials

(4) Recommending restoration options.

(5) Providing project specific specifications.

(6) Providing an on-site training program.

(7) Providing quality control services during construction.

(8) Recommending appropriate repair and restoration materials.

1.5.2.2 Masonry Firm

a. The firm performing the masonry work must have a minimum of five years experience on relevant projects.

b. The firm must have completed work similar in material, design, and extent to that indicated for this Project and demonstrate a record of successful in-service performance.

c. Proven implementation of NPS Hist Prop and related Preservation Briefs are required.

d. Submit a resume that describes the required experience.

1.5.2.3 Field Supervisor

Retain an experienced full-time supervisor on the project site at all times when masonry restoration is in progress. A single individual must be responsible for supervising the historic masonry restoration work throughout the duration of the project.

Submit a resume that describes the required experience.

1.5.2.4 Masonry Applicator

a. Employ craftspeople who are experienced with and specialize in restoration work of the types they will be performing.

b. All masonry restoration treatments must be performed by a craftsperson that is familiar with historic masonry construction and has worked on historic masonry projects for at least five years.

c. Only skilled technicians who are familiar and experienced with the materials and methods specified may be used.

d. Submit resumes for all historic masonry applicators, demonstrating the required experience.

1.5.3 Project Training Definition and Use

In addition to five years demonstrable experience on masonry restoration projects, offer workers project training certificate(s) within the framework of ASTM E2659. Project training certificates are earned by individual workers and issued with the understanding that they are for limited time use, enforceable only to this specific project and for a specific MTR. It is not necessary, nor a requirement of this specification, that all restoration workers obtain all project training certificates offered. Rather it is desirable that workers be trained for each project specific task they will perform to ensure the highest quality results from the cleaning and restoration program.

1.5.4 Mortar Analyst

Laboratory mortar analysis equipment should be operated by and results analyzed by trained personnel experienced with analysis of historic masonry mortar.

1.5.5 Documentation

Submit digital photographic documentation of the all phases of masonry restoration, including prior to the start of restoration work.

Provide thorough photo documentation of the project and project details and targeted areas.

1.5.6 Cleaning and Restoration Methods

1.5.6.1 General Procedure

a. Submit the cleaning and restoration methods, and materials selected for a specific structure for approval before work starts.

b. Take into account the total construction system of the building to be worked upon, including different masonry and mortar materials, as well as non-masonry elements which may be affected by the work.

c. Utilize mockups to identify the appropriate cleaning and restoration treatment and materials and set the standard for each project task.

d. Demonstrate the correct execution of the approved cleaning and restoration methods and materials during the on-site workmanship training program within the framework of ASTM E2659.

1.5.6.2 Cleaning Products and Procedures

1.5.6.2.1 General Cleaning Requirements

a. Establish cleaning products and procedures during the mockup process.

b. Select the least aggressive method used to achieve the desired level of cleanliness.

c. Where chemical products are selected for cleaning, use them in accordance with the manufacturer's instructions.

1.5.6.2.2 Cleaning Mock-Ups

a. Demonstrate the materials, equipment, and methods to be used in cleaning in a test section approximately 3 feet by 3 feet or as limited by the amount of soiling.

b. Locate test patches in inconspicuous areas of the building. The areas tested are subject to approval by the Contracting Officer. The areas tested must exhibit soiling characteristics representative of those larger areas to be cleaned.

c. Adjust the cleaning process as required and the test section rerun until an acceptable process is obtained.

d. Conduct tests on areas to be stripped of paint.

e. Allow tested areas to dry before a determination is made on the effectiveness of a particular treatment.

1.5.7 Masonry Restoration Products and Procedures

1.5.7.1 General Restoration Requirements

a. Do not use masonry or mortar in the work until the mock-ups and the represented material and workmanship have been submitted and approved.

b. Demonstrate the methods and quality of workmanship to be performed in each masonry treatment requirement (MTR). Provide a mock-up for each MTR indicated.

1.5.7.2 General Restoration Mock-Up Requirements

a. Throughout restoration, retain approved mock-up panels in undisturbed condition, suitably marked, as a standard for judging completed work.

b. Review manufacturer's product data sheets to determine suitability of each product for each surface.

c. Apply products using manufacturer-approved application methods, determining actual requirements for application.

d. Obtain approval as to the preservation treatment approach, design, and workmanship to include, but not limited to the verification of all material applications and finishes as specified to the requirements of color, texture, profiles, and finishes before proceeding with work.

1.5.7.2.1 Mock-ups

May be performed on inconspicuous sections of actual construction under the same weather conditions expected the remainder of the work.

a. Location and number as directed.

b. Size: 3 feet by 3 feet or as appropriate for the repair specified.

c. Repair unacceptable work. Repeat mock-ups until approval is achieved.

1.5.7.3 Restoration Mock-Ups

1.5.7.3.1 Repointing

Repoint mortar joints, minimum acceptable mock up dimensions: twelve feet in length - 2/3 horizontal joints and 1/3 vertical joints. Demonstrate method for cutting out mortar joints, preparing wall for repointing, mixing mortar, installing mortar and curing the mortar. Prepare and place repointing mortar in accordance with NPS TPS Brief 2 and in compliance with NPS Hist Prop. Perform a repointing mock-up for cast stone, brick, and stone masonry.

1.5.7.3.2 Masonry Removal and Replacement

Fully remove masonry and replace to specified dimensions and texture. Select size of masonry units representing typical conditions. Return one masonry unit to same location, set to surrounding profile joint width and bond pattern. Set masonry unit using specified mortar. Confirm with Contracting Officer's Representative that the replacement masonry units meet specification requirements for matching and that sufficient quantity required for the work have been identified. Leave one stone dry-set into opening set on wood shims for evaluation and approval of preparation conditions. Perform removal and replacement mock-ups for the brick.

1.5.7.3.3 Repair Material

1.5.7.3.3.1 Patching

Apply repair material on at least two cast stone masonry units for repair. Include one masonry unit on which to demonstrate proficiency in removing previous patching or deteriorated material and repairing with new substitute repair material.

1.5.7.3.4 Crack Repair

Repair one crack, 2 feet in length, using mortar. Repair one crack, 2 feet in length, using restoration grout injection technique with appropriate repair material.

1.5.7.3.5 New Masonry Elements

Install new components in a manner demonstrating their final installation on the structure.

1.6 DELIVERY, STORAGE, AND HANDLING

a. Furnish cement in suitable bags used for packaging cements.

b. Provide packages with labeling that clearly defines contents, manufacturer, and batch identification.

c. Provide detergents, masonry cleaners, paint removers, solvents, epoxies and other chemicals used for masonry cleaning in sealed containers that legibly show the designated name, formula or specification number, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name of manufacturer.

d. Store materials in weathertight structures which will protect all

materials from moisture and contaminants.

e. Store accessories to avoid contamination and deterioration.

f. Do not use admixtures which have been in storage onsite for six months or longer, or which have been subjected to freezing, unless retested and proven to meet the specified requirements.

1.7 PROJECT/SITE CONDITIONS

1.7.1 Environmental Requirements

a. Do not place materials when weather conditions adversely affect the quality of the finished product.

b. Do not place masonry or mortar when the air or surface temperature is below 40 degrees F in the shade and will remain so for at least 48 hours after completion of the work. Heated enclosures may be used to overcome ambient weather restrictions, where such enclosures are feasible.

c. Do not place masonry or mortar when air or surface temperature is above 90 degrees F with a wind speed above8 miles per hour and will remain so for at least 48 hours after completion of the work.

d. Do not place masonry or mortar when air or surface temperature is above 100 degrees F with or without wind and will remain so for at least 48 ours after completion of the work.

e. Do not place materials during periods of rain or other precipitation. Stop material placements, and protect all in-place material from exposure, during periods of rain or other precipitation.

f. Clean masonry surfaces when air temperatures are above 40 degrees F and will remain so until masonry has dried out, but for not less than 7 days after completion of the work.

g. Do not perform work in wind conditions that may blow materials onto surfaces not intended to be treated.

1.7.2 Masonry Installation Requirements

a. Phase work during hot weather by performing work on the shady side(s) of the building during daylight hours and on the daylight side(s) of the building during cooler evening hours to prevent premature evaporation of the water from the mortar.

b. Do not use frozen materials or materials mixed or coated with ice or frost. Do not apply materials to frozen surfaces; allow complete thawing prior to installation.

c. Do not lower the freezing point of mortar by the use of admixtures or anti-freeze agents. Do not add chlorides or admixtures to the mortar.

d. Prevent mortar from staining the face of the masonry or other exposed surfaces. Immediately remove mortar that comes in contact with such surfaces. Cover partially completed work when work is not in progress. Protect sills, ledges and projections from mortar droppings. Building damage resulting from work of this Section is the

Contractor's responsibility. Restore damaged areas to the satisfaction of the Owner at no expense to the Owner. Do not apply products under conditions outside product manufacturer's requirements.

1.8 WARRANTY

1.8.1 Cleaning Warranty

Warrant cleaning procedures for a period of two years against harm to substrate (masonry and mortar) or to adjacent materials including, but not limited to discoloration of substrate from improper procedures or usage, chemical damage from inadequate rinse procedures, and abrasive damage from improper procedures.

1.8.2 Repair Warranty

Warrant repair procedures, including repointing, for a period of two years against: discoloration or mismatch of new mortar to adjacent original historic mortar, discoloration or damage to masonry from improper mortar clean-up, loss of bond between masonry and mortar, fracturing of masonry edges from improper mortar joint preparation procedures or improper mortar formulation, and occurrence of efflorescence from improper repair procedures.

PART 2 PRODUCTS

2.1 CLEANING MATERIALS

2.1.1 General Requirements

Selection of appropriate cleaning products requires a clear understanding of the masonry materials to be cleaned, a rationale for the cleaning, and an understanding of the anticipated level of cleanliness expected from the cleaning program. Overly aggressive cleaning methods and materials can cause subtle, long-term damage to masonry units. Use products that have a minimum 5 year performance record on relevant projects. Select the products predicated on long-term negative effects to the masonry rather than current level of cleanliness of the comparable structure.

2.1.2 Paint Removers

a. Provide chemical paint removers that are water soluble, low toxicity products, effective for removal of paint on masonry without altering, damaging, or discoloring the masonry surface.

b. Provide commercially available poulticing materials designed to adhere to and peel off paint without damaging the underlying masonry or project specific mixtures that include absorbent materials and cleaning solutions which can be demonstrated to do no harm to the masonry.

2.1.3 Chemical Cleaners

a. Provide commercially available products that have a proven record of cleaning masonry without altering, damaging or discoloring the masonry units, mortar or surrounding materials.

b. Soiling conditions to be addressed include biological growth,

carbonate crusts, iron stains, and copper stains.

c. Provide the associated pre and post treatment material to neutralize the long term effects of the chemicals.

2.1.4 Liquid Strippable Masking Agent

Provide manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from the damaging effect of acidic and alkaline masonry cleaners.

2.1.5 Cleaning Implements

Furnish brushes that contain natural or nylon fiber bristles only. Do not use metallic wire brushes. Use scrapers and application paddles made of wood with rounded edges. Metallic tools are not permitted.

2.1.6 Water

Obtain potable water from a local source.

2.2 REPAIR MATERIALS

2.2.1 General

Use repair materials of one type and from one source, when used in repair treatments that will have surfaces exposed in the finished structure.

2.2.2 Mortar

2.2.2.1 Testing and Matching

a. Take test specimens of existing mortar from a sound and intact representative portion of the structure, at locations indicated by the Contracting Officer's Representative and assess in accordance with ASTM C1713 and ASTM C1324.

b. Subject a part of the historic mortar sample to petrographic examination and differential thermal analysis, or X-ray diffraction, or analytical chemistry to determine the binder components.

c. Aggregate Analysis

(1) Separate aggregate of the mortar sample from the binder by chemically separating the aggregate from the binder.

(2) Rinse the separated aggregate clean with water and dry. Microscopically examine the aggregate, and record the component materials as to range of materials, sizes, colors, as well as the presence of other materials.

(3) Perform sand analysis using a sieve analysis of the aggregate as part of the ASTM C1324 process.

d. Match the replacement mortar to the original existing material in color, texture and tooling.

2.2.2.2 Replacement Mortar

Provide replacement mortar that will:

a. Coexist with the old in a sympathetic, supportive and, if necessary, sacrificial capacity.

b. Have greater vapor permeability and be softer (measured in compressive strength) than the masonry units.

(1) Measure water vapor transmission in accordance with ASTM E96/E96M.

(2) Prepare ASTM E96/E96M water vapor transmission specimens with thickness similar to that expected in service, or a maximum of 1/2 inch, whichever is thinner.

c. Be as vapor permeable, and as soft, as existing historic mortar or stucco.

2.2.2.3 Binder Content

Provide binder type or mixture of mortar with a cement, lime, or combination thereof consistent with the original existing mortar content in order to provide uniform durability, weathering characteristics, and the same, or better, life-cycle performance expectations.

a. Hydrated Lime: ASTM C207, Type S

b. Natural Hydraulic Lime (NHL): EN 459

c. Natural Cement: ASTM C10

d. Portland Cement: ASTM C150/C150M Type I, white or gray or both, where required for color matching of historic mortars. Masonry cement is not permitted.

2.2.2.4 Aggregate

Match size, texture, and gradation of existing mortar sand as closely as possible while remaining in compliance with ASTM C144 grading and soundness requirements. Blend several sands if necessary, to achieve suitable match.

a. Mortar Aggregates: ASTM C144 natural sand blend, rounded to subangular in shape, washed, screened, and dried.

2.2.2.5 Dry Pigments

Pigments, if required, will be non-fading, UV-stable pigments meeting the requirements of ASTM C979/C979M. When blended with other dry components, the pigment proportion shall not to exceed 10 percent by weight of the cementitious or binder materials, except for carbon black, which is limited to 2 percent, unless otherwise demonstrated by a satisfactory history of performance.

2.2.2.6 Repointing Mortar

Provide repointing mortar in mix proportions that match the original as determined by the mortar analysis. Mortar can be pre-blended repointing

mortar in single containers in a factory-controlled environment, or a site mix.

2.2.2.7 Admixtures

Do not use admixtures in the mortar or stucco unless specifically approved in writing by the Contracting Officer.

2.2.3 Lead T-Caps and Accesories

Lead T-Caps (also known as Lead Weatherstripping): T-caps are a weatherproofing product, manufactured from lead, which are designed to be used with a building sealant for the weatherproofing and protection of masonry joints.

a. T-caps shall consist of a molded cap or fillet surface with a splined tang for anchoring in the sealant-filled mortar joint and shall be provided in continuous strips for field cutting and fitting.

b. T-caps shall be of sufficient width to cover the joint opening to be sealed plus allowance for the percentage of anticipated or known joint movement experienced plus 1/4 inch.

c. Sealant: Exterior grade, urethane or silicone

d. Sealant Primer: Use if required by sealant manufacturer.

e. Closed cell foam backer rod of a width sufficient to fill the joints.

f. Masking Tape: Non-staining, non-absorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.

2.2.4 Crack Injection

a. Comply with the restoration injection grout manufacturer's written instructions.

b. Inject cracks that are no greater than 1/8 inch in width and masonry is soundly bonded but cracked.

c. Inject the full length of the cracks unless specifically instructed otherwise.

2.2.5 Replacement Masonry Materials

2.2.5.1 Clay Brick

a. Provide replacement brick matching color, shape, size, texture, appearance, and thermal expansion properties of the existing historic brick.

b. Test brick in comparison to the original existing historic brick using ASTM C67/C67M.

c. Do not use reclaimed brick unless approved by Contracting Officer.

d. Provide brick meeting the requirements of ASTM C216 Grade SW, including a rating of "not effloresced", unless otherwise specified.

2.2.5.2 Architectural Precast Stone

See Specification 04 03 10 Cast Stone Restoration.

2.2.6 Miscellaneous Materials

2.2.6.1 Cementitious Grout

Use cementitious grout, recommended by the manufacturer for the application, to bond steel anchors to masonry.

2.2.6.2 Metal Attachments

a. Provide threaded or deformed stainless steel anchors for spall repairs, size as indicated.

b. Provide other plates, angles, anchors, and embedments conforming to ASTM A36/A36M, prime painted with inorganic zinc primer.

2.2.6.3 Lead Flashing

Provide commercially available lead flashing conforming to GSA HPTP 07656-01.

2.3 EQUIPMENT

2.3.1 Cleaning Equipment

Provide cleaning equipment that does not cause staining, erosion, marring, or other damage or changes in the appearance of the surfaces to be cleaned.

2.3.1.1 Sandblasting

Use of sandblasting equipment is not allowed for cleaning masonry surfaces.

2.3.1.2 Water Blasting

a. Provide water blasting equipment including a trailer-mounted water tank, pumps, high-pressure hose, wand with safety release cutoff control, nozzle, and auxiliary water re-supply equipment.

b. Do not operate the equipment at a pressure which will cause etching or other damage to the masonry surface or mortar joints. Operate the equipment at a discharge capacity of 55 to 400 psi and 2.5 to 3 gpm for general surface cleaning operations.

c. Provide water tank and auxiliary re-supply equipment of sufficient capacity to permit continuous operations.

d. Provide protective covers and barriers as required to prevent over-spray onto adjacent surfaces.

2.3.1.3 Micro-Abrasive Blasting Equipment

a. Micro-abrasive blasting methods require equipment designed to discharge sponges, walnut shells, ice, and other friable materials at low pressures (<60 psi).

b. Operate equipment in accordance with manufacturer's recommendations and maintain in good working order.

c. Do not operate equipment at a pressure which will cause etching or other damage to the masonry surface or mortar joints.

d. Determine discharge capacity on a case by case basis during the mockup test panel demonstration and approval process.

e. Provide protective covers and barriers as required to prevent over-spray onto adjacent surfaces.

2.3.2 Drilling Equipment

a. Use standard small, powered, handheld masonry drills, commonly used for drilling small holes in concrete and masonry to drill holes in masonry for patch anchors and other applications.

b. Use drills in rotary mode only. Do not use impact type drills.

2.3.3 Compressed Air Supplies

a. Use compressed air equipment that delivers clean, oil and moisture free compressed air at the surface to be cleaned. Use a minimum of two in-line air filters to remove oil and moisture from the air supply.

b. Test the compressed air supply during each shift for the presence of oil and moisture.

2.3.4 Material Handling and Associated Equipment

2.3.4.1 Mixing, Transporting, and Placing Job Materials

a. Provide equipment used for mixing, transporting, placing, and confining masonry and mortar placements capable of satisfactorily mixing material and supporting uninterrupted placement operations.

b. Provide equipment used for mixing, conveying, and placing of materials that is clean, free of old materials and contaminants, and in conformance with material manufacturer's recommendations.

2.3.4.2 Associated Equipment

Provide associated equipment, such as mixer timing equipment, valves, pressure gauges, pressure hoses, other hardware, and tools, as required to ensure a continuous supply of material and operation control.

2.4 Mortar Mix

2.4.1 General

a. Proportion materials appropriately with regard to the effect of moisture content on the individual components (cement, sand and lime).

b. Batch materials using volumetric measurement devices and consistently consolidate the material in these devices to ensure the uniformity of the mortar. Do not batch by shovel counts.

2.4.2 Batching

a. Utilize a calibrated measuring device for batching Portland cement.

b. Utilize a calibrated measuring device for batching hydrated lime.

c. Utilize a calibrated measuring device for batching the sand.

2.4.3 Cement and Lime Proportions

a. Fill the measuring device with portland cement or hydrated lime.

b. Briskly strike the bottom of the measuring device against the ground a minimum of ten times and then strike the top flush.

c. For dry hydrate lime, fill the measuring device using a minimum of three lifts, strike the bottom of the measuring device against the ground a minimum of ten times for each lift and then strike the top flush. Mix dry hydrate lime to a wet paste that is 40 to 42 percent solid.

2.4.4 Sand Proportions

a. Proportion sand when the sand is in saturated surface dry (SSD), loose damp condition.

b. Proportion the sand by filling a measuring device using a minimum of three lifts, striking the sides a minimum of ten times, and then striking the top flush.

PART 3 EXECUTION

3.1 EXAMINATION

a. Undertake masonry renovation only after complete evaluation and analysis of the areas to be repaired are completed, including sampling and testing of the existing mortar to determine its composition and qualities. Do not start repair work until conditions that have caused masonry deterioration have been identified and corrected.

b. Use the gentlest means to perform the work and take the greatest of care to ensure that the historic materials are not damaged in the process of the work, as established by mock-ups and testing.

c. In addition to requirements in this Section, comply with NPS Hist Prop.

3.1.1 Field (In Situ) Mortar Examination

a. Detect cracks, degradation and de-bonding from the surrounding masonry.

b. Determine previous surface coating treatments that may be contributing to the current conditions.

c. Compare the bedding mortar with the pointing mortar and determine the cross-sectional characteristics of the wall.

d. Determine the level of moisture movement in the in situ mortar, and if the mortar or masonry units are handling the brunt of the water movement through the wall.

3.1.2 Taking and Preparation of Samples

a. Take and analyze samples of unweathered original historic mortar and different types of mortar in the structure in order to match the new mortar to be used for repointing.

b. Remove three or four samples of each type of mortar to be matched with a hand chisel from several locations on the building. Mortar samples to be intact pieces with a minimum size of 1 ounce.

c. Set aside the largest sample for comparison with the repointing mortar.

d. Place the remaining samples in labeled, sealed sample bags for transport to the laboratory for evaluation per Part 2 of this Specification.

3.2 PREPARATION

3.2.1 Protection

a. Protect persons, motor vehicles, adjacent surfaces, surrounding buildings, equipment, and landscape materials from chemicals used and runoff from cleaning and paint removal operations.

b. Erect temporary protection covers, which will remain in operation during the course of the work, over pedestrian walkways and at personnel and vehicular points of entrance and exit.

c. Protect the interior of buildings from the weather, cleaning, and repair operations at all times.

d. Do not expose workers to chemical substances in excess of the limits established by ACGIH 0100. Comply with more stringent regulations where applicable.

3.2.2 Surface Preparation

a. Do not proceed with cleaning until mock-ups have been approved.

b. Do not proceed with repointing until existing mortar and has been analyzed and suitable repair materials have been determined.

c. Do not proceed with restoration work until the cause of observed distresses have been identified and corrected.

3.2.3 Equipment and Techniques Demonstration

a. Demonstrate equipment and techniques of operation in an approved location.

b. Assemble dependable and sufficient equipment, appropriate and adequate to accomplish the work specified, at the work site with sufficient lead time before the start of the work to permit inspection, calibration of weighing and measuring devices, adjustment of parts, and the making of any repairs that may be required.

c. Maintain the equipment in good working condition throughout the project.

3.3 MASONRY CLEANING

3.3.1 General

a. Exercise caution against over-cleaning of surfaces, which may be detrimental, and which may remove desirable historic surface details or patinas. For example, if cleaning reveals unexpected joint painting or historic signage; suspend the cleaning action, protect the exposed area and notify the Contracting Officer.

b. Do not damage or mar historic materials in the process of cleaning.

c. Perform cleaning per NPS TPS Brief 1.

d. Protect open joints to prevent water and cleaner intrusion into the interior of the structure.

e. Protect non-masonry materials and severely deteriorated masonry by approved methods prior to initiation of cleaning operations.

f. Remove all organic and inorganic contaminants from the surface and pores of the substrate, without causing any short or long-term negative consequences.

g. Clean surfaces evenly with no evidence of streaking or bleaching.

h. Do not affect the density, porosity, or color of the existing masonry or mortar.

i. Maintain a neutral pH on surface of cleaned masonry units.

j. Use the gentlest methods possible for cleaning historic masonry to achieve the desired results.

k. Proceed with cleaning in an orderly manner, working from top to bottom of each scaffold width and from one end of each elevation to the other.

l. Perform cleaning in a manner which results in uniform coverage of all surfaces, including corners, moldings, interstices and which produces an even effect without streaking or damage to masonry.

m. Use the following sequence of methods to determine the least aggressive, effective cleaning method:

(1) Water with non-metallic brushes (cold water).
(2) Water with mild soap
(3) Water with stronger soap

(4) Stronger chemical cleaners, only when above methods are determined to be ineffective by the Contracting Officer

3.3.2 Chemical Cleaners

a. Do not use chemical cleaners without approval from the Contracting Officer.

b. Do not use acidic chemical cleaners on limestone, marble, concrete and other calcareous (calcium containing) masonry materials. If chemical

cleaners are used on such materials, use alkaline based cleaners with neutralizing afterwashes.

3.3.3 Water Cleaning

3.3.3.1 Pressure Spraying

a. Spray apply water to masonry surfaces to comply with requirements indicated by test patches for location, purpose, water temperature, pressure, volume, and equipment.

b. Unless otherwise indicated, wash the surface with clean, low pressure water (pressure of less than 55 psi and 2.5 to 3 gpm discharge) and hold spray nozzle not less than 12 inches from surface of masonry.

c. Apply water side to side and top to bottom in overlapping bands to produce uniform coverage.

3.3.3.2 Hand Scrubbing

a. Scrub surfaces to be cleaned to remove surface contaminants.

b. Pre-wet surfaces and use hand-held natural bristle or nylon brushes.

c. Do not use wire brushes.

3.3.3.3 Rinsing

a. Rinse scrubbed surfaces clean of all contaminants with water in a low-to-moderate pressure spray, working from top to bottom of each treated area.

3.3.4 Chemical Cleaning

3.3.4.1 General

a. Chemical cleaning is the use of any product in addition to water, including detergents, ammonia, vinegar, and bleach.

b. Use gentlest means possible to achieve the desired result as determined by test patches.

c. Proceed in an orderly manner, working from top to bottom of each scaffold width and from one end of each elevation to the other.

d. Provide uniform coverage of all surfaces, including corners, moldings, interstices and produce an even effect without streaking or damage to masonry.

e. Do not apply chemical cleaners to the same masonry surfaces more than twice.

3.3.4.2 Surface Prewetting

a. Wet masonry surfaces to be cleaned with chemical cleaners with water using a low pressure spray before application of any cleaner.

b. Prewet walls working from top to bottom, except work bottom to top on one-story walls.

c. Do not prewet masonry surface prior to applying biological growth cleaners.

3.3.4.3 Acidic Chemical Cleaning

a. Apply acidic chemical cleaners according to manufacturer's instructions.

b. Do not apply acidic chemical cleaners to masonry with high calcium content (e.g. marble, limestone.

c. Apply acidic cleaners to masonry surfaces by low pressure spray 50 psi max., roller, or brush.

d. Leave cleaner on on masonry surface for the time period recommended by the manufacturer.

e. Employ manual scrubbing by brushes as indicated by test patches for the specific location.

f. Rinse cleaned surfaces with a low-to-moderate pressure spray of water to remove all traces of chemical cleaner.

3.3.4.4 Alkaline Chemical Cleaning

3.3.4.4.1 Prewash Phase

a. Apply alkaline chemical cleaners to masonry surfaces according to manufacturer's instructions, by low pressure spray 50 psi max., roller, or brush.

b. Leave cleaner on masonry surface for the time period recommended by the manufacturer.

c. Employ manual scrubbing by brushes as indicated by test patches for the specific location.

d. Rinse cleaned surfaces with a low-to-moderate pressure spray of water.

3.3.4.4.2 Afterwash Phase

a. Immediately after rinsing of alkaline cleaned surfaces, apply a neutralizing afterwash to the cleaned masonry areas.

b. Apply neutralizing afterwash according to manufacturer's instructions, by low pressure spray 50 psi max., roller, or brush.

c. Leave afterwash on masonry surface for the time period recommended by manufacturer.

d. Rinse cleaned surfaces with a low-to-moderate pressure spray of water to remove all traces of chemical cleaners.

3.3.4.5 Rinsing and pH Testing

a. Determine the pH of masonry surfaces that have been chemically cleaned using pH monitoring pencils or papers.

b. Rinse chemically cleaned masonry, using a low pressure spray, until the pH of the treated surface reads neutral or equal to that of the rinse water. Note: "neutral" pH for the cast stone may be around 8 or 9.

3.4 MASONRY REPAIR

3.4.1 General

a. Match repaired surfaces with adjacent existing surfaces in all respects.

b. Demonstrate the materials, methods and equipment proposed for use in the repair work in mock-ups, as specified in PART 2.

c. Use products in accordance with the manufacturer's instructions.

d. Proceed with masonry repair only after the cause of deterioration has been corrected.

e. Assist Historic Masonry Consultant with performing field investigation to determine the causes and extent of degradation. Utilize the following techniques as deemed necessary.

(1) Employ a field microscope to closely assess the conditions at the surface of the mortar and masonry units. Detect cracks and assess for degradation and debonding from the surrounding masonry. Detect previous surface coating treatments on the mortar and masonry that may be contributing to the current conditions.

(2) Employ a boroscope to examine mortar deeper in the joint. Compare the bedding mortar with the pointing mortar and ascertain the cross-sectional characteristics of the wall.

(3) Employ moisture meters to determine the level of moisture in the mortar and masonry, and if the mortar or masonry units are handling the brunt of the water movement through the wall. Infrared thermography, employed by a trained investigator, can provide additional information on the moisture conditions.

(4) Employ RILEM tubes using the method of RILEM II.4 or water penetration testing in accordance with ASTM C1601 to determine the rate of water uptake into the masonry.

(5) To access the physical characteristics of hard mortar, use a spring loaded or pendulum impact device to determine surface hardness as an indicator of relative compressive strength. For evaluating softer mortars, mortar integrity deeper in the wall, and the condition of the masonry units, use a drill resistance tool by an experienced consultant.

(6) Utilize technologies such as ground penetrating radar or metal detection equipment to map metal reinforcement and embedments in the wall.

(7) Use flat jack or jacks and rams to gather information on in situ compressive stress (ASTM C1196, masonry compressive response ASTM C1197, and mortar joint shear strength ASTM C1531.

3.4.2 Repointing Masonry

Repoint masonry in accordance with NPS TPS Brief 2, using ASTM E2260 as a reference guide.

3.4.2.1 Wall Preparation

a. Remove old caulking, grout, non-matching, or deteriorated mortar from joints to a minimum depth of 2.5 times the width of the joint. Cut all joints back to sound, solid, back up material. Leave a clean, square face at the back of the joint to provide for maximum contact of repointing mortar.

b. Shallow or feather edging is not permitted. Remove loose particles from joints. Clean joints, followed by blowing with filtered, dry, compressed air or vacuum.

c. Cut out existing horizontal mortar joints (bed joints) that are filled with a hard Portland mortar using a diamond blade that is narrower than the joint width. Make a cut down the middle of the mortar joint using a rotary power saw. Remove the remaining mortar from the masonry joints by hand using masonry chisels or pneumatic carving tools.

d. Do not use rotary power saws to cut out vertical joints (head joints) . Remove all vertical head joints by hand using a pneumatic carving tool, or hammer and chisel.

e. Remove existing historic lime-based mortar using only small-headed chisels that are no wider than half the width of the existing masonry joints. Pneumatic air carving chisels are permitted as are specially designed mortar removal reciprocating tools (i.e. Arbortech Saw).

f. Do not widen the existing masonry joints. Do not chip or spall the surrounding masonry edges in the process of mortar removal. Damage to surrounding masonry units resulting from rotary blade over running is not permitted. Damages to adjacent materials exceeding 1/8 inch in size are the responsibility of the contractor and must be repaired by removal and replacement of damaged materials.

g. Permit applicators to be trained at the project site in this masonry treatment requirement.

3.4.2.2 Presoaking Masonry / Mortar Consistency / Lifts

a. Use the same mortar as the repointing mortar for setting the replacement masonry.

b. Soak exposed surfaces of historic masonry adjacent to joint with water prior to repointing.

c. Allow time for excess water to run off and evaporate prior to repointing. Joint surfaces must be damp but free from standing water.

d. Maintain a water sprayer on site at all times during the repointing process.

e. The mortar material must resemble the consistency of brown sugar during installation. This drier consistency enables the material to

be tightly packed into the joint, allows for cleaner work, and prevents shrinkage cracks as the mortar cures.

f. Allow mixed repointing mortar to stand for not less than one-half hour and not more than one and one-half hours for pre-hydration to reduce post-curing shrinkage. After this time, water can be added to small batches by hand to bring the mortar to a stiff yet workable consistency. Use repointing mortar within two and one-half hours after initial mixing and within one hour after adding water to bring the mortar to a working consistency. Retempering of the mortar to replace evaporated water is permitted within these time frames.

g. Point joints in layers or "lifts" where the joints are deeper than 1-1/4 inch. Apply in layers not less than 1/2 the depth but not more than 1-1/4 inch or until a uniform depth is formed.

3.4.2.3 Compression / Joint Finish / Curing

a. Compress each layer thoroughly.

b. When mortar is thumbprint hard at the surface of the wall, finish the joints to match the original historic joint profile.

3.4.2.4 Protection

a. Keep the mortar from drying out too quickly or from becoming too wet.

b. Protect mortar from direct sun and high winds for the first 72 hours after installation or from driving rain for the first 24 hours, using plastic sheeting if necessary. Do not create a greenhouse effect by sealing off air movement in an attempt to protect the wall with plastic. Allow for air circulation to facilitate the carbonation process.

3.4.3 Lead T-Cap Installation

a. Mark off width of T-cap on stone using a pencil or other non-permanent marking. Apply 1-inch wide masking tape lateral to these markings.

b. Notch, bend, and pre-fit T-cap in joint as required to match the profile of the stone; use a continuous (un-cut) section of T-cap.

c. Lift cap out of joint and apply metal primer to underside of cap, if required by sealant manufacturer, and allow to dry until tacky.

d. Seat foam backer rod into masonry joint to proper compressed depth.

e. Prime masonry, if required by sealant manufacturer, and allow to dry until tacky.

f. Apply a small bead of sealant to tacky metal surface to prevent air entrapment when seated in place.

g. Fill masonry joint to approximately 1/8-inch above the face of the stone with sealant/caulking compound.

h. Set cap in place, pressing firmly into sealant/caulking compound for seating and shaping. Turn down at all angles and edges.

i. Remove excess sealant compound with a putty knife, being careful not to get excess material on masonry. Leave joint neat and clean.

j. Remove masking tape.

3.4.4 Masonry Removal and Replacement

a. Before removing any deteriorated masonry units, establish bonding patterns, levels and coursings. Remove masonry that has deteriorated or is damaged beyond repair, as determined through investigation and evaluation. Carefully demolish or remove entire units from joint to joint, without damaging surrounding units in a manner that permits replacement with full-size units. Support and protect remaining masonry work that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition. Notify Contracting Officer of unforeseen detrimental conditions including voids, cracks, bulges, and loose masonry units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items. Remove as many whole masonry units as possible without damage.

b. Remove mortar, loose particles, and soil from masonry by cleaning with hand chisels, non-metallic brushes, and water.

c. Remove sealants by cutting close to masonry units with utility knife and cleaning with solvents. Clean surrounding masonry areas by removing mortar, dust, and loose particles in preparation for replacement.

d. Replace removed masonry with masonry units removed from inconspicuous areas of the building, where possible, or with new masonry units matching the existing units. Butter vertical joints for full width before setting and set units in full bed of mortar, unless otherwise indicated. Remove mortar used for laying/setting masonry units before mortar sets to the repointing depth of the surrounding area. Repoint new mortar joints in repaired area to comply with requirements for repointing at existing masonry units.

e. If a few isolated masonry units are to be replaced, remove each without disturbing the surrounding masonry. Remove deteriorated masonry units and mortar requiring replacement by hand chiseling. Do not damage adjoining masonry units during the removal of deteriorated units and mortar.

f. Test the new element for fitting into its space without mortar. Use wedges made from non-expanding, non-corrosive material such as plastic to support and align the new unit, cover them with at least 1-1/2 inches of mortar when pointing is complete.

g. Cover the four sides of the space with sufficient mortar to ensure that there will be no air spaces when the new unit is set. Fill the back of the space with mortar only if it matches existing construction.

h. Line up and set the new unit by tapping it into place with a wooden or rubber mallet. Align the face of new unit with that of existing masonry.

i. Repoint joints to match the rest of the wall after new units have been

properly installed and adjusted.

j. Clean replacement areas with a non-metallic brush and water to remove excess mortar.

3.4.5 Patch Repair

Replace original historic masonry materials only if surfaces are extensively deteriorated (surface missing to a depth of 4 inches or more) or are threatening the safety of the structure or individuals. If additional damage is found, notify the Contracting Officer. Replacements must match the materials, colors, and finish of the existing historic masonry as closely as possible.

3.4.5.1 Application of Patch Repair Materials

a. Place repair materials to rebuild spalled or damaged areas to match the original surface finish, level, texture, bonding patterns, color and porosity. Match the finished appearance of the substitute repair material patch with the adjacent existing surface. Apply samples to the masonry units in situ.

b. Do not install repair material in thicknesses exceeding 2 inches. Utilize replacement unit for masonry repairs in excess of 2 inches.

c. Remove loose mortar and masonry prior to installation of the repair material. "Sound" the masonry with a hammer to verify its integrity. If necessary, cut away an additional 1/2 inch of the masonry substrate to ensure the surface to be repaired is solid and stable.

d. Remove all deteriorated masonry, sealant residue, and previous repair materials back to sound substrate using hammer and chisel or power equipment. Finish edges square to a minimum depth of 1/2 inch. Do not feather edges. Roughen substrate surface to achieve surface roughness required by manufacturer for good bond, but do not overly damage the substrate surface.

e. Remove sealant residue. Cut out used anchors, threaded rod anchors and/or dowels within the damaged masonry area. Any anchors that are free of rust, solidly embedded, and do not project beyond the solid masonry surface may remain.

f. Using clean water and a non-metallic scrub brush, clean dust from surface and pores of the substrate.

g. Pre-wet the substrate with water prior to the application of the repair material to prevent the substrate from drawing out the moisture too quickly. Re-wet the surface with water again immediately before applying the repair material. Use methods approved by the repair material manufacturer to deliver the substitute repair work as demonstrated.

h. Follow manufacturers' instructions pertaining to the placement of materials. If the manufacturer requires that installers of a specified product be trained, provide this documentation to the Contracting Officer. Training certificates previously issued by product companies for the application of specified products cannot be substituted for the Project Training "Substitute Repair Material Certificate" on this project.

i. Masonry and Material Repair Finishes and Color

(1) Match the exposed surfaces of masonry and substitute material repair finish, color, texture, and surface detail with the original surface. Mechanical finishing and texturing may be required to produce the required finish and appearance.

(2) Conceal bond lines between the repaired area and adjacent surfaces.

(3) Replicate all surface details, including tooling and machine marks.

(4) Use low-impact energy type equipment in finishing and texturing, which will not weaken the patch or damage the patch bond and the adjacent masonry.

3.4.5.2 Anchors for Patches

a. Provide anchors to ensure that the patch is tied to the existing masonry structure at a frequency of at least one anchor per 4 square inches of patch plan surface area; specific locations for anchors must be as indicated.

b. Use small handheld, low-speed rotary masonry drills to produce holes in the existing masonry, within the limits for the patch anchor installation.

(1) Drill holes into the existing substrate material of the masonry using rotary (non-hammer) drills making holes with a diameter of 1/8 inch larger than the anchor diameter and a depth of 4 inches, except as otherwise indicated or directed.

(2) Drill holes must not penetrate completely through the masonry, and must provide at least 1 inch of cover around the drill hole.

(3) Clean holes by water blasting to remove drill dust and other debris and then blow dry with filtered, dry, compressed air.

(4) Condition drill holes in accordance with the epoxy adhesive manufacturer's recommendations.

c. Clean anchors to remove all contaminants which may hinder epoxy bond.

d. Pressure inject adhesive into the back of the drilled holes.

(1) Fill holes without spilling excess grout when the anchors are inserted.

(2) Insert anchors immediately into the holes.

(3) Set back anchors from the exterior face at least 1 inch.

(4) Install anchors without breaking or chipping the exposed masonry surface.

(5) Use socked or screen tube anchors where voids exist in the masonry units or between the wythes.

3.4.5.3 Cleanup

a. Protect masonry surfaces from excess grount adhesive and spills.

b. Leave the surface of the masonry in a clean and uncontaminated condition.

3.4.6 Crack Injection with Restoration Injection Grout

3.4.6.1 General

a. Notify the Contracting Officer as to when and where the installation will occur at least 48 hours prior to start.

b. Provide samples to the Government representative from the dispenser during the course of the injection.

c. Apply in accordance with the manufacturer's instructions.

3.4.6.2 Application of Injection Grout

a. Drill 1/8-inch diameter, downward-sloping injection holes. For transverse cracks less than 1/8 inch wide, drill holes through center of crack at 1 to 1.5 inches on center.

b. Clean out drill holes and cracks with compressed air and potable water. Remove dirt and organic matter, loose material, sealants, and failed crack repair materials.

c. Inject grout using hypodermic needles or pressure ports through holes sequentially, beginning at one end of area and working to opposite end. Do not exceed 10 psi injection pressure. Where possible begin at lower end of injection area and work upward. Inject grout until it extrudes from adjacent holes. After grout has set, remove excess material and patch injection holes and surface of cracks with a restoration patching mortar designed to match the original masonry.

3.5 INSTALLATION OF NEW ELEMENTS

Evaluate new materials and components for both functional and aesthetic impacts on historic structures.

3.6 FINAL CLEANING

a. No sooner than 72 hours after completion of the repair work and after joints are sealed, wash down faces and other exposed surfaces of masonry with water applied with a soft bristle brush, then rinse with clean water.

b. Discolorations that cannot be removed by these procedures, are considered defective work.

c. Perform cleaning work when temperature and humidity conditions allow the surfaces to dry rapidly.

d. Protect adjacent surfaces from damage during cleaning operations.

3.7 PROTECTION OF WORK

Protect work against damage from subsequent operations.

3.8 DEFECTIVE WORK

Repair or replace defective work as directed by Contracting Officer, using approved procedures.

3.9 FINAL INSPECTION

Following completion of the work, inspect the structure for damage, staining, and other distresses. Inspect the patches for cracking, crazing, delamination, unsoundness, staining and other defects. Inspect the finish, texture, color and shade, and surface tolerances of the patches to verify that all requirements have been met. Repair surfaces exhibiting defects as directed.

a. Following completion of the work, inspect the structure for damage, staining, and other distresses.

   (1) Inspect patches for cracking, crazing, delamination, unsoundness, staining and other defects.

   (2) Inspect finish, texture, color and shade, and surface tolerances of the patches to verify that all requirements have been met.

b. Repair surfaces exhibiting defects as directed by Contracting Officer.

-- End of Section --

SECTION 04 03 10

CAST STONE RESTORATION
02/22

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH 0100	(2015; Suppl 2002-2016) Documentation of the Threshold Limit Values and Biological Exposure Indices

ASTM INTERNATIONAL (ASTM)

ASTM A615/A615M	(2020) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A1064/A1064M	(2017) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C33/C33M	(2018) Standard Specification for Concrete Aggregates
ASTM C150/C150M	(2020) Standard Specification for Portland Cement
ASTM C173/C173M	(2016) Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C231/C231M	(2017a) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260/C260M	(2010a; R 2016) Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C426	(2016) Standard Test Method for Linear Drying Shrinkage of Concrete Masonry Units
ASTM C494/C494M	(2019) Standard Specification for Chemical Admixtures for Concrete
ASTM C979/C979M	(2016) Standard Specification for Pigments for Integrally Colored Concrete
ASTM C1194	(2019) Standard Test Method for

	Compressive Strength of Architectural Cast Stone
ASTM C1195	(2021) Standard Test Method for Absorption of Architectural Cast Stone
ASTM C1364	(2018) Standard Specification for Architectural Cast Stone

1.2 DEFINITIONS

a. Cast Stone: a refined architectural concrete building unit manufactured to simulate natural cut stone.

b. Dry Cast: manufactured from zero slump concrete.

c. Vibrant Dry Tamp (VDT) casting method: vibratory ramming of earth moist, zero-slump concrete against a rigid mold until it is densely compacted.

d. Machine casting method: manufactured from earth moist, zero-slump concrete compacted by machinery using vibration and pressure against a mold until it becomes densely consolidated.

e. Wet Cast: manufactured from measurable slump concrete.

f. Wet casting method: manufactured from measurable slump concrete and vibrated into a mold until it becomes densely compacted.

g. Crack Injection: a repair method in which restoration grout material is injected into small cracks ranging in width from hairline to 1/8 inch by use of needle or syringe.

h. In situ: a term referencing a repair procedure in which the masonry units remain in place and are repaired without removal from the wall system.

i. Mockup: specific area on the building approved by Contracting Officer to demonstrate the ability to apply, match, and installed specified materials.

j. Mortar: a mixture of binders, aggregates, and pigments used for reconstruction, repointing, or stucco applications.

k. Patch: the use of substitute repair materials to treat damaged or deteriorated masonry units in situ.

l. Remove: specifically for historic masonry materials, the term means to detach an item from existing construction to the limits indicated.

m. Replace: to reinstall an item in its original position (or where indicated) after remedial treatment, or to duplicate and reinstall an entire item with new material with the original item service as the pattern for creating the duplicate.

n. Wall System: a term used to address the fact that masonry structures are comprised of different materials but function holistically, requiring that all restoration and cleaning processes take into account the implications of the treatment to the adjacent materials

and the building as a whole.

o. Masonry Treatment Requirement (MTR): defined treatments that are required by the specification (contract) documents for project specific repairs to masonry.

1.3 ADMINISTRATIVE REQUIREMENTS

1.3.1 Pre-installation Meeting

Prior to beginning the work of this Section, convene a meeting with the Contracting Officer's Representative(s) to review the requirements of the Quality Control Plan, Project Training Program, installation procedures, location of required mockup areas, and all job conditions and processes. All subcontracting firms involved with this work must participate in this meeting.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Quality Control Plan; G

Project Training Program; G

Qualifications; G

SD-02 Shop Drawings

Photographic Documentation

SD-03 Product Data

Qualifications

Cast Stone; G

Repair Materials; G

SD-04 Samples

Mock-ups; G

Cast Stone; G

Repair Materials; G

SD-06 Test Reports

Testingand Matching

SD-07 Certificates

Repair Materials

1.5 QUALITY CONTROL

1.5.1 Quality Control Plan

Prior to beginning restoration and cleaning work, submit a written Quality Control Plan. Do not proceed without written approval of the Quality Control Plan. At a minimum, include the following items in the Quality Control Plan:

a. Describe methods of dust containment during the work specific to the work of this section.

b. Describe the methods of protecting surrounding masonry, windows doors, roof, and building trim as well as surrounding landscape. Provide drawings of protection when requested.

c. Describe the work procedures, materials, and proposed tools to use for each Masonry Treatment Requirement (MTR) specified.

d. Describe the sequence of each MTR.

e. Describe how each MTR sequence and the overall construction schedule changes with weather variations and how completed work will be protected.

f. Describe the methods for surveying original layout and collecting datum points and plumb lines for rebuilding masonry.

g. Describe the methods for shoring and providing a safe working environment.

h. Describe the method and approach to mortar joint removal.

i. Describe the method and approach for assuring repair material compatibility with original materials.

j. Describe the method and approach to cleaning mortar, coating, smears and old patching materials from the masonry surfaces.

k. Describe, in detail, the procedures relating to techniques and tools proposed for masonry matching.

l. Describe the complete masonry removal and matching procedures; include equipment, approach, length of time the masonry will be out of the wall, documentation on mapping the location, and where (on-site or in shop) the masonry units will be repaired.

m. Describe the procedure for matching of different patching colors at different locations.

n. Describe the procedure for mixing and matching of repair materials.

o. Describe the methods for setting masonry back into its original position and maintaining the original bond patterns and joint width.

p. Describe the on-site project training program. Provide the opportunity for workers to be trained in each masonry treatment requirement (MTR) as work proceeds.

1.5.2 Qualifications

1.5.2.1 Historic Masonry Consultant

a. Secure the services of a historic masonry consultant with a minimum of 10 years' experience applying NPS Hist Prop as they relate to the work in this section.

b. Submit a resume that describes five relevant projects within that period and include how NPS Hist Prop was applied to the work of similar scope and scale and what jurisdiction or agency was involved in approving the work.

c. The consultant's services include:

1. Investigating the condition of the masonry materials and mortar.

2. Arranging for material analysis in the laboratory.

3. Recommending appropriate cleaning methods and materials.

4. Recommending restoration options.

5. Providing project specific specifications.

6. Providing an on-site training program.

7. Providing quality control services during construction.

8. Recommending appropriate repair and restoration materials.

1.5.2.2 Masonry Firm

a. The firm performing the masonry work must have a minimum of five years' experience on relevant projects.

b. The firm must have completed work similar in material, design, and extent to that indicated for this Project and demonstrate a record of successful in-service performance.

c. Proven implementation of NPS Hist Prop and related Preservation Briefs are required.

d. Submit a resume that describes the required experience.

1.5.2.3 Field Supervisor

a. Retain an experienced full-time supervisor on the project site at all times when masonry restoration is in progress. A single individual must be responsible for supervising the historic masonry restoration work throughout the duration of the project.

b. Submit a resume that describes the required experience.

1.5.2.4 Masonry Applicator

a. Employ craftspeople who are experienced with and specialize in restoration work of the types they will be performing. When Cast Stone units are being installed, assign at least one worker among those performing installation work who is trained and certified by manufacturer of Cast Stone unit to apply its products.

b. All masonry restoration treatments must be performed by a craftsperson that is familiar with historic masonry construction and has worked on historic masonry projects for at least five years.

c. Only skilled technicians who are familiar and experienced with the materials and methods specified may be used.

d. Submit resumes for all historic masonry applicators, demonstrating the required experience.

1.5.2.5 Cast Stone Fabricator

a. Cast Stone shall be produced in a plant certified by the Cast Stone Institute®.

b. Fabricator shall have sufficient plant facilities to produce the shapes, quantities and size of Cast stone required in accordance with the project schedule.

c. Fabricator shall provide proof of at least five (5) years of experience fabricating cast stone unit masonry. The manufacturer shall demonstrate three projects similar in scope, scale, complexity, and type involving facilities listed on the State or National Register of Historic Places, on local Landmark Registers, or listed a New York Landmark.

d. Contracting Officer shall be given access to the Fabricator's facility to inspect work being performed.

e. The Contracting Officer shall be given regular access to delivered materials. Within one week of Project site delivery of Cast Stone units, the Contracting Officer shall have the right to reject unsatisfactory units and request new units at no additional cost to the Owner.

1.5.3 Project Training Definition and Use

In addition to five years demonstrable experience on masonry restoration projects, offer workers project training certificate(s) within the framework of ASTM E2659. Project training certificates are earned by individual workers and issued with the understanding that they are for limited time use, enforceable only to this specific project and for a specific MTR. It is not necessary, nor a requirement of this specification, that all restoration workers obtain all project training certificates offered. Rather it is desirable that workers be trained for each project specific task they will perform to ensure the highest quality results from the cleaning and restoration program.

1.5.4 Documentation

a. Submit digital photographic documentation of all phases of masonry

restoration, including prior to the start of restoration work.

b. Provide thorough photo documentation of the project and project details and targeted areas.

1.5.5 Cleaning Methods

See Specification 04 03 00 for cleaning requirements.

1.5.6 Repointing Methods

See Specification 04 03 00 for repointing requirements.

1.5.7 Cast Stone Restoration Products and Procedures

1.5.7.1 General Restoration Requirements

a. Do not perform any work until the mock-ups and the represented material and workmanship have been submitted and approved.

b. Demonstrate the methods and quality of workmanship to be performed in each masonry treatment requirement (MTR). Provide a mock-up for each MTR indicated.

1.5.7.2 General Restoration Mock-Up Requirements

a. Throughout restoration, retain approved mock-up panels in undisturbed condition, suitably marked, as a standard for judging completed work.

b. Review manufacturer's product data sheets to determine suitability of each product for each surface.

c. Apply products using manufacturer-approved application methods, determining actual requirements for application.

d. Obtain approval as to the preservation treatment approach, design, and workmanship to include, but not limited to the verification of all material applications and finishes as specified to the requirements of color, texture, profiles, and finishes before proceeding with work.

1.5.7.2.1 Mock-ups

May be performed on inconspicuous sections of actual construction under the same weather conditions expected for the remainder of the work.

a. Location and number as directed.

b. Size: as appropriate for the repair specified, and as directed by the Contracting Officer.

c. Repair unacceptable work. Repeat mock-ups until approval is achieved.

1.5.7.3 Cast Stone Restoration Mock-ups

1.5.7.3.1 Masonry Removal and Replacement

Fully remove masonry and replace to specified dimensions and texture. Select size of masonry units representing typical conditions. Set one new cast stone unit to same location, set to surrounding profile joint width

and bond pattern. Set masonry unit using specified mortar. Confirm with Contracting Officer's Representative that the replacement masonry units meet specification requirements for matching and that sufficient quantity required for the work have been identified. Leave one stone dry-set into opening set on wood shims for evaluation and approval of preparation conditions.

1.5.7.3.2 Repair Material

1.5.7.3.2.1 Patching

Apply repair material on at least three cast stone masonry units for repair, though more may be necessary. Patching mockups shall be prepared on several examples of original cast stone exhibiting the full-range of colors. Include one masonry unit on which to demonstrate proficiency in removing previous patching or deteriorated material and repairing with new substitute repair material.

Patching samples must match the texture and finish of the surrounding cast stone. The mockups shall be evaluated for color match in addition to workmanship.

1.5.7.3.2.2 Crack Repair

Repair one crack, 2 feet in length, using mortar. Repair one crack, 1 foot in length, using restoration grout injection technique with appropriate repair material.

1.6 DELIVERY, STORAGE, AND HANDLING

a. Deliver Cast Stone units to Project site in heavy-duty cartons that shall be labeled with its contents, the job name and location, and the name of the Fabricator.

b. Mark production units with the identification marks as shown on the shop drawings.

c. Protect units from staining or damage during shipping and storage.

d. Provide an itemized list of products to support the bill of lading.

e. Protect Cast Stone units, including corners and edges, during storage, handling, and installation to prevent chipping, cracking, or other damage.

f. The Architect/Architect's Representative shall inspect within one week of delivery and shall notify the Fabricator of any damage or non-conformity in writing within that time frame.

g. Following notification of damage in transit or non-conformity, the Fabricator shall immediately proceed with the remaking of the affected units.

h. Upon arrival and acceptance on Project site, the Architect and Restoration firm become responsible for the units.

i. Deliver other materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

j. Store Cast Stone units in their original packing material until ready for use. Cartons shall not be stacked and shall remain in an upright position. Store units on firm, level and smooth surfaces, under cover, and in a dry location.

k. Store pre-mixed mortar on elevated platforms, under cover and in a dry location.

l. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

m. Store sand where grading and other required characteristics can be maintained, and contamination avoided.

n. Store all materials in spaces designated by Construction Manager. All such spaces shall comply with pertinent federal, state, and local laws, codes, and regulations.

o. Maintain temperatures in storage spaces within range recommended by manufacturer of material being stored in each case. Protect liquid components from freezing.

p. Store products and materials at least 4-inches above the floor and protect them from water, dampness, or high humidity.

q. Discard and remove from site deteriorated or contaminated materials and products that have exceeded their expiration dates and replace with fresh materials.

1.7 WARRANTY

1.7.1 Fabricator's Warranty

Fabricator shall warranty the Cast Stone units described in this Section in writing against any failures due to material or manufacturing that occur within five years from the date of Substantial Completion. Failed units shall be replaced at no cost to the Owner. When any unit covered by the warranty has failed, and been corrected by replacement, reinstate the warranty by written endorsement.

1.7.2 Repair Warranty

Warrant repair procedures for a period of two years against: discoloration or mismatch of new mortar to adjacent original historic mortar, discoloration or damage to masonry from improper mortar clean-up, loss of bond between masonry and mortar, fracturing of masonry edges from improper mortar joint preparation procedures or improper mortar formulation, and occurrence of efflorescence from improper repair procedures.

PART 2 PRODUCTS

2.1 CLEANING MATERIALS

See Specification 04 03 00.

2.2 CAST STONE MATERIALS

2.2.1 Cast Stone

a. Provide replacement cast stone in each location/or for each stone being replaced to match original in appearance, including shape, size, color, texture, and surface finish.

b. Provide samples for verification before erecting mock-ups. Samples shall include:

1. One or more samples as necessary of cast stone measuring at least 6"x6" for showing the colors and surface finishes of the replacement cast stone required to match the full range of color variation in the existing, original cast stone. More than one sample may be required to show natural variation.

2. Once the surface color and finish samples have been approved, provide full-sized samples of each type of cast stone unit to be used for replacing deteriorated units.

c. Cast Stone shall comply with ASTM C1364

1. Compressive Strength - ASTM C1194: 6,500 psi minimum at 28 days

2. Absorption - ASTM C1195: 6% maximum by the cold-water method or 10% maximum by the boiling method at 28 days.

3. Air Content - ASTM C173/C173M or ASTM C231/C231M: For wet-cast product, 4 to 8% for units exposed to freeze-thaw environments. Air entrainments is not required for VDT products.

4. Freeze-Thaw- ASTM C1364: the CPWL shall be less than 5% after 300 cycles of freezing and thawing.

5. Linear Shrinkage - ASTM C426: Shrinkage shall not exceed 0.065%

d. Cast Stone Materials: Materials shall match those required to produce results matching the physical properties specified, the colors and finishes to match the original cast stone, and the following:

1. Portland Cement; ASTM C150/C150M, Type I or Type III, white and/or gray. For consistency and quality control, use only one brand, type, and source of supply of cement throughout the Project.

2. Coarse Aggregate: Provide carefully and washed aggregate of crushed stone such as silica, quartz, or other durable stone meeting requirements of ASTM C33/C33M except that gradation may vary to achieve desired finish and texture. Extremely fine aggregates may be required to match existing finish. Modify mix design as required to meet strength requirements.

3. Fine Aggregate: Provide carefully graded and washed manufacturers or natural sands meeting requirements of ASTM C33/C33M except that gradation may vary to achieve desired finish and texture. Color/Type: Match existing and Contracting Officer's approved control sample(s).

4. Pigments: All colors added shall be inorganic (natural or

synthetic) iron oxide pigments meeting ASTM C979/C979M and shall be guaranteed by the manufacturer to be "lime proof" or alkali-stable. Carbon black pigments shall not be used.

5. Water: potable, free from foreign materials in amounts harmful to concrete and embedded steel.

6. Air-entrainment: Wet cast mixtures shall contain 5% to 7% air-entrainment where surfaces are exposed to freeze-thaw, and admixture shall meet requirements of ASTM C260/C260M. No air entrainment is required for dry cast mix.

7. Water-Reducing, Retarding, or Accelerating Admixtures: ASTM C494/C494M, type as selected by Fabricator and containing not more than 0.1% chloride ions.

e. Formwork

1. Provide forms that will produce required sizes, finish surfaces and surface appearances.

2.2.2 Reinforcing

a. Cast stone shall be reinforced with new billet steel reinforcing bars meeting requirements of ASTM A615/A615M, grade 40 or grade 60, when necessary for safe handling, setting and structural stress.

b. All reinforcement shall be epoxy coated. The cast material covering in all cases shall be no less than twice the diameter of the reinforcing elements.

c. Cast Stone units shall be reinforced as required for handling, to allow for temperature changes and structural stresses. There shall be a minimum steel reinforcement amounting to 0.25 percent of the sectional area of the unit. Should the unit be greater than twelve (12) inches in any sectional dimension, the tempered steel shall be placed in both directions.

d. Where applicable, cold-drawn steel wire reinforcement, welded wire Fabric Reinforcement meeting requirements of ASTM A1064/A1064M.

2.2.3 Curing

a. Cure units in a warm curing chamber approximately 100?F (37.8?C) at 95% relative humidity for approximately 12 hours, or cure in a 95% moist environment as a minimum of 70?F (21.1?C) for 16 hours after casting.

b. Additional yard cutting at 95% relative humidity shall be 350 degree-days (i.e., 7 days at 50?F (10?C) or 5 days at 70 ?F (21 ?C) prior to shipping.

c. Form-cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

2.2.4 Manufacturing Tolerances

a. Cross section dimensions shall not deviate by more than +/- 1/8-inch (3mm) from approved dimensions.

b. Length of units shall not deviate by more than length/360 or +/- 1/8-inch (3mm), whichever is greater, not to exceed +/- 1/8-inch (3mm).

c. Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.

d. Warp, bow, or twist of units shall not exceed length/360 or +/- 1.8-inch (3mm), whichever is greater.

e. Location of dowel holes, anchor slots, flashing grooves, and similar features on formed sides of the unit, 1/8-inch (3mm), on unformed sides of unit 3/8-inch (9mm) maximum deviation.

2.2.5 Testing

a. Test compressive strength and absorption from specimens selected at random from plant production. Perform tests in accordance with ASTM C1194 and ASTM C1195.

b. Samples shall be taken and tested from every 500 cubic feet (14m3) of product produced.

c. New and existing mix designs shall be tested for strength and absorption compliance prior to producing units.

2.3 REPOINTING MATERIALS

See Specification 04 03 00.

2.4 CRACK INJECTION

a. Provide a cementitious restoration grout designed for injection into masonry cracks and voids.

b. Inject cracks that are no greater than 1/8-inch in width and masonry is soundly bonded but cracked. Cracks wider than 1/8" shall be repaired with patching material.

2.5 PATCHING MATERIAL

a. Provide a custom-colored, cementitious restoration patching mortar for filling voids and spalls in masonry. Patching material shall match the color and texture of the existing cast stone.

b. Submit samples matching the range of colors present in the original cast stone for Contracting Officer's approval prior to mock-ups. Several samples will be required to match the full-range of color. Samples shall also match the surface texture and finish of the original cast stone.

    1. Provide in situ mockups of the approved patching colors in the corresponding units requiring patching for verification of appearance.

c. Contracting Officer, in consultation with the Contractor, shall select the original, standard units against which the samples will be compared.

PART 3 EXECUTION

3.1 GENERAL

a. Undertake masonry renovation only after complete evaluation and analysis of the areas to be repaired are completed, including sampling and testing. Do not start repair work until conditions that have caused masonry deterioration have been identified and corrected.

b. Use the gentlest means to perform the work and take the greatest of care to ensure that the historic materials are not damaged in the process of the work, as established by mock-ups and testing.

c. In addition to requirements in this Section, comply with NPS Hist Prop.

d. Match repaired surfaces with adjacent existing surfaces in all respects.

e. Demonstrate the materials, methods and equipment proposed for use in the repair work in mock-ups, as specified in PART 2.

f. Use products in accordance with the manufacturer's instructions.

g. Assist Historic Masonry Consultant with performing field investigation to determine the causes and extent of degradation. Utilize the following techniques as deemed necessary.

h. Cast stone restoration shall be completed in the following sequence:

1. Clean all the cast stone.

2. Remove all sealant from joints.

3. Perform repairs and replacements.

4. Repoint joints.

3.2 PREPARATION

3.2.1 Protection

a. Protect persons, motor vehicles, adjacent surfaces, surrounding buildings, equipment, and landscape materials from chemicals used and runoff from cleaning and paint removal operations.

b. Erect temporary protection covers, which will remain in operation during the course of the work, over pedestrian walkways and at personnel and vehicular points of entrance and exit.

c. Protect the interior of buildings from the weather, cleaning, and repair operations at all times.

d. Do not expose workers to chemical substances in excess of the limits established by ACGIH 0100. Comply with more stringent regulations where applicable.

e. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work, including removals and

new installation work.

f. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.

g. Prevent mortar from staining face of surrounding masonry and other surfaces.

h. Cover sills, ledges, and projections to protect from mortar droppings.

i. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.

j. Immediately remove mortar in contact with exposed masonry and other surfaces.

k. Clean mortar splatters from scaffolding at end of each day.

3.2.2 Equipment and Techniques Demonstration

a. Demonstrate equipment and techniques of operation in an approved location.

b. Assemble dependable and sufficient equipment, appropriate and adequate to accomplish the work specified, at the work site with sufficient lead time before the start of the work to permit inspection, calibration of weighing and measuring devices, adjustment of parts, and the making of any repairs that may be required.

c. Maintain the equipment in good working condition throughout the project.

3.3 REMOVAL OF SAMPLE UNITS FOR REPLICATION

a. For each variation in shape, color, or design requiring replication, one representative sample of an existing cast stone unit shall be removed by the Restoration Contractor and made available to the Fabricator to replicate. Representative units shall be as determined by the Contracting Officer.

b. Units shall be cleaned using the products and procedures approved in Section 04 03 00 prior to transmitting to the Fabricator.

c. Remove and clean additional samples for reference purposes where so ordered by the Contracting Officer.

3.4 CAST STONE FABRICATION

a. Fabricate Cast Stone Units complying with manufacturing and testing procedures, quality control recommendations, and agreed upon dimensional tolerances.

b. Shop Drawings:

1. Submit shop drawings for approval prior to fabrication.

2. Include plans, elevations, sections, and locations of cast stone units to be replaced on the structure.

3. Show Fabricator's shop drawings including profiles, cross-sections, reinforcement, exposed faces, arrangement of joints (optional for standard or semi-custom installations), anchoring methods, anchors (if required), annotation of stone types and their locations.

4. Show full-size patterns with complete dimensions for new Cast Stone units, and their shapes and their jointing, showing relationship of existing units to new units.

5. Indicate setting number of each new Cast Stone unit and its location on the structure in annotated plans and elevations.

c. Forms/Molds: Take molds of existing elements requiring fabrication. Molds shall be taken from units in sound condition. If units in sound condition are not present, molds shall be taken from units in the best existing condition, and final measurements informed by units of the same profile remaining on the building. Cast plaster positives from molds. Employ an experienced and highly skilled sculptor to correct all deficiencies, recreate missing areas and details, and replicate original appearance of cast stone elements. Obtain approval from Contracting Officer of the corrected plaster models. Make mold/forms from the approved plaster models only.

d. Accurately construct forms to be mortar-tight and of sufficient strength to withstand pressures due to concrete placing operations, and temperature changes.

e. Maintain formwork and molds to provide completed cast stone units to exactly match plaster models.

f. All molds fabricated during this phase of the project shall become property of the Owner at the completion of this Project.

g. Ensure enough mortar coverage to protect reinforcing steel from the corrosive effects of weather.

h. Place Cast Stone mix into molds and formwork, and consolidate to eliminate all honeycombs, voids and air bubbles, defects, both visible defects and structural defects. Cure work for at least seven (7) full days prior to handling.

i. Dimensional Tolerances of Finished Units: Overall height and width measured at face adjacent to mold at time of casting plus or minus 1/8 inch.

j. Fabricate units smooth and true to plaster models with exposed edges and corners precise and well defined.

k. Cast units that are warped, cracked, broken, spalled, stained or otherwise defective will not be acceptable.

l. Surface Finish: Fabricate Cast Stone units and provide exposed surface finishes to exactly match original cast stone work in good condition as approved by Contracting Officer and approved appearance range samples.

m. Color and texture of Cast Stone shall be equal to the approved sample when viewed in direct daylight at a distance of 5 feet.

n. The range of total acceptable color (lightness, color saturation and hue) variation shall not exceed CIELAB 3.0 provided that the difference in hue alone does not exceed CIELAB 1.0 as defined by the International Commission on Illumination, 1976 Standards.

3.5 CAST STONE REMOVAL AND REPLACEMENT

3.5.1 Removal

a. Replace original historic cast stone only if surfaces are extensively deteriorated, as indicated on the drawings, or are threatening the safety of the structure or individuals. If additional damage is found, notify the Contracting Officer. Replacements must match the materials, colors, and finish of the existing historic masonry as closely as possible.

b. Before removing any deteriorated masonry units, establish bonding patterns, levels and coursings. Remove masonry that has deteriorated or is damaged beyond repair, as determined through investigation and evaluation. Carefully demolish or remove entire units from joint to joint, without damaging surrounding units in a manner that permits replacement with full-size units. Support and protect remaining masonry work that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition. Notify Contracting Officer of unforeseen detrimental conditions including voids, cracks, bulges, and loose masonry units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items. Remove as many whole masonry units as possible without damage.

c. Remove mortar, loose particles, and soil from masonry by cleaning with hand chisels, non-metallic brushes, and water.

d. Remove sealants by cutting close to masonry units with utility knife and cleaning with solvents. Clean surrounding masonry areas by removing mortar, dust, and loose particles in preparation for replacement.

e. If a few isolated masonry units are to be replaced, remove each without disturbing the surrounding masonry. Remove deteriorated masonry units and mortar requiring replacement by hand chiseling. Do not damage adjoining masonry units during the removal of deteriorated units and mortar.

3.5.2 Resetting

3.5.2.1 Examination

Architect and Restoration firm shall check Cast Stone materials for fit and finish upon delivery prior to installation. Unacceptable units shall not be set. Follow requirements outlined in Paragraph 1.10-B of this Section.

3.5.2.2 Setting Tolerances

Comply with Cast Stone Institute® Technical Manual and the following:

a. Variation from Plumb: Do not exceed 1/8-inch in 5 feet (3mm in 1.5m) or 1/4-inch in 20 feet (6mm in 6m), or more.

b. Variation from Level: Do not exceed 1/8-inch in 5 feet (3mm in 1.5m), 1/4-inch in 20 feet (6mm in 6m), or 3/8-inch (9mm) maximum.

c. Variation in Joint Width: Do not vary joint thickness more than 1/8-inch (3mm) or 1/4 of nominal joint width, whichever is greater.

d. Variation in Plane between Adjacent Surfaces: Do not exceed 1/8-inch (3mm) difference between planes of adjacent components or adjacent surfaces indicated to be flush with components.

3.5.2.3 Joints

a. Joint size: To match existing joints between cast stone units and between cast stone and brick and/or natural stone (gneiss & granite).

b. Joint materials should follow requirements outlined in Section 04 03 00.

3.5.2.4 Setting

a. Replace removed cast stone with new units matching the existing units.

b. Drench units with clean water prior to setting.

c. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

d. Set units in full bed of mortar, unless otherwise detailed.

e. Rake mortar joints 2.5 times the width of the joint for pointing.

f. Remove excess mortar from unit faces immediately after setting.

g. Tuck point unit joints with a profile to match original per Section 04 03 00.

3.5.2.5 Repair and Cleaning

a. Repair chips with touchup materials furnished by Fabricator.

b. Saturate units to be cleaned prior to applying an approved masonry cleaner.

c. Consult with Fabricator for appropriate cleaners.

3.5.2.6 Inspection and Acceptance

a. Inspect finished installation according to Cast Stone Institute® Technical Bulletin #36.

b. Upon completion and acceptance of Cast Stone units, Fabricator shall return original units provided for replication to Owner.

3.6 PATCHING

3.6.1 Application of Patch Repair Materials

a. Place repair materials to rebuild spalled or damaged areas and cracks

larger than 1/8-inch to match the original surface finish, level, texture, bonding patterns, color and porosity. Match the finished appearance of the substitute repair material patch with the adjacent existing surface.

b. Do not install repair material in thicknesses exceeding 4 inches. Utilize replacement unit for masonry repairs in excess of 4 inches.

c. Remove loose mortar and masonry prior to installation of the repair material. "Sound" the masonry with a hammer to verify its integrity. If necessary, cut away an additional 1/2 inch of the masonry substrate to ensure the surface to be repaired is solid and stable.

d. Remove all deteriorated masonry, sealant residue, and previous repair materials back to sound substrate using hammer and chisel or power equipment. Finish edges square to a minimum depth of 1/2 inch. Do not feather edges. Roughen substrate surface to achieve surface roughness required by manufacturer for good bond, but do not overly damage the substrate surface.

e. Cut out used anchors, threaded rod anchors and/or dowels within the damaged masonry area. Any anchors that are free of rust, solidly embedded, and do not project beyond the solid masonry surface may remain.

f. Using clean water and a non-metallic scrub brush, clean dust from surface and pores of the substrate.

g. Pre-wet the substrate with water prior to the application of the repair material to prevent the substrate from drawing out the moisture too quickly. Re-wet the surface with water again immediately before applying the repair material. Use methods approved by the repair material manufacturer to deliver the substitute repair work as demonstrated.

h. Follow manufacturers' instructions pertaining to the placement of materials. If the manufacturer requires that installers of a specified product be trained, provide this documentation to the Contracting Officer. Training certificates previously issued by product companies for the application of specified products cannot be substituted for the Project Training "Substitute Repair Material Certificate" on this project.

i. Masonry and Material Repair Finishes and Color

    1. Match the exposed surfaces of masonry and substitute material repair finish, color, texture, and surface detail with the original surface. Mechanical finishing and texturing may be required to produce the required finish and appearance.

    2. Conceal bond lines between the repaired area and adjacent surfaces.

    3. Replicate all surface details, including tooling and machine marks.

    4. Use low-impact energy type equipment in finishing and texturing, which will not weaken the patch or damage the patch bond and the adjacent masonry.

3.6.2 Anchors for Patches

a. Provide stainless steel anchors to ensure that the patch is tied to the existing masonry structure at a frequency of at least one anchor per 4 square inches of patch plan surface area; specific locations for anchors must be as indicated.

b. Use small handheld, low-speed rotary masonry drills to produce holes in the existing masonry, within the limits for the patch anchor installation.

1. Drill holes into the existing substrate material of the masonry using rotary (non-hammer) drills making holes with a diameter of 1/8 inch larger than the anchor diameter and a depth of 4 inches, except as otherwise indicated or directed.

2. Drill holes must not penetrate completely through the masonry and must provide at least 1 inch of cover around the drill hole.

3. Clean holes by water blasting to remove drill dust and other debris and then blow dry with filtered, dry, compressed air.

4. Condition drill holes in accordance with the epoxy adhesive manufacturer's recommendations.

c. Clean anchors to remove all contaminants which may hinder epoxy bond.

d. Pressure inject adhesive into the back of the drilled holes.

1. Fill holes without spilling excess grout when the anchors are inserted.

2. Insert anchors immediately into the holes.

3. Set back anchors from the exterior face at least 1 inch.

4. Install anchors without breaking or chipping the exposed masonry surface.

3.6.3 Cleanup

a. Protect masonry surfaces from excess grout adhesive and spills.

b. Leave the surface of the masonry in a clean and uncontaminated condition.

3.7 CRACK INJECTION WITH RESTORATION INJECTION GROUT

3.7.1 General

a. Notify the Contracting Officer as to when and where the installation will occur at least 48 hours prior to start.

b. Provide samples to the Government representative from the dispenser during the course of the injection.

c. Apply in accordance with the manufacturer's instructions.

3.7.2 Application of Injection Grout

a. Drill 1/8-inch diameter, downward-sloping injection holes. For transverse cracks less than 1/8 inch wide, drill holes through center of crack at 1 to 1.5 inches on center.

b. Clean out drill holes and cracks with compressed air and potable water. Remove dirt and organic matter, loose material, sealants, and failed crack repair materials.

c. Inject grout using hypodermic needles or pressure ports through holes sequentially, beginning at one end of area and working to opposite end. Do not exceed 10 psi injection pressure. Where possible begin at lower end of injection area and work upward. Inject grout until it extrudes from adjacent holes. After grout has set, remove excess material and patch injection holes and surface of cracks with a restoration patching mortar designed to match the original masonry.

3.8 FINAL CLEANING

a. No sooner than 72 hours after completion of the repair work and after joints are sealed, wash down faces and other exposed surfaces of masonry with water applied with a soft bristle brush, then rinse with clean water.

b. Discolorations that cannot be removed by these procedures, are considered defective work.

c. Perform cleaning work when temperature and humidity conditions allow the surfaces to dry rapidly.

d. Protect adjacent surfaces from damage during cleaning operations.

3.9 PROTECTION OF WORK

Protect work against damage from subsequent operations.

3.10 DEFECTIVE WORK

Repair or replace defective work as directed by Contracting Officer, using approved procedures.

3.11 FINAL INSPECTION

Following completion of the work, inspect the structure for damage, staining, and other distresses. Inspect the patches for cracking, crazing, delamination, unsoundness, staining and other defects. Inspect the finish, texture, color and shade, and surface tolerances of the patches to verify that all requirements have been met. Repair surfaces exhibiting defects as directed.

a. Following completion of the work, inspect the structure for damage, staining, and other distresses.

    1. Inspect patches for cracking, crazing, delamination, unsoundness, staining and other defects.

    2. Inspect finish, texture, color and shade, and surface tolerances of the patches to verify that all requirements have been met.

b. Repair surfaces exhibiting defects as directed by Contracting Officer.

-- End of Section --

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SECTION 04 20 00

UNIT MASONRY
11/15

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 216.1	(2014) Code Requirements for Determining Fire Resistance of Concrete and Masonry Construction Assemblies
ACI SP-66	(2004) ACI Detailing Manual

ASTM INTERNATIONAL (ASTM)

ASTM A153/A153M	(2016a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A167	(2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A185/A185M	(2007) Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM A641/A641M	(2019) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM A951/A951M	(2011) Standard Specification for Steel Wire for Masonry Joint Reinforcement
ASTM C90	(2016) Standard Specification for Loadbearing Concrete Masonry Units
ASTM C129	(2017) Standard Specification for Nonloadbearing Concrete Masonry Units
ASTM C207	(2018) Standard Specification for Hydrated Lime for Masonry Purposes
ASTM C270	(2019) Standard Specification for Mortar for Unit Masonry
ASTM C476	(2020) Standard Specification for Grout for Masonry

ASTM C494/C494M	(2019) Standard Specification for Chemical Admixtures for Concrete
ASTM C586	(2011) Standard Test Method for Potential Alkali Reactivity of Carbonate Rocks as Concrete Aggregates (Rock-Cylinder Method)
ASTM C616/C616M	(2010) Standard Specification for Quartz-Based Dimension Stone
ASTM C641	(2017) Standard Test Method for Iron Staining Materials in Lightweight Concrete Aggregates
ASTM C780	(2020) Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
ASTM C979/C979M	(2016) Standard Specification for Pigments for Integrally Colored Concrete
ASTM C1019	(2019) Standard Test Method for Sampling and Testing Grout
ASTM C1314	(2014) Standard Test Method for Compressive Strength of Masonry Prisms
ASTM C1384	(2012a) Standard Specification for Admixtures for Masonry Mortars
ASTM C1611/C1611M	(2014) Standard Test Method for Slump Flow of Self-Consolidating Concrete

THE MASONRY SOCIETY (TMS)

TMS MSJC	(2016) Masonry Standard Joint Committee's (MSJC) Book - Building Code Requirements and Specification for Masonry Structures, Containing TMS 402/ACI 530/ASCE 5, TMS 602/ACI 530.1/ASCE 6, and Companion Commentaries

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Cut CMU Drawings; G, RO

Reinforcement Detail Drawings; G

Stone and Custom Cast Stone Cladding Assembly Drawings; G

Including - profiles and dimensions of stone and cast stone units, Show locations and details of joints both within stone cladding assembly and between stone cladding assembly and other construction. Include details of mortar joints and sealant joints.

Show locations and details of anchors and backup structure. Show direction of veining, grain, or other directional patterns. Include large-scale shaded elevations and details of decorative surfaces and inscriptions.

SD-03 Product Data

Hot Weather Procedures; G,RO

Cold Weather Procedures; G, RO

Stone and Accessories; G, AE

Dimension Stone and Custom Cast Units

Information on each varitey of stone, custom cast stone, autoclaved aerated concrete units, accessories, anchors, andother products used.

Cement; G, RO

Cementitious Materials; G, RO

Recycled Content of Cementitious Materials; S, RO

Insulation; G, RO

SD-04 Samples

Concrete Masonry Units (CMU); G, RO

Custom Cast Stone Units; G, RO

Admixtures for Masonry Mortar; G, RO

Bar Positioners; G, RO

Joint Reinforcement; G, RO

SD-05 Design Data

Masonry Compressive Strength; G, RO

Fire-Rated Concrete Masonry Units

Bracing Calculations; G, RO

SD-06 Test Reports

Fire-Rated Concrete Masonry Units

Field Testing of Mortar

Field Testing of Grout

Prism Tests

SD-07 Certificates

Special Masonry Inspector Qualifications

Concrete Masonry Units (CMU)

Cementitious Materials

Admixtures for Masonry Mortar

Admixtures for Grout

Bar Positioners

Joint Reinforcement

Custom Cast Stone Units

SD-08 Manufacturer's Instructions

Admixtures for Masonry Mortar

Admixtures for Grout

SD-10 Operation and Maintenance Data

Take-Back Program

SD-11 Closeout Submittals

Recycled Content of Cement; S

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials: Option 2, Leadership Extraction Practices

a. For CMU and steel reinforcement: Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

3. LEED Information: Provide product documentation from supplier with regional materials information. If multiple, equivalent suppliers are available, priority shall be given to those that can procure product components within 100 miles of the project site. Information must include location of material manufacturer and points of extraction, harvest or recovery for each material. Include statement indicating distance to project location, cost for each regional material and fraction by weight that is considered regional.

a. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

b. LEED Submittal shall be submitted and reviewed concurrently with product data submittal and samples.

1.3 QUALITY ASSURANCE

1.3.1 Special Masonry Inspector Qualifications

Refer to Section 01 45 35 SPECIAL INSPECTIONS for qualifications and responsibilities of the masonry special inspector.

1.3.2 Fire-Resistance Ratings

Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

1.3.3 Custom Cast Stone Manufacturer Qualifications

Certify that the custom cast stone manufacturer meets the following qualifications:

1. Sufficient plant facilities to provide quality, shapes, quantities, and sizes of custom cast stone units required without delaying progress of Work.
2. Minimum of 10 years experience in producing custom cast stone.
3. Fabricating plant shall be certified by the Architectural Precast Association (APA), Cast Stone Institute, or equivalent certification program.
4. Manufacturer shall have an internal Quality Assurance Testing Program with certified laboratory technicians.

1.3.4 Tie Capacity

Provide test results demonstrating that the ties have adequate capacity.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver, store, handle, and protect material to avoid chipping, breakage, and contact with soil or contaminating material. Store and prepare materials in already disturbed areas to minimize project site disturbance and size of project site.

1.4.1 Masonry Units

Cover and protect masonry units from precipitation. Conform to handling and storage requirements of TMS MSJC.

a. Pack glazed brick, glazed structural clay tile, and prefaced concrete masonry units in the manufacturer's standard paper cartons, trays, or shrink wrapped pallets with a divider between each unit. Do not stack pallets. Do not remove units from cartons until cartons are placed on scaffolds or in the location where units are to be laid.

b. Mark prefabricated lintels on top sides to show either the lintel schedule number or the number and size of top and bottom bars.

1.4.2 Reinforcement, Anchors, and Ties

Store steel reinforcing bars, coated anchors, ties, and joint reinforcement above the ground. Maintain steel reinforcing bars and uncoated ties free of loose mill scale and loose rust.

1.4.3 Cementitious Materials, Sand and Aggregates

Deliver cementitious and other packaged materials in unopened containers, plainly marked and labeled with manufacturers' names and brands. Store cementitious material in dry, weathertight enclosures or completely cover. Handle cementitious materials in a manner that will prevent the inclusion of foreign materials and damage by water or dampness. Store sand and aggregates in a manner to prevent contamination and segregation.

Provide Recycled Content of Cementitious Materials.

1.5 PROJECT/SITE CONDITIONS

Conform to TMS MSJC for hot and cold weather masonry erection.

1.5.1 Hot Weather Procedures

When ambient air temperature exceeds 100 degrees F, or exceeds 90 degrees F and the wind velocity is greater than 8 mph, comply with TMS MSJC Article 1.8 D for: preparation prior to conducting masonry work; construction while masonry work is in progress; and protection for newly completed masonry.

1.5.2 Cold Weather Procedures

When ambient temperature is below 40 degrees F, comply with TMS MSJC Article 1.8 C for: preparation prior to conducting masonry work; construction while masonry work is in progress; and protection for newly

completed masonry.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

2.1.1 Design - Specified Compressive Strength of Masonry

The specified compressive strength of masonry, f'm, is as indicated for each type of masonry.

2.1.2 Performance - Verify Masonry Compressive Strength

Verify specified compressive strength of masonry using the "Unit Strength Method" of TMS MSJC. Submit calculations and certifications of unit and mortar strength.

Verify specified compressive strength of masonry using the "Prism Test Method" of TMS MSJC when the "Unit Strength Method" cannot be used. Submit test results.

2.2 MANUFACTURED UNITS

2.2.1 General Requirements

Do not change the source of materials, which will affect the appearance of the finished work, after the work has started except with Contracting Officer's approval. Submit test reports from an approved independent laboratory. Certify test reports on a previously tested material as the same materials as that proposed for use in this project. Submit certificates of compliance stating that the materials meet the specified requirements.

2.2.1.1 Sample Submittal

Submit limestone, granite, and custom cast stone samples as specified, showing the color range and texture of materials to be used. Limit units used on the project to those that conform to the approved sample. Submit sample of colored mortar with applicable masonry unit and color samples of a 24 inch x 24 inch section showing the pattern and one unit for each type of special shape.

2.2.1.2 Drawings

Submit Stone and Custom Cast Stone Cladding Assembly Drawings.

2.2.2 Concrete Units

2.2.2.1 Aggregates

Test lightweight aggregates, and blends of lightweight and heavier aggregates in proportions used in producing the units, for stain-producing iron compounds in accordance with ASTM C641,visual classification method. Do not incorporate aggregates for which the iron stain deposited on the filter paper exceeds the "light stain" classification.

2.2.2.2 Concrete Masonry Units (CMU)

2.2.2.2.1 Cement

Use only cement that has a low alkali content and is of one brand.

2.2.2.2.2 Recycled Content

Provide concrete masonry units with a minimum of 20 percent post-consumer recycled content, based on mass, cost, or volume.

2.2.2.2.3 Size

Provide units of sizes indicated on the drawings.

2.2.2.2.4 Weather Exposure

Provide concrete masonry units with water-repellant admixture added during manufacture where units will be exposed to weather.

2.2.2.2.5 Unit Types

a. Hollow Load-Bearing Units: ASTM C90, lightweight or normal weight. Provide load-bearing units for exterior walls, foundation walls, load-bearing walls, and shear walls.

b. Hollow Non-Load-Bearing Units: ASTM C129, lightweight or normal weight. Load-bearing units may be provided in lieu of non-load-bearing units.

c. Solid Load-Bearing Units: ASTM C90, lightweight or normal weight units. Provide solid units as indicated.

2.2.2.2.6 Jamb Units

Provide jamb units of the shapes and sizes to conform with wall units. Solid units may be incorporated in the masonry work where necessary to fill out at corners, gable slopes, and elsewhere as approved.

Provide sash jamb units with a 3/4 by 3/4 inch groove near the center at end of each unit.

2.2.2.3 Fire-Rated Concrete Masonry Units

For indicated fire-rated construction, provide concrete masonry units of minimum equivalent thickness for the fire rating indicated and the corresponding type of aggregates indicated in TABLE I. Units containing more than one of the aggregates listed in TABLE I will be rated by linear interpolation based on the percent by dry-rodded volume of each aggregate used in manufacturing the units.

TABLE I
FIRE-RATED CONCRETE MASONRY UNITS

Aggregate Type	Minimum Equivalent Thickness for Fire-Resistance Rating, inch						
	1/2 hour	3/4 hour	1 hour	1-1/2 hour	2 hours	3 hours	4 hours

TABLE I FIRE-RATED CONCRETE MASONRY UNITS							
Aggregate Type	Minimum Equivalent Thickness for Fire-Resistance Rating, inch						
Calcareous or siliceous gravel (other than limestone)	2.0	2.4	2.8	3.6	4.2	5.3	6.2
Limestone, cinders, or air-cooled slag	1.9	2.3	2.7	3.4	4.0	5.0	5.9
Expanded clay, expanded shale, or expanded slate	1.8	2.2	2.6	3.3	3.6	4.4	5.1
Expanded slag or pumice	1.5	1.9	2.1	2.7	3.2	4.0	4.7

Determine equivalent thickness in accordance with ACI 216.1. Where walls are to receive plaster or be faced with brick, or otherwise form an assembly; include the thickness of plaster or brick or other material in the assembly in determining the equivalent thickness. Submit calculation results.

2.2.3 Dimension Stone and Custom Cast Units

Provide dimension stone cut to the design shown and conforming to:

Limestone	ASTM C586	Match existing
Granite	ASTM C616/C616M	Match existing

2.2.4 Custom Cast Stone Units

Provide cast stone shapes for new work in the project in configuration as indicated in the drawings.

Refer to section 04 03 10 for new cast stone unit fabrication requirements. New cast stone finish and color is to match fully refurbished cast stone finish and color. Coordinate color and finish of cast stone in new work with finish and color of restoration cast stone.

2.3 EQUIPMENT

2.3.1 Vibrators

Maintain at least one spare vibrator on site at all times.

2.3.2 Grout Pumps

Pumping through aluminum tubes is not permitted.

2.4 MATERIALS

2.4.1 Mortar Materials

2.4.1.1 Cementitious Materials

Provide cementitious materials that conform to those permitted by ASTM C270.

2.4.1.2 Hydrated Lime and Alternates

Provide lime that conforms to one of the materials permitted by ASTM C207 for use in combination with portland cement, hydraulic cement, and blended hydraulic cement. Do not use lime in combination with masonry cement or mortar cement.

2.4.1.3 Colored Mortar

Use mortar pigment that conforms to ASTM C979/C979M. Add pigment to mortar to produce a uniform color matching the adjscent mortar when fully dry. Furnish pigments in accurately pre-measured and packaged units that can be added to a measured amount of cementitious materials or supply pigments via preblended cementitious materials or dry mortar mix.

a. In masonry cement or mortar cement, do not exceed 5 percent of cement weight for mineral oxide pigment; do not exceed 1 percent of cement weight for carbon black pigment.

b. In cement-lime mortar mix, do not exceed 10 percent of cementitious materials' weight for mineral oxide pigment; do not exceed 2 percent of cementitious materials' weight for carbon black pigment.

2.4.1.4 Admixtures for Masonry Mortar

In cold weather, use a non-chloride based accelerating admixture that conforms to ASTM C1384, unless Type III portland cement is used in the mortar.

In showers and kitchens, use mortar that contains a water-repellent admixture that conforms to ASTM C1384. Provide a water-repellent admixture, conforming to ASTM C1384 and of the same brand and manufacturer as the block's integral water-repellent, in the mortar used to place concrete masonry units that have an integral water-repellent admixture.

2.4.1.5 Aggregate and Water

Provide aggregate (sand) and water that conform to materials permitted by ASTM C270.

2.4.2 Grout and Ready-Mix Grout Materials

2.4.2.1 Cementitious Materials for Grout

Provide cementitious materials that conform to those permitted by ASTM C476.

2.4.2.2 Admixtures for Grout

Water-reducing admixtures that conform to ASTM C494/C494M Type F or G and viscosity-modifying admixtures that conform to ASTM C494/C494M Type S are permitted for use in grout. Other admixtures require approval by the

Contracting Officer.

In cold weather, a non-chloride based accelerating admixture may be used subject to approval by the Contracting Officer; use accelerating admixture that is non-corrosive and conforms to ASTM C494/C494M, Type C.

2.4.2.3 Aggregate and Water

Provide fine and coarse aggregates and water that conform to materials permitted by ASTM C476.

2.5 MORTAR AND GROUT MIXES

2.5.1 Mortar Mix

a. Provide mortar Type N unless specified otherwise herein.

b. Provide Type N or S mortar for non-load-bearing, non-shear-wall interior masonry.

c. For field-batched mortar, measure component materials by volume. Use measuring boxes for materials that do not come in packages, such as sand, for consistent batching. Mix cementitious materials and aggregates between 3 and 5 minutes in a mechanical batch mixer with a sufficient amount of water to produce a workable consistency. Do not hand mix mortar unless approved by the Contracting Officer. Maintain workability of mortar by remixing or retempering. Discard mortar that has begun to stiffen or is not used within 2-1/2 hours after initial mixing.

d. For preblended mortar, follow manufacturer's mixing instructions.

2.5.2 Grout and Ready Mix Grout Mix

Use conventional grout with a slump between 8 and 11 inches. Use self-consolidating grout with slump flow of 24 to 30 inches and a visual stability index (VSI) not greater than 1. Do not change proportions and do not use materials with different physical or chemical characteristics in grout for the work unless additional evidence is furnished that grout meets the specified requirements.

2.6 ACCESSORIES

2.6.1 Grout Barriers

Grout barriers for vertical cores that consist of fine mesh wire, fiberglass, or expanded metal.

2.6.2 Bar Positioners

2.6.2.1 General

a. Fabricate joint reinforcement in conformance with ASTM A951/A951M. Hot dip galvanize joint reinforcement in exterior walls and in interior walls exposed to moist environment in conformance with ASTM A153/A153M. Galvanize joint reinforcement in other interior walls in conformance with ASTM A641/A641M; coordinate with paragraph JOINT REINFORCEMENT below.

e. Submit two bar positioners of each type used, as samples.

2.6.2.2 Wire Mesh Anchors

Provide wire mesh anchors of 1/4 inch mesh galvanized hardware cloth, conforming to ASTM A185/A185M, with length not less than 12 inches, at intersections of interior non-bearing masonry walls.

2.6.2.3 Bar Positioners

Factory-fabricate bar positioners, used to prevent displacement of reinforcing bars during the course of construction, from 9 gauge steel wire or equivalent, and hot-dip galvanized. Bar positioners must be suitable for intended use and be corrosion resistant steel. Bar positioners not fully contained within the wythe must be hot-dip galvanized.

2.6.3 Joint Reinforcement

Factory fabricate joint reinforcement in conformance with ASTM A951/A951M, welded construction. Provide ladder type joint reinforcement, having one longitudinal wire in the mortar bed of each face shell for hollow units and one wire for solid units and with all wires a minimum of 9 gauge. Size joint reinforcement to provide a minimum of 5/8 inch cover from each face. Space crosswires not more than 16 inches. Provide joint reinforcement for straight runs in flat sections not less than 10 feet long. Provide joint reinforcement with factory formed corners and intersections. If approved for use, joint reinforcement may be furnished with adjustable wall tie features. Submit one piece of each type used, including corner and wall intersection pieces, showing at least two cross wires.

2.6.4 Reinforcing Steel Bars

As indicated on the drawings.

2.6.5 Through Wall Flashing and Weeps

2.6.5.1 General

Provide stainless steel sheet.

2.6.5.2 Stainless Steel Flashing

Provide stainless steel, ASTM A167, Type 304 or 316, 0.015 inch thick, No. 2D finish.

2.6.5.3 Weep Ventilators

Provide weep ventilators that are prefabricated from stainless steel or plastic. Provide inserts with grill or louver-type openings designed to allow the passage of moisture from cavities and to prevent the entrance of insects, and with a rectangular closure strip to prevent mortar droppings from clogging the opening. Provide ventilators with compressible flanges to fit in a standard 3/8 inch wide mortar joint and with height equal to the nominal height of the unit.

2.6.5.4 Metal Drip Edge

Provide stainless steel drip edge, 15-mil thick, hemmed edges, with down-turned drip at the outside edge and upturned dam at the inside edge for use with membrane flashings.

2.6.6 RIGID BOARD-TYPE INSULATION

Provide rigid board-type insulation as specified in Section 07 21 13 BOARD AND BLOCK INSULATION.

PART 3 EXECUTION

3.1 EXAMINATION

Prior to start of work, verify the applicable conditions as set forth in TMS MSJC, inspection.

3.2 PREPARATION

3.2.1 Stains

Protect exposed surfaces from mortar and other stains. When mortar joints are tooled, remove mortar from exposed surfaces with fiber brushes and wooden paddles. Protect base of walls from splash stains by covering adjacent ground with sand, sawdust, or polyethylene.

3.2.2 Loads

Do not apply uniform loads for at least 12 hours or concentrated loads for at least 72 hours after masonry is constructed. Provide temporary bracing as required.

3.2.3 Protection

Ice or snow formed on the masonry bed shall be thawed by the application of heat. Heat shall be applied carefully until the top surface of the masonry is dry to the touch. Sections of masonry deemed frozen and damaged shall be removed before continuing construction of those sections.

a. Air temperature 40 to 32 degrees F. Sand or mixing water shall be heated to produce mortar temperatures between 40 and 120 degrees F.

b. Air temperature 32 to 25 degrees F. Sand or mixing water shall be heated to produce mortar temperatures between 40 and 120 degrees F. Temperature of mortar on boards shall be maintained above freezing.

c. Air temperature 25 to 20 degrees F. Sand or mixing water shall be heated to produce mortar temperatures between 40 and 120 degrees F. Temperature of mortar on boards shall be maintained above freezing. Sources of heat shall be used on both sides of walls under construction. Windbreaks shall be employed when wind is in excess of 15 mph.

d. Air temperature 20 degrees F and below. Sand or mixing water shall be heated to produce mortar temperatures between 40 and 120 degrees F. Enclosure and auxiliary heat shall be be provided to maintain air temperature above 32 degrees F. Temperature of units when laid shall not be less than 20 degrees F.

3.2.4 Completed Masonry and Masonry Not Being Worked On

a. Mean daily air temperature 40 to 32 degrees F. Masonry shall be protected from rain or snow for 24 hours by covering with weather-resistive membrane.

b. Mean daily air temperature 32 to 25 degrees F. Masonry shall be completely covered with weather-resistant membrane for 24 hours.

c. Mean daily air temperature 25 to 20 degrees F. Masonry shall be completely covered with insulating blankets or equally protected for 24 hours.

d. Mean daily air temperature 20 degrees F and below. Masonry temperature shall be maintained above 32 degrees F for 24 hours by enclosure and supplementary heat, by electric heating blankets, infrared heat hamps, or other approved methods.

3.2.5 Concrete Surfaces

Where masonry is to be placed, clean concrete of laitance, dust, dirt, oil, organic matter, or other foreign materials and slightly roughen to provide a surface texture with a depth of at least 1/8 inch. Sandblast, if necessary, to remove laitance from pores and to expose the aggregate.

3.2.6 Shelf Angles

Adjust shelf angles as required to keep the masonry level and at the proper elevation.

3.2.7 Bracing

Provide bracing and scaffolding necessary for masonry work. Design bracing to resist wind pressure as required by OSHA and local codes and submit bracing calculations, sealed by a registered professional engineer. Do not remove bracing in less than 10 days.

3.3 ERECTION

3.3.1 General

a. Coordinate masonry work with the work of other trades to accommodate built-in items and to avoid cutting and patching. Lay masonry units in running bond pattern. Lay facing courses level with back-up courses, unless the use of adjustable ties has been approved in which case the tolerances is plus or minus 1/2 inch. Adjust each unit to its final position while mortar is still soft and has plastic consistency.

b. Remove and clean units that have been disturbed after the mortar has stiffened, and relay with fresh mortar. Keep air spaces, cavities, chases, expansion joints, and spaces to be grouted free from mortar and other debris. Select units to be used in exposed masonry surfaces from those having the least amount of chipped edges or other imperfections detracting from the appearance of the finished work.

c. When necessary to temporarily discontinue the work, step (rack) back the masonry for joining when work resumes. Toothing may be used only

when specifically approved by the Contracting Officer. Before resuming work, remove loose mortar and thoroughly clean the exposed joint. Cover the top of walls subjected to rain or snow with nonstaining waterproof covering or membrane when work is not in process. Extend the covering a minimum of 610 mm 2 feet down on each side of the wall and hold securely in place.

d. Ensure that units being laid and surfaces to receive units are free of water film and frost. Lay solid units in a nonfurrowed full bed of mortar. Bevel mortar for veneer wythes and slope down toward the cavity side. Shove units into place so that the vertical joints are tight. Completely fill vertical joints between solid units with mortar, except where indicated at control, expansion, and isolation joints. Place hollow units so that mortar extends to the depth of the face shell at heads and beds, unless otherwise indicated. Mortar will be permitted to protrude up to 1/2 inch into the space or cells to be grouted. Provide means to prevent mortar from dropping into the space below or clean grout spaces prior to grouting.

e. In multi-wythe construction with collar joints no more than 3/4 inch wide, bring up the inner wythe not more than 16 inches ahead of the outer wythe. Fill collar joints with mortar during the laying of the facing wythe, and filling shall not lag the laying of the facing wythe by back-buttering each unit as it is laid.

3.3.1.1 Jointing

Tool mortar joints when the mortar is thumbprint hard. Tool horizontal joints after tooling vertical joints. Brush mortar joints to remove loose and excess mortar.

3.3.1.1.1 Tooled Joints

Tool mortar joints in exposed exterior and interior masonry surfaces concave, using a jointer that is slightly larger than the joint width so that complete contact is made along the edges of the unit. Perform tooling so that the mortar is compressed and the joint surface is sealed. Use a jointer of sufficient length to obtain a straight and true mortar joint. No exterior joints are to be left un-tooled.

3.3.1.1.2 Flush Joints

Flush cut mortar joints in concealed masonry surfaces and joints at electrical outlet boxes in wet areas. Finish flush cut joints by cutting off the mortar flush with the face of the wall. Point joints in unparged masonry walls below grade tight. For architectural units, such as fluted units, completely fill both the head and bed joints and flush cut.

3.3.1.1.3 Door and Window Frame Joints

On the exposed interior side of exterior frames, joints between frames and abutting masonry walls shall be raked to a depth of 3/8 inch. On the exterior side of exterior frames, joints between frames and abutting masonry walls shall be raked to a depth of 3/8 inch.

3.3.1.1.4 Joint Widths

a. Provide 3/8 inch wide mortar joints in concrete masonry, except for prefaced concrete masonry units.

b. Maintain mortar joint widths within tolerances permitted by TMS MSJC

3.3.1.2 Cutting and Fitting

Use full units of the proper size wherever possible, in lieu of cut units. Locate cut units where they would have the least impact on the architectural aesthetic goals of the facility. Perform cutting and fitting, including that required to accommodate the work of others, by masonry mechanics using power masonry saws. Concrete masonry units may be wet or dry cut. Before being placed in the work, dry wet-cut units to the same surface-dry appearance as uncut units being laid in the wall. Provide cut edges that are clean, true and sharp.

a. Carefully make openings in the masonry so that wall plates, cover plates or escutcheons required by the installation will completely conceal the openings and will have bottoms parallel with the masonry bed joints. Provide reinforced masonry lintels above openings over 12 inches wide for pipes, ducts, cable trays, and other wall penetrations, unless steel sleeves are used.

b. Do not reduce masonry units in size by more than one-third in height and one-half in length. Do not locate cut products at ends of walls, corners, and other openings.

3.3.1.3 Unfinished Work

Rack back unfinished work for joining with new work. Toothing may be resorted to only when specifically approved by the Contracting Officer. Remove loose mortar and thoroughly clean the exposed joints before laying new work.

3.3.2 Reinforced, Single Wythe Concrete Masonry Units Walls

3.3.2.1 Concrete Masonry Unit Placement

a. Fully bed units used to form piers, pilasters, columns, starting courses on footings, solid foundation walls, lintels, and beams, and where cells are to be filled with grout in mortar under both face shells and webs. Provide mortar beds under both face shells for other units. Mortar head joints for a distance in from the face of the unit not less than the thickness of the face shell.

b. Solidly grout foundation walls below grade.

c. Stiffen double walls at wall-mounted plumbing fixtures by use of strap anchors, two above each fixture and two below each fixture, located to avoid pipe runs, and extending from center to center of each wall within the double wall. Adequately reinforce walls and partitions for support of wall-hung plumbing fixtures when chair carriers are not specified.

d. Submit drawings showing elevations of walls exposed to view and indicating the location of all cut CMU products.

3.3.2.2 Preparation for Reinforcement

Lay units in such a manner as to preserve the unobstructed vertical continuity of cores to be grouted. Remove mortar protrusions extending

1/2 inch or more into cells before placing grout. Position reinforcing bars accurately as indicated before placing grout. Where vertical reinforcement occurs, fill cores solid with grout in accordance with paragraph PLACING GROUT in this Section.

3.3.3 ANCHORAGE

3.3.3.1 Anchorage at Intersecting Walls

Provide wire mesh anchors at maximum 16 inches spacing at intersections of interior non-bearing masonry walls.

3.3.4 Lintels

3.3.4.1 Precast Concrete and Steel Lintels

Provide precast concrete and steel lintels as shown on the Drawings. Set lintels in a full bed of mortar with faces plumb and true. Provide steel and precast lintels with a minimum bearing length of 8 inches unless otherwise indicated. In partially grouted masonry, provide fully grouted units under the full lintel bearing length, unless otherwise indicated.

3.4 INSTALLATION

3.4.1 Bar Reinforcement Installation

3.4.1.1 Preparation

Submit detail drawings showing bar splice locations. Identify bent bars on a bending diagram and reference and locate such bars on the drawings. Show wall dimensions, bar clearances, and wall openings. Utilize bending details that conform to the requirements of ACI SP-66. No approval will be given to the shop drawings until the Contractor certifies that all openings, including those for mechanical and electrical service, are shown. If, during construction, additional masonry openings are required, resubmit the approved shop drawings with the additional openings shown along with the proposed changes. Clearly highlight location of these additional openings. Provide wall elevation drawings with minimum scale of 1/4 inch per foot. Submit drawings including plans, elevations, and details of wall reinforcement; details of reinforcing bars at corners and wall intersections; offsets; tops, bottoms, and ends of walls; control and expansion joints; lintels; and wall openings.

Clean reinforcement of loose, flaky rust, scale, grease, mortar, grout, and other coatings that might destroy or reduce its bond prior to placing grout. Do not use bars with kinks or bends not shown on the approved shop drawings. Place reinforcement prior to grouting. Unless otherwise indicated, extend vertical wall reinforcement to within 2 inches of tops of walls.

3.4.1.2 Positioning Bars

a. Accurately place vertical bars within the cells at the positions indicated on the drawings. A minimum clearance of 1/2 inch shall be maintained between the bars and masonry units. Provide minimum clearance between parallel bars of 1/2 inch between the bars and masonry units for coarse grout and a minimum clearance of 1/4 inch between the bars and masonry units for fine grout. Provide minimum clearance between parallel bars of 1 inch or one diameter of the

reinforcement, whichever is greater. Vertical reinforcement may be held in place using bar positioners located near the ends of each bar and at intermediate intervals of not more than 192 diameters of the reinforcement or by other means to prevent displacement beyond permitted tolerances. As masonry work progresses, secure vertical reinforcement to prevent displacement beyond allowable tolerances.

b. Wire column and pilaster lateral ties in position around the vertical reinforcing bars. Place lateral ties in contact with the vertical reinforcement and do not place in horizontal mortar bed joints.

c. Position horizontal reinforcing bars as indicated. Stagger splices in adjacent horizontal bars, unless otherwise indicated.

d. Form splices by lapping bars as indicated. Do not cut, bend or eliminate reinforcing bars. Foundation dowel bars may be field-bent when permitted by TMS MSJC.

3.4.1.3 Splices of Bar Reinforcement

Lap splice reinforcing bars as indicated. When used, provide welded or mechanical connections that develop at least 125 percent of the specified yield strength of the reinforcement.

3.4.2 Placing Grout

3.4.2.1 General

Fill cells containing reinforcing bars with grout. Solidly grout hollow masonry units in walls or partitions supporting plumbing, heating, or other mechanical fixtures, voids at door and window jambs, and other indicated spaces. Solidly grout cells under lintel bearings on each side of openings for full height of openings. Solidly grout walls below grade, lintels, and bond beams. Units other than open end units may require grouting each course to preclude voids in the units.

Discard site-mixed grout that is not placed within 1-1/2 hours after water is first added to the batch or when the specified slump is not met without adding water after initial mixing. Discard ready-mixed grout that does not meet the specified slump without adding water other than water that was added at the time of initial discharge. Allow sufficient time between grout lifts to preclude displacement or cracking of face shells of masonry units. Provide a grout shear key between lifts when grouting is delayed and the lower lift loses plasticity. If blowouts, flowouts, misalignment, or cracking of face shells should occur during construction, tear down the wall and rebuild.

3.4.2.2 Vertical Grout Barriers for Multi-Wythe Composite Walls

In multi-wythe composite walls, provide grout barriers in the collar join not more than 30 feet apart, or as required, to limit the horizontal flow of grout for each pour.

3.4.2.3 Horizontal Grout Barriers

Embed horizontal grout barriers in mortar below cells of hollow units receiving grout.

3.4.2.4 Grout Holes and Cleanouts

3.4.2.4.1 Grout Holes

Provide grouting holes in slabs, spandrel beams, and other in-place overhead construction. Locate holes over vertical reinforcing bars or as required to facilitate grout fill in bond beams. Provide additional openings spaced not more than 16 inches on centers where grouting of hollow unit masonry is indicated. Fom such openings not less than 4 inches in diameter or 3 by 4 inches in horizontal dimensions. Upon completion of grouting operations, plug and finish grouting holes to match surrounding surfaces.

3.4.2.4.2 Cleanouts for Hollow Unit Masonry Construction

For hollow masonry units. provide cleanout holes at the bottom of every grout pour in cores containing vertical reinforcement when the height of the grout pour exceeds 5 feet 4 inches. Where all cells are to be grouted, construct cleanout courses using bond beam units in an inverted position to permit cleaning of all cells. Provide cleanout holes at a maximum spacing of 32 inches where all cells are to be filled with grout.

Establish a new series of cleanouts if grouting operations are stopped for more than 4 hours. Provide cleanouts not less than 3 by 3 inch by cutting openings in one face shell. Manufacturer's standard cutout units may be used at the Contractor's option. Do not cleanout holes until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected. For walls which will be exposed to view, close cleanout holes in an approved manner to match surrounding masonry.

3.4.2.4.3 Cleanouts for Multi-Wythe Composite Masonry Construction

Provide cleanouts for construction of walls that incorporate a grout filled cavity between solid masonry wythes, provide cleanouts at the bottom of every pour by omitting every other masonry unit from one wythe. Establish a new series of cleanouts if grouting operations are stopped for more than 4 hours. Do not plug cleanout holes until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected. For walls which will be exposed to view, close cleanout holes in an approved manner to match surrounding masonry.

3.4.2.5 Grout Placement

A grout pour is the total height of masonry to be grouted prior to erection of additional masonry. A grout lift is an increment of grout placement within a grout pour. A grout pour is filled by one or more lifts of grout.

a. Lay masonry to the top of a pour permitted by TMS MSJC Table 7, based on the size of the grout space and the type of grout. Prior to grouting, remove masonry protrusions that extend 1/2 inch or more into cells or spaces to be grouted. Provide grout holes and cleanouts in accordance with paragraph GROUT HOLES AND CLEANOUTS above when the grout pour height exceeds 5 feet 4 inches. Hold reinforcement, bolts, and embedded connections rigidly in position before grouting is started. Do not prewet concrete masonry units.

b. Place grout using a hand bucket, concrete hopper, or grout pump to fill the grout space without segregation of aggregate. Operate grout

pumps to produce a continuous stream of grout without air pockets, segregation, or contamination.

c. If the masonry has cured at least 4 hours, grout slump is maintained between 10 to 11 inches, and no intermediate reinforced bond beams are placed between the top and bottom of the pour height, place conventional grout in lifts not exceeding 12 feet 8 inches. For the same curing and slump conditions but with intermediate bond beams, limit conventional grout lift to the bottom of the lowest bond beam that is more than 5 feet 4 inches above the bottom of the lift, but do not exceed 12 feet 8 inches. If masonry has not cured at least 4 hours or grout slump is not maintained between 10 to 11 inches, place conventional grout in lifts not exceeding 5 feet 4 inches.

d. Consolidate conventional grout lift and reconsolidate after initial settlement before placing next lift. For grout pours that are 12 inches or less in height, consolidate and reconsolidate grout by mechanical vibration or puddling. For grout pours that are greater than 12 inches in height, consolidate and reconsolidate grout by mechanical vibration. Apply vibrators at uniformly spaced points not further apart than the visible effectiveness of the machine. Limit duration of vibration to time necessary to produce satisfactory consolidation without causing segregation. If previous lift is not permitted to set, dip vibrator into previous lift. Do not insert vibrators into lower lifts that are in a semi-solidified state. If lower lift sets prior to placement of subsequent lift, form a grout key by terminating grout a minimum of 1-1/2 inch below a mortar joint. Vibrate each vertical cell containing reinforcement in partially grouted masonry. Do not form grout keys within beams.

e. If the masonry has cured 4 hours, place self-consolidating grout (SCG) in lifts not exceeding the pour height. If masonry has not cured for at least 4 hours, place SCG in lifts not exceeding 5 feet 4 inches. Do not mechanically consolidate self-consolidating grout. Place self-consolidating grout in accordance with manufacturer's recommendations.

f. Upon completion of each day's grouting, remove waste materials and debris from the equipment, and dispose of outside the masonry.

3.4.3 Joint Reinforcement Installation

Install joint reinforcement at 16 inches on center unless otherwise indicated. Lap joint reinforcement not less than 6 inches. Install prefabricated sections at corners and wall intersections. Place the longitudinal wires of joint reinforcement in mortar beds to provide not less than 5/8 inch cover to either face of the unit.

3.4.4 Bond Beams

Reinforce and grout bond beams as indicated and as described in paragraphs above. Install grout barriers under bond beam units to retain the grout as required, unless wall is fully grouted or solid bottom units are used. For high lift grouting in partially grouted masonry, provide grout retaining material on the top of bond beams to prevent upward flow of grout. Ensure that reinforcement is continuous, including around corners, except through control joints or expansion joints, unless otherwise indicated.

3.4.5 Flashing and Weeps

a. Install through-wall flashing at obstructions in the cavity and where indicated on Drawings. Ensure continuity of the flashing at laps and inside and outside corners by splicing in a manner approved by the flashing manufacturer. Ensure that the top edge of the flashing is sealed by turning the flashing 1/2 inch into the mortar bed joint of backup masonry. Terminate the horizontal leg of the flashing . Provide sealant below the drip edge of through-wall flashing.

b. Wherever through-wall flashing occurs, provide weep holes to drain flashing to exterior at acceptable locations as indicated. Provide weeps of open head joints. Locate weeps not more than 24 inches on centers in mortar joints of the exterior wythe directly on the horizontal leg of through-wall flashing over foundations, bond beams, and any other horizontal interruptions of the cavity. Place weep holes perfectly horizontal or slightly canted downward to encourage water drainage outward and not inward. Other methods may be used for providing weeps when spacing is reduced to 16 inches on center and approved by the Contracting Officer. Maintain weeps free of mortar and other obstructions.

c. Install single-wythe CMU flashing system in bed joints of CMU walls where CMU cells are open. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall on the exterior side. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

3.5 APPLICATION

3.5.1 Interface with Other Products

3.5.1.1 Built-In Items

Fill spaces around built-in items with mortar. Point openings around flush-mount electrical outlet boxes in wet locations with mortar. Embed anchors, ties, wall plugs, accessories, flashing, pipe sleeves and other items required to be built-in as the masonry work progresses. Fully embed anchors, ties and joint reinforcement in the mortar. Fill cells receiving anchor bolts and cells of the first course below bearing plates with grout, unless otherwise indicated.

3.5.1.2 Door and Window Frame Joints

On the exposed interior and exterior sides of exterior frames, rake joints between frames and abutting masonry walls to a depth of 3/8 inch.

3.5.1.3 Bearing Plates

Set bearing plates for beams, joists, joist girders and similar structural members to the proper line and elevation with damp-pack bedding mortar, except where non-shrink grout is indicated. Provide bedding mortar and non-shrink grout s specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.

3.5.2 Tolerances

Lay masonry plumb, true to line, with courses level within the tolerances of TMS MSJC, Article 3.3 F.

3.6 FIELD QUALITY CONTROL

3.6.1 Tests

3.6.1.1 Field Testing of Mortar

Perform mortar testing at the following frequency: 3 times per day. For each required mortar test, provide a minimum of three mortar samples. Perform initial mortar testing prior to construction for comparison purposes during construction.

Prepare and test mortar samples for mortar aggregate ratio in accordance with ASTM C780 Appendix A4. Prepare and test mortar compressive strength specimens in accordance with ASTM C780 Appendix A6.

3.6.1.2 Field Testing of Grout

a. Perform grout testing at the following frequency: 3 times per day. For each required grout property to be evaluated, provide a minimum of three specimens.

b. Sample and test conventional and self-conslidating grout for compressive strength and temperature in accordance with ASTM C1019.

c. Evaluate slump in conventional grout in accordance with ASTM C1019.

d. Evaluate slump flow and visual stability index of self-consolidating grout in accordance with ASTM C1611/C1611M.

3.6.1.3 Prism Tests

Perform at least one prism test sample for each 5,000 square feet of wall but not less than three such tests for any building. Evaluate three prisms in each test. Fabricate, store, handle, and test prisms in accordance with ASTM C1314.

Seven-day tests may be used provided the relationship between the 7- and 28-day strengths of the masonry is established by the tests of the materials used. If the compressive strength of any prism falls below the specified value by more than 500 psi, take steps to assure that the load-carrying capacity of the structure is not jeopardized. If the likelihood of low-strength masonry is confirmed and computations indicate that the load-carrying capacity may have been significantly reduced, tests of cores drilled, or prisms sawed, from the area in question may be required. In such case, take three specimens for each prism test more than 500 psi below the specified value. Masonry in the area in question will be considered structurally adequate if the average compressive strength of three specimens is equal to or exceeds the specified value. Additional testing of specimens extracted from locations represented by erratic core or prism strength test results will be permitted.

3.6.2 Special Inspection

Perform special inspections and testing in accordance with Section 01 45 35 SPECIAL INSPECTIONS.

3.7 POINTING AND CLEANING

After mortar joints have attained their initial set, but prior to hardening, completely remove mortar and grout daubs and splashings from masonry-unit surfaces that will be exposed or painted. Before completion of the work, rake out defects in joints of masonry to be exposed or painted, fill with mortar, and tool to match existing joints. Immediately after grout work is completed, remove scum and stains that have percolated through the masonry work using a low pressure stream of water and a stiff bristled brush. Do not clean masonry surfaces, other than removing excess surface mortar, until mortar in joints has hardened. Leave masonry surfaces clean, free of mortar daubs, dirt, stain, and discoloration, including scum from cleaning operations, and with tight mortar joints throughout. Do not use metal tools and metal brushes for cleaning.

3.7.1 Dry-Brushing Concrete Masonry

Dry brush exposed concrete masonry surfaces at the end of each day's work and after any required pointing, using stiff-fiber bristled brushes.

3.8 CLOSE-OUT TAKE-BACK PROGRAM

Collect information from manufacturer for take-back program options. Set aside masonry units, full and partial to be returned to manufacturer for recycling into new product. When such a service is not available, seek local recyclers to reclaim the materials. Submit documentation that includes contact information, summary of procedures, and the limitations and conditions applicable to the project. Indicate manufacturer's commitment to reclaim materials for recycling and/or reuse.

3.9 PROTECTION

Protect facing materials against staining. Cover top of walls with nonstaining waterproof covering or membrane to protect from moisture intrusion when work is not in progress. Continue covering the top of the unfinished walls until the wall is waterproofed with a complete roof or parapet system. Extend covering a minimum of 2 feet down on each side of the wall and hold securely in place. Before starting or resuming work, clean top surface of masonry in place of loose mortar and foreign material.

-- End of Section --

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SECTION 05 12 00

STRUCTURAL STEEL
08/18

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 207	(2016; R 2017) Certification Standard for Steel Fabrication and Erection, and Manufacturing of Metal Components
AISC 303	(2016) Code of Standard Practice for Steel Buildings and Bridges
AISC 325	(2017) Steel Construction Manual
AISC 326	(2009) Detailing for Steel Construction
AISC 360	(2016) Specification for Structural Steel Buildings
AISC DESIGN GUIDE 10	(1997) Erection Bracing of Low-Rise Structural Steel Buildings

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ANSI/ASNT CP-189	(2016) ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel (ANSI/ASNT CP-105-2006)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B46.1	(2009) Surface Texture, Surface Roughness, Waviness and Lay

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(2012) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS D1.1/D1.1M	(2020) Structural Welding Code - Steel
AWS D1.8/D1.8M	(2016) Structural Welding Code—Seismic Supplement
AWS QC1	(2016) Specification for AWS Certification of Welding Inspectors

ASTM INTERNATIONAL (ASTM)

ASTM A6/A6M	(2017a) Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A29/A29M	(2016) Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A143/A143M	(2007; R 2020) Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
ASTM A307	(2014; E 2017) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A780/A780M	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM B695	(2004; R 2016) Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
ASTM C827/C827M	(2016) Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
ASTM C1107/C1107M	(2020) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM F436/F436M	(2019) Standard Specification for Hardened Steel Washers Inch and Metric Dimensions
ASTM F959/F959M	(2017a) Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series
ASTM F1136/F1136M	(2011) Standard Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners
ASTM F2329/F2329M	(2015) Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners
ASTM F2833	(2011; R 2017) Standard Specification for Corrosion Protective Fastener Coatings

	with Zinc Rich Base Coat and Aluminum Organic/Inorganic Type
ASTM F3125/F3125M	(2019) Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-301-01	(2019) Structural Engineering

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

29 CFR Part 1926, Subpart R	Steel Erection

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Erection and Erection Bracing Drawings; G, AE

SD-02 Shop Drawings

Fabrication Drawings Including Details of Connections; G, AE

SD-03 Product Data

Welding Electrodes and Rods

Direct Tension Indicator Washers

Non-Shrink Grout

Tension Control Bolts

Recycled Content for Structural Steel; S

Recycled Content for Structural Steel Tubing; S

Recycled Content for Steel Pipe; S

Environmental Product Declaration (EPD) for Steel; S

SD-05 Design Data

Design Calculations for Steel Connections; G, AE

SD-06 Test Reports

Bolts, Nuts, and Washers

Weld Inspection Reports

Direct Tension Indicator Washer Inspection Reports

Bolt Testing Reports

Embrittlement Test Reports

SD-07 Certificates

Steel

Bolts, Nuts, and Washers

Galvanizing

AISC Structural Steel Fabricator Quality Certification

AISC Structural Steel Erector Quality Certification

Welding Procedures and Qualifications

Welding Electrodes and Rods

Certified Welding Inspector

NDT Technician

Welding Procedure Specifications (WPS)

1.3 AISC QUALITY CERTIFICATION

Work must be fabricated by an AISC Certified Structural Steel Fabricator, in accordance with AISC 207, Category BU. Submit AISC Structural Steel Fabricator quality certification.

Work must be erected by an AISC Structural Steel Certified Erector, in accordance with AISC 207, Category CSE. Submit AISC Structural Steel erector quality certification.

1.4 QUALITY ASSURANCE

1.4.1 Preconstruction Submittals

1.4.1.1 Erection and Erection Bracing Drawings

Submit for record purposes. Indicate the sequence of erection, temporary shoring and bracing. The erection drawings must conform to AISC 303.

1.4.2 Fabrication Drawing Requirements

Submit fabrication drawings for approval prior to fabrication. Prepare in accordance with AISC 303, AISC 326 and AISC 325. Fabrication drawings must not be reproductions of contract drawings. Include complete information for the fabrication and erection of the structure's

components, including the location, type, and size of bolts, welds, member sizes and lengths, connection details, blocks, copes, and cuts. Use AWS A2.4 standard welding symbols. Clearly highlight any deviations from the details shown on the contract drawings highlighted on the fabrication drawings. Explain the reasons for any deviations from the contract drawings.

1.4.3 Delegated Connection Design

Design structural steel connection indicated in the contract documents per AISC 303, Option 3, using the connection loads indicated. Submit design calculations for steel connections signed and sealed by a registered professional engineer.

1.4.4 Certifications

1.4.4.1 Welding Procedures and Qualifications

Prior to welding, submit certification for each welder stating the type of welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests.

Conform to all requirements specified in AWS D1.1/D1.1M and AWS D1.8/D1.8M.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide the structural steel system, including shop primer galvanizing, complete and ready for use. Provide structural steel systems including design, materials, installation, workmanship, fabrication, assembly, erection, inspection, quality control, and testing in accordance with AISC 303, AISC 360, and UFC 3-301-01 except as modified in this contract.

2.2 STEEL

2.2.1 Structural Steel

Provide structural steel containing a minimum of 95 percent recycled content. Submit data identifying percentage of recycled content for structural steel.

Submit Environmental Product Declaration (EPD) for Steel, if available. Provide one of the following EPD options including Product Category Rules (PCR) standard EN 15804 or ISO 21930.

1. Product-Specific Declaration

2. Product-Specific Type III EPD

3. Industry-Wide (Generic) EPD: Provide proof manufacturer is a participant.

2.2.2 Structural Steel Tubing

Provide structural steel tubing containing a minimum of 25 percent recycled content. Submit data identifying percentage of recycled content for structural steel tubing.

Submit Environmental Product Declaration (EPD) for Steel, if available. Provide one of the following EPD options including Product Category Rules (PCR) standard EN 15804 or ISO 21930.

1. Product-Specific Declaration

2. Product-Specific Type III EPD

3. Industry-Wide (Generic) EPD: Provide proof manufacturer is a participant.

2.2.3 Steel Pipe

Provide steel pipe containing a minimum of 50 percent recycled content. Submit data identifying percentage of recycled content for steel pipe.

Submit Environmental Product Declaration (EPD) for Steel, if available. Provide one of the following EPD options including Product Category Rules (PCR) standard EN 15804 or ISO 21930.

1. Product-Specific Declaration

2. Product-Specific Type III EPD

3. Industry-Wide (Generic) EPD: Provide proof manufacturer is a participant.

2.3 BOLTS, NUTS, AND WASHERS

Submit the certified manufacturer's mill reports which clearly show the applicable ASTM mechanical and chemical requirements together with the actual test results for the supplied fasteners.

2.3.1 High-Strength Bolts

High strength bolts and nuts must be shipped together in the same shipping container. Fasteners indicated to be galvanized shall be tested by the supplier to show that the galvanized nut with the supplied lubricant provided may be rotated from the snug tight condition well in excess of the rotation required for pretentioned installation without stripping. The supplier shall supply nuts that have been lubricated and tested with the supplied bolts.

2.3.1.1 Direct Tension Indicator Washers

ASTM F959/F959M. Submit product data for direct tension indicator washers.

2.3.1.2 Washers

ASTM F436/F436M, plain carbon steel.

2.3.2 Tension Control Bolts

Submit product data for tension control bolts.

2.4 STRUCTURAL STEEL ACCESSORIES

2.4.1 Welding Electrodes and Rods

AWS D1.1/D1.1M and AWS D1.8/D1.8M. Submit product data for welding electrodes and rods.

2.4.2 Non-Shrink Grout

ASTM C1107/C1107M, with no ASTM C827/C827M shrinkage. Submit product data for non-shrink grout.

2.4.3 Welded Shear Stud Connectors

ASTM A29/A29M, Grades 1010 through 1020. AWS D1.1/D1.1M, Table 7.1, Type B.

2.5 GALVANIZING

ASTM F2329/F2329M, ASTM F1136/F1136M, ASTM F2833 or ASTM B695 for threaded parts or ASTM A123/A123M for structural steel members, as applicable, unless specified otherwise galvanize after fabrication where practicable.

2.6 FABRICATION

Fabrication must be in accordance with the applicable provisions of AISC 325. Fabrication and assembly must be done in the shop to the greatest extent possible. Punch, subpunch and ream, or drill bolt holes perpendicular to the surface of the member.

Compression joints depending on contact bearing must have a surface roughness not in excess of 500 micro inch as determined by ASME B46.1, and ends must be square within the tolerances for milled ends specified in ASTM A6/A6M.

Shop splices of members between field splices will be permitted only where indicated on the Contract Drawings. Splices not indicated require the approval of the Contracting Officer.

2.6.1 Markings

Prior to erection, identify members by a painted erection mark. Connecting parts assembled in the shop for reaming holes in field connections must be match marked with scratch and notch marks. Do not locate erection markings on areas to be welded. Do not locate match markings in areas that will decrease member strength or cause stress concentrations. Affix embossed tags to hot-dipped galvanized members.

2.6.2 Fireproofing Coated Surfaces

Clean and prepare surfaces to receive sprayed-on fireproofing coatings in accordance with the manufacturer's recommendations, and as specified in Section 07 81 00 SPRAY-APPLIED FIREPROOFING.

2.6.3 Surface Finishes

ASME B46.1 maximum surface roughness of 125 for pin, pinholes, and sliding bearings, unless indicated otherwise.

2.7 DRAINAGE HOLES

Drill adequate drainage holes to eliminate water traps. Hole diameter must be 1/2 inch and location indicated on the detail drawings. Hole size and locations must not affect the structural integrity.

PART 3 EXECUTION

3.1 ERECTION

a. Erection of structural steel, except as indicated in item b. below, must be in accordance with the applicable provisions of AISC 325, AISC 303 and 29 CFR Part 1926, Subpart R.

b. For low-rise structural steel buildings (60 feet tall or less and a maximum of 2 stories), erect the structure in accordance with AISC DESIGN GUIDE 10.

After final positioning of steel members, provide full bearing under base plates and bearing plates using nonshrink grout. Place nonshrink grout in accordance with the manufacturer's instructions.

3.1.1 STORAGE

Store the material out of contact with the ground in such manner and location as to minimize deterioration.

3.2 CONNECTIONS

Except as modified in this section, design connections indicated in accordance with AISC 360. Build connections into existing work. Do not tighten anchor bolts set in concrete with impact torque wrenches. Holes must not be cut or enlarged by burning. Bolts, nuts, and washers must be clean of dirt and rust, and lubricated immediately prior to installation.

3.2.1 Common Grade Bolts

Tighten ASTM A307 bolts to a "snug tight" fit. "Snug tight" is the tightness that exists when plies in a joint are in firm contact. If firm contact of joint plies cannot be obtained with a few impacts of an impact wrench, or the full effort of a man using a spud wrench, contact the Contracting Officer for further instructions.

3.2.2 High-Strength Bolts

Provide direct tension indicator washers in all ASTM F3125/F3125M, Grade A325 and Grade A490 bolted connections. Bolts must be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, fully tension bolts, progressing from the most rigid part of a connection to the free edges.

Fastener components shall be protected from dirt and moisture in closed containers at the site of the installation. Fastener components that are not incorporated into the work shall be returned to protected storage at the end of the work shift.

3.2.2.1 Installation of Direct Tension Indicator Washers (DTIW)

Where possible, install the DTIW under the bolt head and tighten the nut. If the DTIW is installed adjacent to the turned element, provide a flat

washer between the DTIW and nut when the nut is turned for tightening, and between the DTIW and bolt head when the bolt head is turned for tightening. In addition to the LIW, provide flat washers under both the bolt head and nut when ASTM F3125/F3125M, Grade A490 bolts are used.

3.2.3 Tension Control Bolts

Bolts must be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, fully tension bolts, progressing from the most rigid part of a connection to the free edges.

3.3 GAS CUTTING

Use of gas-cutting torch in the field for correcting fabrication errors is not permitted on any major member in the structural framing. Use of a gas cutting torch will be permitted on minor members not under stress only after approval has been obtained from the Contracting Officer.

3.4 WELDING

Welding must be in accordance with AWS D1.1/D1.1M. Provide AWS D1.1/D1.1M qualified welders, welding operators, and tackers.

Develop and submit the Welding Procedure Specifications (WPS) for all welding, including welding done using prequalified procedures. Submit for approval all WPS, whether prequalified or qualified by testing.

3.4.1 Removal of Temporary Welds, Run-Off Plates, and Backing Strips

Removal is not required.

3.5 GALVANIZING REPAIR

Repair damage to galvanized coatings using ASTM A780/A780M zinc rich paint for galvanizing damaged by handling, transporting, cutting, welding, or bolting. Do not heat surfaces to which repair paint has been applied.

3.6 FIELD QUALITY CONTROL

Perform field tests, and provide labor, equipment, and incidentals required for testing, except that electric power for field tests will be furnished as set forth in Division 1. Notify the Contracting Officer in writing of defective welds, bolts, nuts, and washers within 7 working days of the date of the inspection.

3.6.1 Welds

3.6.1.1 Visual Inspection

AWS D1.1/D1.1M. Furnish the services of AWS-certified welding inspectors for fabrication and erection inspection and testing and verification inspections. A Certified Welding Inspector must perform visual inspection on 100 percent of all welds. Document this inspection in the Visual Weld Inspection Log. Submit certificates indicating that certified welding inspectors meet the requirements of AWS QC1.

Inspect proper preparation, size, gaging location, and acceptability of all welds; identification marking; operation and current characteristics

of welding sets in use.

3.6.1.2 Nondestructive Testing

Nondestructive testing must be in accordance with AWS D1.1/D1.1M. Ultrasonic testing must be performed in accordance with Table 6.2 or 6.3 of AWS D1.1/D1.1M. Test locations must be selected by the Contracting Officer. All personnel performing NDT must be certified in accordance with ANSI/ASNT CP-189 in the method of testing being performed. Submit certificates showing compliance with ANSI/ASNT CP-189 for all NDT technicians. If more than 20 percent of welds made by a welder contain defects identified by testing, then all groove welds made by that welder must be tested by ultrasonic testing, and all fillet welds made by that welder must be inspected by magnetic particle testing (MT) or dye penetrant testing (PT) as approved by the Contracting Officer. When groove welds made by an individual welder are required to be tested, magnetic particle or dye penetrant testing may be used only in areas inaccessible to ultrasonic testing. Retest all repaired areas. Submit weld inspection reports.

Testing frequency: Provide the following types and number of tests:

Test Type	Number of Tests
Ultrasonic	50 percent of CJP Welds
Magnetic Particle	50 percent of PJP and Fillet Welds
Dye Penetrant	50 percent of PJP Welds

3.6.2 Direct Tension Indicator Washers

3.6.2.1 Direct Tension Indicator Washer Compression

Test direct tension indicator washers in place to verify that they have been compressed sufficiently to provide the 0.015 inch gap, as required by ASTM F959/F959M. Submit direct tension indicator washer inspection reports.

3.6.3 High-Strength Bolts

3.6.3.1 Testing Bolt, Nut, and Washer Assemblies

Test a minimum of 3 bolt, nut, and washer assemblies from each mill certificate batch in a tension measuring device at the job site prior to the beginning of bolting start-up. Demonstrate that the bolts and nuts, when used together, can develop tension not less than the provisions specified in AISC 360, depending on bolt size and grade. The bolt tension must be developed by tightening the nut. A representative of the manufacturer or supplier must be present to ensure that the fasteners are properly used, and to demonstrate that the fastener assemblies supplied satisfy the specified requirements. Submit bolt testing reports.

3.6.3.2 Inspection

Inspection procedures must be in accordance with AISC 360. Confirm and report to the Contracting Officer that the materials meet the project specification and that they are properly stored. Confirm that the faying surfaces have been properly prepared before the connections are

assembled. Observe the specified job site testing and calibration, and confirm that the procedure to be used provides the required tension. Monitor the work to ensure the testing procedures are routinely followed on joints that are specified to be fully tensioned.

Inspect calibration of torque wrenches for high-strength bolts.

3.6.3.3 Testing

The Government has the option to perform nondestructive tests on 5 percent of the installed bolts to verify compliance with pre-load bolt tension requirements. Provide the required access for the Government to perform the tests. The nondestructive testing will be done in-place using an ultrasonic measuring device or any other device capable of determining in-place pre-load bolt tension. The test locations must be selected by the Contracting Officer. If more than 10 percent of the bolts tested contain defects identified by testing, then all bolts used from the batch from which the tested bolts were taken, must be tested at the Contractor's expense. Retest new bolts after installation at the Contractor's expense.

3.6.4 Testing for Embrittlement

ASTM A143/A143M for steel products hot-dip galvanized after fabrication. Submit embrittlement test reports.

-- End of Section --

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SECTION 05 30 00

STEEL DECKS
05/15

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2020) Structural Welding Code - Steel
AWS D1.3/D1.3M	(2018) Structural Welding Code - Sheet Steel

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A653/A653M	(2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A780/A780M	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A792/A792M	(2010; R 2015) Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
ASTM A1008/A1008M	(2020) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

STEEL DECK INSTITUTE (SDI)

ANSI/SDI C	(2017) Standard for Composite Steel Floor Deck - Slabs

ANSI/SDI NC	(2017) Standard for Non-Composite Steel Floor Deck
ANSI/SDI QA/QC	(2017) Standard for Quality Control and Quality Assurance for Installation of Steel Deck
SDI DDP	(1987; R 2000) Deck Damage and Penetrations
SDI MOC3	(2016) Manual of Construction with Steel Deck (3rd Edition)

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

29 CFR 1926	Safety and Health Regulations for Construction

UNDERWRITERS LABORATORIES (UL)

UL Fire Resistance	(2014) Fire Resistance Directory

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29, SUSTAINABITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication Drawings; G, AE

SD-03 Product Data

Accessories

Deck Units

Mechanical Fasteners

Welding Equipment

Welding Rods and Accessories

Recycled Content of Steel Products; S

Environmental Product Declaration (EPD) for Steel; S

SD-07 Certificates

Powder-Actuated Tool Operator

Welder Qualifications

Welding Procedures

Fire Safety

Manufacturer's Certificate

1.3 QUALITY ASSURANCE

1.3.1 Deck Units

Furnish deck units and accessory products from a manufacturer regularly engaged in manufacture of steel decking. Provide manufacturer's certificates attesting that the decking material meets the specified requirements.

1.3.2 Certification of Powder-Actuated Tool Operator

Provide manufacturer's certificate attesting that the operators are authorized to use the low velocity powder-actuated tool.

1.3.3 Qualifications for Welding Work

Follow Welding Procedures of AWS D1.3/D1.3M for sheet steel and AWS D1.1/D1.1M for stud welding.
Submit qualified Welder Qualifications in accordance with AWS D1.3/D1.3M for sheet steel and AWS D1.1/D1.1M for stud welding, or under an equivalent approved qualification test. Perform tests on test pieces in positions and with clearances equivalent to those actually encountered. If a test weld fails to meet requirements, perform an immediate retest of two test welds until each test weld passes. Failure in the immediate retest will require the welder be retested after further practice or training, performing a complete set of test welds.

Submit manufacturer's catalog data for Welding Equipment and Welding Rods and Accessories.

1.3.4 Regulatory Requirements

1.3.4.1 Fire Safety

Test roof deck as a part of a roof deck construction assembly of the type used for this project, listing as fire classified in the UL Fire Resistance, or listing as Class I construction in the FM APP GUIDE, and so labeled.

1.3.5 Fabrication Drawings

Show type and location of units, location and sequence of connections, bearing on supports, methods of anchoring, attachment of accessories, adjusting plate details, cant strips, ridge and valley plates, metal closure strips, size and location of holes to be cut and reinforcement to be provided, the manufacturer's erection instructions and other pertinent details.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver deck units to the site in a dry and undamaged condition. Store and handle steel deck in a manner to protect it from corrosion, deformation, and other types of damage. Do not use decking for storage or as working platform until units have been fastened into position. Exercise care not to damage material or overload decking during construction. The maximum uniform distributed storage load must not

exceed the design live load. Stack decking on platforms or pallets and cover with weathertight ventilated covering. Elevate one end during storage to provide drainage. Maintain deck finish at all times to prevent formation of rust. Repair deck finish using touch-up paint. Replace damaged material.

PART 2 PRODUCTS

2.1 DECK UNITS

Submit manufacturer's design calculations, or applicable published literature for the structural properties of the proposed deck units.

Provide products with an average recycled content of steel products so postconsumer recycled content plus one half of preconsumer recycled content not less than 50 percent.

Submit data identifying percentage of recycled content for steel. Submit Environmental Product Declaration (EPD) for Steel, if available. Provide one of the following EPD options including Product Category Rules (PCR) standard EN 15804 or ISO 21930.

1. Product-Specific Declaration

2. Product-Specific Type III EPD

3. Industry-Wide (Generic) EPD: Provide proof manufacturer is a participant.

2.1.1 Roof Deck

Conform to ASTM A792/A792M or ASTM A1008/A1008M for deck used in conjunction with insulation and built-up roofing. Fabricate roof deck units of the steel design thickness required by the design drawings and zinc-coated in conformance with ASTM A653/A653M, Z275 G90 coating class or aluminum-zinc coated in accordance with ASTM A792/A792M Coating Designation AZM165 AZ55.

2.1.2 Composite Deck

Conform to ASTM A653/A653M or ASTM A1008/A1008M for composite deck assembly. Fabricate deck used as the tension reinforcing in composite deck. The steel design thickness required by the design drawings. Zinc-coat in conformance with ASTM A653/A653M, G60 coating class.

2.1.3 Length of Deck Units

Provide deck units of sufficient length to span three or more spacings where possible.

2.2 ACCESSORIES

Provide accessories of same material as deck, unless specified otherwise. Provide manufacturer's standard type accessories, as specified.

2.2.1 Adjusting Plates

Provide adjusting plates, or segments of deck units, of same thickness and configuration as deck units in locations too narrow to accommodate full

size units. Provide factory cut plates of predetermined size where possible.

2.2.2 End Closures

Fabricated of sheet metal by the deck manufacturer. Provide end closures minimum 0.0295 inch thick to close open ends at exposed edges of floors, parapets, end walls, eaves, and openings through deck.

2.2.3 Closure Plates for Composite Deck

Support and retain concrete at each floor level. Provide edge closures at all edges of the slab of sufficient strength and stiffness to support the wet concrete. Provide metal closures for all openings in composite steel deck 1/4 inch and over.

2.2.4 Sheet Metal Collar

Where deck is cut for passage of pipes, ducts, columns, etc., and deck is to remain exposed, provide a neatly cut sheet metal collar to cover edges of deck. Do not cut deck until after installation of supplemental supports.

2.2.5 Cover Plates

Sheet metal to close panel edge and end conditions, and where panels change direction or butt. Polyethylene-coated, self-adhesive, 2 inch wide joint tape may be provided in lieu of cover plates on flat-surfaced decking butt joints.

Fabricate cover plates for abutting floor deck units from the specified structural-quality steel sheets not less than nominal 18 gagethick before galvanizing. Provide 6 inch wide cover plates and form to match the contour of the floor deck units.

2.2.6 Column Closures

Sheet metal, minimum 0.0358 inch thick or metal rib lath.

2.2.7 Access Hole Covers

Sheet metal, minimum 0.0474 inch thick.

2.2.8 Hanger

Provide clips or loops for utility systems and suspended ceilings of one or more of the following types:

a. Lip tabs or integral tabs where noncellular decking or flat plate of cellular section is 0.0474 inch thick or more, and a structural concrete fill is used over deck.

b. Slots or holes punched in decking for installation of pigtails.

c. Tabs driven from top side of decking and arranged so as not to pierce electrical cells.

d. Decking manufacturer's standard as approved by the Contracting Officer.

2.2.9 Metal Closure Strips for Roof Decks

Fabricate strips from the specified commercial-quality steel sheets not less than nominal 0.0358 inch thick before galvanizing. Provide strips from the configuration required to provide tight-fitting closures at open ends and sides of steel roof decking.

2.2.10 Galvanized Steel Angles for Roof Decks

Provide hot-rolled carbon steel angles conforming to ASTM A36/A36M, and hot-dip galvanized in accordance with ASTM A123/A123M.

2.2.11 Mechanical Fasteners

Provide mechanical fasteners, such as powder actuated fasteners, pneumatically driven fasteners or self-drilling screws, for anchoring the deck to structural supports and adjoining units as indicated.

2.2.12 Miscellaneous Accessories

Furnish the manufacturer's standard accessories to complete the deck installation. Furnish metal accessories of the same material as the deck and with the minimum design thickness as follows: saddles, 0.0474 inch welding washers, 0.0598 inch other metal accessories, 0.0358 inch unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

Prior to installation of decking units and accessories, examine worksite to verify that as-built structure will permit installation of decking system without modification.

3.2 INSTALLATION

Install steel deck units in accordance with 29 CFR 1926, Subpart R – Steel Erection, ANSI/SDI QA/QC, ANSI/SDI CANSI/SDI NC and approved shop drawings. Place units on structural supports, properly adjusted, leveled, and aligned at right angles to supports before permanently securing in place. Damaged deck and accessories including material which is permanently stained or contaminated, deformed, or with burned holes shall not be installed. Extend deck units over three or more supports unless absolutely impractical. Report inaccuracies in alignment or leveling to the Contracting Officer and make necessary corrections before permanently anchoring deck units. Locate deck ends over supports only. Lap 2 inch deck ends. Do not use unanchored deck units as a work or storage platform. Do not fill unanchored deck with concrete. Permanently anchor units placed by the end of each working day. Do not support suspended ceilings, light fixtures, ducts, utilities, or other loads by steel deck unless indicated. Distribute loads by appropriate means to prevent damage.

3.2.1 Attachment

Immediately after placement and alignment, and after correcting inaccuracies, permanently fasten steel deck units to structural supports and to adjacent deck units as indicated on the design drawings and in accordance with manufacturer's recommended procedure and ANSI/SDI C and ANSI/SDI NC. Clamp or weight deck units to provide firm contact between deck units and structural supports while performing welding or fastening.

Attachment of adjacent deck units by button-punching is prohibited.

3.2.1.1 Welding

Perform welding in accordance with AWS D1.3/D1.3M using methods and electrodes recommended by the manufacturers of the base metal alloys being used. Ensure only operators previously qualified by tests prescribed in AWS D1.3/D1.3M make welds. Immediately recertify, or replace qualified welders, that are producing unsatisfactory welding. Do not use welding washers at sidelaps. Holes and similar defects will not be acceptable. Immediately clean welds by chipping and wire brushing. Heavily coat welds, cut edges and damaged portions of coated finish with zinc-dust paint conforming to ASTM A780/A780M.

3.2.1.2 Sidelap Fastening

Lock sidelaps between adjacent floor deck units together by welding or screws as indicated.

3.2.2 Openings

Cut or drill all holes and openings required and be coordinated with the drawings, specifications, and other trades. Frame and reinforce openings through the deck in conformance with SDI DDP. Reinforce holes and openings 6 to 12 inch across by 0.0474 inch thick steel sheet at least 12 inch wider and longer than the opening and be fastened to the steel deck at each corner of the sheet and at a maximum of 6 inch on center.

3.2.3 Deck Damage

SDI MOC3, for repair of deck damage.

3.2.4 Accessory Installation

3.2.4.1 Adjusting Plates

Provide in locations too narrow to accommodate full-size deck units and install as shown on shop drawings.

3.2.4.2 End Closures

Provide end closure to close open ends of cells at columns, walls, and openings in deck.

3.2.4.3 Cover Plates

Where concrete leakage would be a problem, provide metal cover plates, or joint tape, at joints between decking sheets, cellular or noncellular, to be covered with concrete fill.

3.2.4.4 Column Closures

Provide for spaces between floor decking and columns which penetrate the deck. Field cut closure plate to fit column in the field and tack weld to decking and columns.

3.2.4.5 Access Hole Covers

Provide access whole covers to seal holes cut in decking to facilitate

welding of the deck to structural supports.

3.2.5 Concrete Work

Prior to placement of concrete, inspect installed decking to ensure that there has been no permanent deflection or other damage to decking. Replace decking which has been damaged or permanently deflected as approved by the Contracting Officer. Place concrete on metal deck in accordance with Construction Practice of ANSI/SDI C or ANSI/SDI NC.

3.2.6 Preparation of Fire-Proofed Surfaces

Provide deck surfaces, both composite and noncomposite, which are to receive sprayed-on fireproofing, galvanized and free of all grease, mill oil, paraffin, dirt, salt, and other contaminants which impair adhesion of the fireproofing. Complete any required cleaning prior to steel deck installation using a cleaning method that is compatible with the sprayed-on fireproofing.

3.3 CLOSURE STRIPS FOR ROOF DECKS

Provide closure strips at open, uncovered ends and edges of the roof decking and in voids between roof decking and top of walls and partitions where indicated. Install closure strips in position in a manner to provide a weathertight installation.

3.4 ROOF INSULATION SUPPORT FOR ROOF DECKS

Provide metal closure strips for support of roof insulation where rib openings in top surface of metal roof decking occur adjacent to edges and openings. Weld metal closure strips in position.

3.5 CLEANING AND PROTECTION FOR ROOF DECKS

Upon completion of the deck, sweep surfaces clean and prepare for installation of the roofing.

3.6 FIELD QUALITY CONTROL

3.6.1 Deck Weld Inspection

Visual inspect welds in accordance with AWS D1.3/D1.3M.

3.6.2 Decks Not Receiving Concrete

Inspect the decking top surface for distortion after installation. For roof decks not receiving concrete, verify distortion by placing a straight edge across three adjacent top flanges. The maximum allowable gap between the straight edge and the top flanges should not exceed manufacturing and construction tolerances of supporting members. When gap is more than the allowable, provide corrective measures or replacement. Reinspect decking after performing corrective measures or replacement.

-- End of Section --

SECTION 05 50 13

MISCELLANEOUS METAL FABRICATIONS
05/17

PART 1 GENERAL

1.1 REFERENCES

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

ALUMINUM ASSOCIATION (AA)

AA DAF45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 303	(2016) Code of Standard Practice for Steel Buildings and Bridges

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B18.2.1	(2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(2015) Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
ASME B18.6.2	(1998; R 2010) Slotted Head Cap Screws, Square Head Set Screws, and Slotted Headless Set Screws: Inch Series
ASME B18.6.3	(2013; R 2017) Machine Screws, Tapping Screws, and Machine Drive Screws (Inch Series)
ASME B18.21.1	(2009; R 2016) Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series)
ASME B18.21.2M	(1999; R 2014) Lock Washers (Metric Series)
ASME B18.22M	(1981; R 2017) Metric Plain Washers

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP A10.3	(2013) Safety Requirements for Powder-Actuated Fastening Systems American National Standard for Construction and Demolition Operations

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2020) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A47/A47M	(1999; R 2018; E 2018) Standard Specification for Ferritic Malleable Iron Castings
ASTM A48/A48M	(2003; R 2016) Standard Specification for Gray Iron Castings
ASTM A53/A53M	(2020) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2016a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A283/A283M	(2013) Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A307	(2014; E 2017) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A500/A500M	(2020) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A653/A653M	(2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A780/A780M	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A924/A924M	(2020) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM C1513	(2018) Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections
ASTM D1187/D1187M	(1997; E 2011; R 2011) Asphalt-Base Emulsions for Use as Protective Coatings for Metal

ASTM F1554	(2020) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

MASTER PAINTERS INSTITUTE (MPI)

MPI 79	(2012) Primer, Alkyd, Anti-Corrosive for Metal

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM MBG 531	(2017) Metal Bar Grating Manual

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 3	(2018) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2014) Safety and Health Requirements Manual

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Cover Plates and Frames, Installation Drawings; G, RO

Floor Gratings, Installation Drawings; G, RO

Bollards/Pipe Guards; G, RO

SD-03 Product Data

Cover Plates and Frames; G, RO

Floor Gratings; G

Roof Hatches; G

Floor Doors; G

Recycled Content; S, RO

SD-07 Certificates

Certificates of Compliance; G, RO

Certified Mill Test Reports for Chemistry and Mechanical Properties; G, RO

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials: Option 2, Leadership Extraction Practices

a. Submit description of salvaged, refurbished or reused products.

b. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

c. LEED Submittal shall be submitted and reviewed concurrently with product data submittal and samples.

1.3 QUALIFICATION OF WELDERS

Qualify welders in accordance with AWS D1.1/D1.1M. Use procedures, materials, and equipment of the type required for the work.

1.4 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new items.

1.5 MISCELLANEOUS REQUIREMENTS

1.5.1 Fabrication Drawings

Submit fabrication drawings showing layout(s), connections to structural system, and anchoring details as specified in AISC 303.

1.5.2 Installation Drawings

Submit templates, erection, and installation drawings indicating thickness, type, grade, class of metal, and dimensions. Show construction details, reinforcement, anchorage, and installation in relation to the building construction.

PART 2 PRODUCTS

2.1 RECYCLED CONTENT

Provide products with recycled content. Provide certificates of compliance for recycled content.

2.2 MATERIALS

Provide exposed fastenings of compatible materials (avoid contact of dissimilar metals). Coordinate color and finish with the material to which fastenings are applied. Submit the manufacturer's certified mill reports which clearly show the applicable ASTM mechanical and chemical requirements together with the actual test results for the supplied materials.

2.2.1 Structural Carbon Steel

Provide in accordance with ASTM A36/A36M.

2.2.2 Structural Tubing

Provide in accordance with ASTM A500/A500M.

2.2.3 Steel Pipe

Provide in accordance with ASTM A53/A53M, Type E or S, Grade B.

2.2.4 Fittings for Steel Pipe

Provide standard malleable iron fittings in accordance with ASTM A47/A47M.

2.2.5 Gratings

a. Provide gray cast iron in accordance with ASTM A48/A48M, Class 40.

b. Provide metal plank grating, non-slip requirement, steel in accordance with ASTM A653/A653M, Z275 G90.

c. Provide metal bar type grating in accordance with NAAMM MBG 531.

2.2.6 Anchor Bolts

Provide in accordance with ASTM F1554. Where exposed, provide anchor bolts of the same material, color, and finish as the metal to which they are applied.

2.2.6.1 Lag Screws and Bolts

Provide in accordance with ASME B18.2.1, type and grade best suited for the purpose.

2.2.6.2 Toggle Bolts

Provide in accordance with ASME B18.2.1.

2.2.6.3 Bolts, Nuts, Studs and Rivets

Provide in accordance with ASME B18.2.2 or ASTM A307.

2.2.6.4 Powder Actuated Fasteners

Follow safety provisions in accordance with ASSP A10.3.

2.2.6.5 Screws

Provide in accordance with ASME B18.2.1, ASME B18.6.2, ASME B18.6.3 and ASTM C1513.

2.2.6.6 Washers

Provide plain washers in accordance with ASME B18.22M, ASME B18.21.1. Provide beveled washers for American Standard beams and channels, square or rectangular, tapered in thickness, and smooth. Provide lock washers in accordance with ASME B18.21.2M, ASME B18.21.1.

2.3 FABRICATION FINISHES

2.3.1 Galvanizing

Hot-dip galvanize items specified to be zinc-coated, after fabrication where practicable. Provide galvanizing in accordance with ASTM A123/A123M, ASTM A153/A153M, ASTM A653/A653M or ASTM A924/A924M, Z275 G90.

2.3.2 Galvanize

Anchor bolts, grating fasteners, washers, and parts or devices necessary for proper installation, unless indicated otherwise.

2.3.3 Repair of Zinc-Coated Surfaces

Repair damaged surfaces with galvanizing repair method and paint in accordance with ASTM A780/A780M or by application of stick or thick paste material specifically designed for repair of galvanizing, as approved by Contracting Officer. Clean areas to be repaired and remove slag from welds. Heat, with a torch, surfaces to which stick or paste material will be applied. Heat to a temperature sufficient to melt the metals in the

stick or paste. Spread molten material uniformly over surfaces to be coated and wipe off excess material.

2.3.4 Shop Cleaning and Painting

2.3.4.1 Surface Preparation

Blast clean surfaces in accordance with SSPC SP 6/NACE No.3. Surfaces that will be exposed in spaces above ceiling or in attic spaces, crawl spaces, furred spaces, and chases may be cleaned in accordance with SSPC SP 3 in lieu of being blast cleaned. Wash cleaned surfaces which become contaminated with rust, dirt, oil, grease, or other contaminants with solvents until thoroughly clean. Steel to be embedded in concrete must be free of dirt and grease prior to embed. Do not paint or galvanize bearing surfaces, including contact surfaces within slip critical joints. Shop coat these surfaces with rust prevention.

2.3.4.2 Pretreatment, Priming and Painting

Apply pre-treatment, primer, and paint in accordance with manufacturer's printed instructions. On surfaces concealed in the finished construction or not accessible for finish painting, apply an additional prime coat to a minimum dry film thickness of 1.0 mil. Tint additional prime coat with a small amount of tinting pigment.

2.3.5 Nonferrous Metal Surfaces

Protect by plating, anodic, or organic coatings.

2.3.6 Aluminum Surfaces

2.3.6.1 Surface Condition

Before finishes are applied, remove roll marks, scratches, rolled-in scratches, kinks, stains, pits, orange peel, die marks, structural streaks, and other defects which will affect uniform appearance of finished surfaces.

2.3.6.2 Aluminum Finishes

Sandblast castings' finish, medium, AA DAF45. Unless otherwise specified, provide all other aluminum items with an anodized finish. Provide a coating thickness not less than that specified for protective and decorative type finishes for items used in interior locations or architectural Class I type finish for items used in exterior locations in accordance with AA DAF45. Provide a polished satin finish on items to be anodized.

2.4 COVER PLATES AND FRAMES

Fabricate cover plates of 1/4 inch thick rolled steel weighing not more than 100 pounds per plate with a slip-resistant, carbon steel in accordance with ASTM A283/A283M. Provide aluminum oxide or silicon carbide on wearing surfaces. Provide galvanized plate. Reinforce to sustain a live load of 100 pounds per square foot. Provide structural steel shapes and plates for frames, securely fastened to the structure as indicated. Miter and weld all corners. Butt joint straight runs. Allow for expansion on straight runs over 15 feet. Provide holes for lifting tools. Provide flush drop handles for removal where indicated; form from

1/4 inch round stock. Provide holes and openings with 1/2 inch clearance for pipes and equipment. Remove sharp edges and burrs from cover plates and exposed edges of frames. Weld all connections and grind top surface smooth. Weld bar stops every six inches. Provide 1/8 inch clearance at edges and between cover plates.

2.5 FLOOR GRATINGS

Design steel grating in accordance with NAAMM MBG 531 for bar type gratings, or in accordance with manufacturer's charts for plank grating. Galvanize steel floor gratings.

a. Design floor gratings to support a stress live load of 100 pounds per square foot for the spans indicated, with maximum deflection of L/240.

b. In accordance with NAAMM MBG 531, band edges of grating with bars of the same size as the bearing bars. Weld banding in accordance with the manufacturer's standard for trim unless otherwise indicated. Design tops of bearing bars, cross or intermediate bars to be in the same plane and to match grating finish.

c. NAAMM MBG 531, band ends of gratings with bars of the same or greater thickness than the metal used for grating. Weld banding bars to bearing bars or channels at least every fourth bar or channel and in every corner. Tack weld intervening bars or channels. Band diagonal or round cuts by welding bars of the same or greater thickness as the grating and in accordance with the manufacturer's standard for trim unless otherwise indicated.

d. Anchor gratings to structural members with bolts, toggle bolts, or expansion shields and bolts.

e. Provide slip resistant surface finishes.

2.6 BOLLARDS/PIPE GUARDS

Provide 6 inch galvanized weight steel pipe in accordance with ASTM A53/A53M. Anchor posts in concrete as indicated and fill solidly with concrete with minimum compressive strength of 2500 psi.

2.7 MISCELLANEOUS PLATES AND SHAPES

Provide items that do not form a part of the structural steel framework, such as lintels, sill angles, miscellaneous mountings and frames. Provide lintels fabricated from structural steel shapes over openings in masonry walls and partitions as indicated and as required to support wall loads over openings. Provide with connections and fasteners. Construct to have at least 8 inch bearing on masonry at each end.

Provide angles and plates in accordance with ASTM A36/A36M, for embedment as indicated. Galvanize embedded items exposed to the elements in accordance with ASTM A123/A123M.

2.8 ROOF HATCHES (SCUTTLES)

Provide aluminum sheets not less than 14 gauge with 3 inch beaded flange, welded and ground at corners. Provide a minimum clear opening of 30 by 36 inches. Insulate cover and curb with one inch thick rigid fiberboard insulation, covered and protected by aluminum sheet of not less than 26

gage. Provide with 12 inches high curb, formed with 3 inch mounting flanges with holes for securing to the floor deck.

2.9 Floor Doors

Provide aluminum sheets not less than 14 gauge with 3 inch beaded flange, welded and ground at corners. Provide a minimum clear opening of 30 by 36 inches. Provide with 3 inch mounting flanges with holes for securing to the floor slab.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated in accordance with manufacturer's instructions. Verify all field dimensions prior to fabrication. Include materials and parts necessary to complete each assembly, whether indicated or not. Mis-alignment and mis-sizing of holes for fasteners is cause for rejection. Conceal fastenings where practicable. Joints exposed to weather must be watertight.

3.2 WORKMANSHIP

Provide miscellaneous metalwork that is true and accurate in shape, size, and profile. Make angles and lines continuous and straight. Make curves consistent, smooth and unfaceted. Provide continuous welding along the entire area of contact except where tack welding is permitted. Do not tack weld exposed connections. Unless otherwise indicated and approved, provide a smooth finish on exposed surfaces. Provide countersunk rivets where exposed. Provide coped and mitered corner joints aligned flush and without gaps.

3.3 ANCHORAGE, FASTENINGS, AND CONNECTIONS

Provide anchorage as necessary, whether indicated or not, for fastening miscellaneous metal items securely in place. Include slotted inserts, expansion shields, powder-driven fasteners, toggle bolts (when approved for concrete), through bolts for masonry, headed shear studs, machine and carriage bolts for steel, through bolts, lag bolts, and screws for wood. Do not use wood plugs. Provide non-ferrous attachments for non-ferrous metal. Provide exposed fastenings of compatible materials (avoid contact of dissimilar metals), that generally match in color and finish the surfaces to which they are applied. Conceal fastenings where practicable. Provide all fasteners flush with the surfaces they fasten, unless indicated otherwise.

3.4 BUILT-IN WORK

Where necessary and not otherwise indicated, form built-in metal work for anchorage with concrete or masonry. Provide built-in metal work in ample time for securing in place as the work progresses.

3.5 WELDING

Perform welding, welding inspection, and corrective welding in accordance with AWS D1.1/D1.1M. Use continuous welds on all exposed connections. Grind visible welds smooth in the finished installation. Provide welded

headed shear studs in accordance with AWS D1.1/D1.1M, Clause 7, except as otherwise specified. Provide in accordance with the safety requirements of EM 385-1-1.

3.6 DISSIMILAR METALS

Where dissimilar metals are in contact, protect surfaces with a coating in accordance with MPI 79 to prevent galvanic or corrosive action. Where aluminum is in contact with concrete, plaster, mortar, masonry, wood, or absorptive materials subject to wetting, protect in accordance with ASTM D1187/D1187M, asphalt-base emulsion. Clean surfaces with metal shavings from installation at the end of each work day.

3.7 PREPARATION

3.7.1 Material Coatings and Surfaces

Remove rust preventive coating just prior to field erection, using a remover approved by the metal manufacturer. Surfaces, when assembled, must be free of rust, grease, dirt and other foreign matter.

3.7.2 Environmental Conditions

Do not clean or paint surfaces when damp or exposed to foggy or rainy weather, when metallic surface temperature is less than minus 5 degrees F above the dew point of the surrounding air, or when surface temperature is below 45 degrees F or over 95 degrees F, unless approved by the Contracting Officer. Metal surfaces to be painted must be dry for a minimum of 48 hours prior to the application of primer or paint.

3.8 COVER PLATES AND FRAMES

Provide tops of cover plates and frames flush with finished surface. Test for trip hazards and adjust for any encountered lippage.

3.9 INSTALLATION OF BOLLARDS/PIPE GUARDS

Set bollards/pipe guards vertically in concrete piers. Fill hollow cores with concrete having a compressive strength of 3000 psi.

3.10 INSTALLATION OF MISCELLANEOUS PLATES AND SHAPES

Provide lintels fabricated from structural steel shapes over openings in masonry walls and partitions as indicated and as required to support wall loads over openings. Provide with connections and fasteners. Construct to have at least 8 inches bearing on masonry at each end.

-- End of Section --

SECTION 05 51 00

METAL STAIRS
02/17

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 314	(1990; R 2013) Standard Specification for Steel Anchor Bolts

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 360	(2016) Specification for Structural Steel Buildings

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B18.2.1	(2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)
ASME B18.6.1	(2016) Wood Screws (Inch Series)
ASME B18.6.3	(2013; R 2017) Machine Screws, Tapping Screws, and Machine Drive Screws (Inch Series)
ASME B18.21.1	(2009; R 2016) Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series)

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2020) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A27/A27M	(2020) Standard Specification for Steel Castings, Carbon, for General Application
ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A47/A47M	(1999; R 2018; E 2018) Standard Specification for Ferritic Malleable Iron Castings
ASTM A53/A53M	(2020) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A108	(2013) Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2016a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A283/A283M	(2013) Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A307	(2014; E 2017) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A325	(2014) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A449	(2014) Standard Specification for Hex Cap Screws, Bolts, and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
ASTM A500/A500M	(2020) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A512	(2006; R 2012) Standard Specification for Cold-Drawn Buttweld Carbon Steel Mechanical Tubing
ASTM A568/A568M	(2019a) Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for
ASTM A575	(2020) Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades
ASTM A653/A653M	(2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A924/A924M	(2020) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM A1008/A1008M	(2020) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability,

	Solution Hardened, and Bake Hardenable
ASTM A1011/A1011M	(2018a) Standard Specification for Steel Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
ASTM C514	(2004; R 2020) Standard Specification for Nails for the Application of Gypsum Board
ASTM C636/C636M	(2013) Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
ASTM E488/E488M	(2015) Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2018; ERTA 18-1; ERTA 18-2; ERTA 18-3; ERTA 18-4; TIA 18-1; TIA 18-2; TIA 18-3; TIA 18-4) Life Safety Code

1.2 SUBMITTALS

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SD-02 Shop Drawings

Iron and Steel Hardware; G, AE

Steel Shapes, Plates, Bars, and Strips; G, AE

Metal Stair System; G, AE

SD-03 Product Data

Recycled Content for Steel; S

Environmental Product Declaration (EPD) for Steel; S

Structural-Steel Plates, Shapes, and Bars; G, AE

Structural-Steel Tubing; G, AE

Hot-Rolled Carbon Steel Sheets and Strips; G, AE

Cold-Finished Steel Bars; G, AE

Hot-Rolled Carbon Steel Bars; G, AE

Cold-Rolled Carbon Steel Sheets; G, AE

Galvanized Carbon Steel Sheets; G, AE

Cold-Drawn Steel Tubing; G, AE

Concrete Inserts; G, AE

Masonry Anchorage Devices; G, AE

Steel Pan Stairs; G, AE

Steel Stairs; G, AE

SD-05 Design Data

Member And Connection Calculation

SD-07 Certificates

Welding Procedures; G, AE

Welder Qualification; G, AE

Certification Letter from Contractor's Professional Engineer; G

SD-08 Manufacturer's Instructions

Structural-Steel Plates, Shapes, and Bars; G, AE

Structural-Steel Tubing; G, AE

Hot-Rolled Carbon Steel Sheets and Strips; G, AE

Cold-Finished Steel Bars; G, AE

Hot-Rolled Carbon Steel Bars; G, AE

Cold-Rolled Carbon Steel Sheets; G, AE

Galvanized Carbon Steel Sheets; G, AE

Cold-Drawn Steel Tubing; G, AE

Masonry Anchorage Devices; G, AE

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment, if available; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products

with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials: Option 2, Leadership Extraction Practices

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

c. LEED Submittal shall be submitted and reviewed concurrently with product data submittal and samples.

1.3 QUALITY CONTROL

1.3.1 Qualifications for Welding Work

Submit welding procedures in accordance with AWS D1.1/D1.1M. Make test specimens in the presence of the Contracting Officer, and have the specimens tested by an approved testing laboratory at the Contractor's expense.

Certify welder qualification by tests in accordance with AWS D1.1/D1.1M, or under an equivalent approved qualification test. In addition, perform tests on test pieces in positions and with clearances equivalent to those actually encountered. If a test weld fails to meet requirements, ensure that two test welds are retested immediately and that each test weld is made and passes. Failure in the immediate retest requires that the welder be retested after further practice or training and a complete set of test welds be made.

1.3.2 Shop Drawings

Include plans, elevations, sections, details, and attachments to other work. Indicate sizes, spacing and locations of structural members. Include details of cuts, connections, splices, attachments, holes, and other pertinent data. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Indicate all AWS weld designations for pre-qualified full and partial penetration welds and detail all joint preparations. Provide erection details of all field welded connections. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Detail material required for the connection of other work. The Professional Structural Engineer's signature and seal shall appear on all structural steel shop drawings (including erection drawings, piece drawings, member and connection calculations. Cloud, bubble, or otherwise highlight and identify all revisions on the drawings. Submittals which do not identify changes and revisions will be returned as "Not Reviewed". Drawings that have been renumbered will be rejected.

1.3.3 Design Calculations

Design Calculations for Metal Stairs: Design Metal Stairs under direct supervision of the manufacturer employed Professional Engineer. Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers and a coordinated table of contents. Design Calculations submittal shall be signed and sealed by a qualified Professional Engineer licensed in the state or district in which the project is located. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect. Design Calculations submission must be concurrent with the submission of corresponding Fabrication drawings. Fabrication drawings submitted without corresponding Design Calculations will be returned as "Not Reviewed". Design Calculations shall be submitted for information only.

1.3.3.1 Certification Letter from Contractor's Professional Engineer

a. Prior to the submission of Shop Drawings, Product Data, Design Calculations and other required submittals, submit a Certification Letter from the Contractor's responsible design Professional Engineer. No shop drawings will be reviewed by the Architect prior to the submission and acceptance of this Certification Letter. Certification Letter shall be submitted for information only. The Certification Letter shall include the following:

    1. Signature and seal of the registered Professional Engineer (registered in the state or district in which the project is located).

    2. Statement that the Professional Engineer is fully experienced in the design of Metal Stairs.

    3. Statement that all calculations and shop drawings are in accordance with the Contract Documents and applicable building codes and have been prepared under the direction of the Professional Engineer.

    4. Statement that the Professional Engineer's signature and seal shall appear on all design calculations and on all shop drawings.

    5. Statement that the design shall be in accordance with the aesthetic design intent of the project with the Architect having final authority in reference to aesthetic matters.

    6. Statement that the Professional Engineer will submit an additional signed and sealed letter at the completion of the work related to this section stating that the fabrication and installation of the Metal Stairs have been performed in accordance with the Professional Engineer's design.

b. Final Engineer Certification Letter: After construction of the metal stairs is complete, submit a signed and sealed certification letter from the responsible design professional stating that the fabrication and installation of the metal stairs have been performed in accordance

with the Professional Engineer's design. Final certification letter shall be submitted for record only.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Submit complete and detailed fabrication drawings for all iron and steel hardware, and for all steel shapes, plates, bars, and strips used in accordance with the design specifications referenced in this section.

2.2 FABRICATION

Preassemble items in the shop to the greatest extent possible. Disassemble units only to the extent necessary for shipping and handling. Clearly mark units for reassembly and coordinated installation.

For the fabrication of work exposed to view, use only materials that are smooth and free of surface blemishes, including pitting, seam marks, roller marks, rolled trade names, and roughness. Remove blemishes by grinding, or by welding and grinding, before cleaning and treating surfaces and applying surface finishes, including zinc coatings.

2.2.1 General Fabrication

Prepare and submit metal stair system shop drawings with detailed plans and elevations at scales not less than 1 inch to 1 foot and with details of sections and connections at scales not less than 3 inches to 1 foot. Also detail the placement drawings, diagrams, and templates for installation of anchorages, including concrete inserts, anchor bolts, and miscellaneous metal items having integral anchorage devices.

Use materials of size and thicknesses indicated or, if not indicated, of the size and thickness necessary to produce a finished product that is strong enough and durable enough for its intended use. Work the materials to the dimensions indicated on approved detail drawings, using proven methods of fabrication and support. Use the type of materials indicated or specified for the various components of work.

Form exposed work true to line and level, with accurate angles and surfaces and with straight sharp edges. Ease exposed edges to a radius of approximately 1/32 inch, and bend metal corners to the smallest radius possible without causing grain separation or otherwise impairing the work.

Continuously weld corners and seams in accordance with the recommendations of AWS D1.1/D1.1M. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.

Form exposed connections with hairline joints that are flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of the type indicated or, if not indicated, use Phillips flat-head (countersunk) screws or bolts.

Provide and coordinate anchorage of the type indicated for the supporting structure. Fabricate anchoring devices, and space them as indicated and as necessary to provide adequate support for the intended use of the work.

Use hot-rolled steel bars for work fabricated from bar stock unless work is indicated or specified as fabricated from cold-finished or cold-rolled

stock.

2.2.2 Steel Pan Stairs

2.2.2.1 General

Joining pieces by welding. Fabricate units so that bolts and other fastenings do not appear on finished surfaces. Make joints true and tight, and connections between parts lighttight. Grind continuous welds smooth where exposed.

Construct metal stair units to sizes and arrangements indicated to support a minimum live load of 100 pounds per square foot. Provide framing, hangers, columns, struts, clips, brackets, bearing plates, and other components as required for the support of stairs and platforms.

2.2.2.2 Stair Framing

Fabricate stringers of structural-steel channels, or plates, or a combination thereof as indicated. Provide closures for exposed ends of strings.

Construct platforms of structural-steel channel headers and miscellaneous framing members as indicated. Bolt headers to stringers and newels, and bolt framing members to stringers and headers.

2.2.2.3 Riser, Subtread, and Subplatform Metal Pans

Form metal pans of 0.1084-inch (12-gage) structural-steel sheets, conforming to ASTM A1011/A1011M, Grade 36. Shape the pans to the configuration indicated.

Construct risers and subtread metal pans with steel angle supporting brackets, of the size indicated, welded to stringers. Secure metal pans to brackets with rivets or welds. Secure subplatform metal pans to platform frames with welds.

2.3 COMPONENTS

2.3.1 Steel Stairs

Provide steel stairs complete with stringers, metal-pan concrete-filled treads, , precast terrazzo treads and risers and landing treads, landings, columns, handrails, and necessary bolts and other fastenings, steel stairs, and accessories.

2.3.1.1 Design Loads

Design stairs to sustain a live load of not less than 100 pounds per square foot, or a concentrated load of 300 applied where it is most critical. Except for a commercial product, design and fabricate steel stairs to conform to AISC 360. Design fire stairs to conform to NFPA 101.

2.3.1.2 Materials

Provide steel stairs of welded construction except that bolts may be used where welding is not practicable. Do not use screw or screw-type connections.

a. Structural Steel: ASTM A36/A36M.

b. Support metal pan for concrete fill on angle cleats welded to stringers or treads with integral cleats, welded or bolted to the stringer. Close exposed ends.

c. Before fabrication, obtain necessary field measurements and verify drawing dimensions.

d. Clean metal surfaces free of mill scale, flake rust, and rust pitting before shop finishing. Weld permanent connections. Finish welds flush and smooth on surfaces that will be exposed after installation.

2.3.2 Soffit Clips

Provide clips with holes for attaching metal furring for plastered soffits. Space the clips not more than 12 inches on center, and weld them to stair treads and platforms as required.

2.3.3 Concrete Inserts

Threaded-type concrete inserts consisting of galvanized ferrous castings, internally threaded to receive 3/4-inch diameter machine bolts; either malleable iron conforming to ASTM A47/A47M or cast steel conforming to ASTM A27/A27M, and hot-dip-galvanized in accordance with ASTM A153/A153M.

Wedge-type concrete inserts consisting of galvanized box-type ferrous castings designed to accept 3/4-inch diameter bolts having special wedge-shaped heads; either malleable iron conforming to ASTM A47/A47M or cast steel conforming to ASTM A27/A27M and hot-dip-galvanized in accordance with ASTM A153/A153M.

Carbon steel bolts having special wedge-shaped heads, nuts, washers, and shims and galvanized in accordance with ASTM A153/A153M. Provide slotted-type concrete inserts consisting of galvanized 1/8-inch thick pressed steel plate conforming to ASTM A283/A283M; of box-type welded construction with slot designed to receive 3/4-inch diameter square-head bolt with knockout cover; and be hot-dip-galvanized in accordance with ASTM A123/A123M.

2.3.4 Masonry Anchorage Devices

Provide masonry anchorage devices consisting of expansion shields complying with AASHTO M 314, ASTM E488/E488M and ASTM C514 as follows:

a. Lead expansion shields for machine screws and bolts 1/4 inch and smaller; head-out embedded-nut type, single unit class, Group I, Type 1, Class 1.

b. Lead expansion shields for machine screws and bolts larger than 1/4 inch in size; head-out embedded-nut type, multiple unit class, Group I, Type 1, Class 2.

c. Bolt anchor expansion shields for lag bolts; zinc-alloy, long-shield anchors class, Group II, Type 1, Class 1.

d. Bolt anchor expansion shields for bolts; closed-end bottom-bearing class, Group II, Type 2, Class 1.

Use toggle bolts of the tumble-wing type, conforming to ASTM A325, ASTM A449, and ASTM C636/C636M, type, class, and style as required.

2.3.5 Fasteners

Select galvanized zinc-coated fasteners conforming to ASTM A153/A153M for exterior applications or where the fasteners are built into exterior walls or floor systems. Select the fasteners for the type, grade, and class required for the installation of steel stair items:

a. Standard/regular hexagon-head bolts and nuts, conforming to ASTM A307, Grade A.

b. Square-head lag bolts conforming to ASME B18.2.1.

c. Cadmium-plated steel machine screws, conforming to ASME B18.6.3.

d. Flat-head carbon steel wood screws, conforming to ASME B18.6.1.

e. Plain, round, general-assembly-grade, carbon steel washers, conforming to ASME B18.21.1.

f. Helical-spring, carbon steel lockwashers, conforming to ASME B18.2.1.

2.4 MATERIALS

2.4.1 Structural-Steel Plates, Shapes and Bars

Structural-size shapes and plates, conforming to ASTM A36/A36M, unless otherwise noted, except bent or cold-formed plates.

Steel plates - bent or cold-formed, conforming to ASTM A283/A283M, Grade C.

Steel bars and bar-size shapes, conforming to ASTM A36/A36M, unless otherwise noted for steel bars and bar-size shapes.

Recycled Content for Steel: Provide a minimum of 25 percent post-consumer recycled content. Submit data identifying percentage of recycled content for steel. Submit Environmental Product Declaration (EPD) for Steel, if available. Provide one of the following EPD options including Product Category Rules (PCR) standard EN 15804 or ISO 21930.

1. Product-Specific Declaration

2. Product-Specific Type III EPD

3. Industry-Wide (Generic) EPD: Provide proof manufacturer is a participant.

2.4.2 Structural-Steel Tubing

Provide the following:

a. Structural steel tubing, hot-formed, welded or seamless, conforming to ASTM A500/A500M, Grade B, unless otherwise noted.

2.4.3 Hot-Rolled Carbon Steel Bars

Provide the following:

a. Hot-rolled carbon steel bars and bar-size shapes, conforming to ASTM A575, grade as selected by the fabricator.

2.4.4 Cold-Finished Steel Bars

Provide the following:

a. Cold-finished steel bars conforming to ASTM A108, grade as selected by the fabricator.

2.4.5 Hot-Rolled Carbon Steel Sheets and Strips

Provide the following:

a. Hot-rolled carbon sheets and strips conforming to ASTM A568/A568M and ASTM A1011/A1011M, pickled and oiled.

2.4.6 Cold-Rolled Carbon Steel Sheets

Provide the following:

a. Cold-rolled carbon steel sheets conforming to ASTM A1008/A1008M.

2.4.7 Galvanized Carbon Steel Sheets

Provide the following:

a. Galvanized carbon steel sheets conforming to ASTM A653/A653M, with galvanizing conforming to ASTM A653/A653M and ASTM A924/A924M.

2.4.8 Cold-Drawn Steel Tubing

Provide the following:

a. Cold-drawn steel tubing conforming to ASTM A512, sunk drawn, butt-welded, cold-finished, and stress-relieved.

2.4.9 Steel Pipe

Provide the following:

a. Steel pipe conforming to ASTM A53/A53M, type as selected, Grade B; primed finish, unless galvanizing is required; standard weight (Schedule 40).

PART 3 EXECUTION

3.1 PREPARATION

Clean surfaces thoroughly before installation. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions. Examine materials upon arrival at site. Notify the carrier and manufacturer of any damage.

Protect installed products until completion of project. Touch up, repair or replace, damaged products before substantial completion

3.2 INSTALLATION

Install in accordance with the manufacturer's instructions and approved submittals. Install in proper relationship with adjacent construction.

Install items at locations indicated, according to the manufacturer's instructions. Verify all measurements and take all field measurements necessary before fabrication. Ensure that exposed fastenings are compatible with generally match the color and finish of, and harmonize with the material to which they are applied. Include materials and parts necessary to complete each item, even though such work is not definitely shown or specified. Poor matching of holes for fasteners is cause for rejection. Conceal fastenings where practicable. Select thickness of metal and details of assembly and supports that adequately strengthen and stiffen the construction. Form joints exposed to the weather to exclude water.

3.2.1 Field Preparation

Remove rust-preventive coating just before field erection, using a remover approved by the coating manufacturer. Provide surfaces, when assembled, free of rust, grease, dirt and other foreign matter.

3.2.2 Field Welding

Comply with AWS D1.1/D1.1M in executing manual shielded-metal arc welding, (for appearance and quality of new welds) and in correcting existing welding.

3.2.3 Safety Nosings

Completely embed nosing in concrete before the initial set of the concrete occurs and finish flush with the top of the concrete surface.

3.2.4 Touchup Painting

Immediately after installation, clean all field welds, bolted connections, and abraded areas of the shop-painted material, and repaint exposed areas with the same paint used for shop painting. Apply paint by brush or spray to provide a minimum dry-film thickness of 2 mils.

-- End of Section --

SECTION 05 51 33

METAL LADDERS
02/16

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN LADDER INSTITUTE (ALI)

ALI A14.3	(2008; R 2018) Ladders - Fixed - Safety Requirements

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP Z359.16	(2016) Safety Requirements for Climbing Ladder Fall Arrest Systems

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2020) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A47/A47M	(1999; R 2018; E 2018) Standard Specification for Ferritic Malleable Iron Castings
ASTM A53/A53M	(2020) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2016a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A500/A500M	(2020) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A653/A653M	(2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A780/A780M	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A924/A924M	(2020) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM D1187/D1187M	(1997; E 2011; R 2011) Asphalt-Base Emulsions for Use as Protective Coatings for Metal

MASTER PAINTERS INSTITUTE (MPI)

MPI 79	(2012) Primer, Alkyd, Anti-Corrosive for Metal

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 3	(2018) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning

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

29 CFR 1910.23	(Nov 2016) Ladders
29 CFR 1910.28	(Nov 2016)Duty to Have Fall Protection and Falling Object Protection
29 CFR 1910.29	(Nov 2016) Fall Protection System and Falling Object Protection - Criteria and Practices

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Ladders, Installation Drawings

SD-03 Product Data

Ladders

Ladder Safety Devices (Climbing Ladder Fall Arrest Systems)

SD-07 Certificates

Fabricator Certification for Ladder Assembly

Fabricator Certification for Ships Ladder Assembly

1.3 CERTIFICATES

Provide fabricator certification for ladder assembly stating that the ladder and associated components have been fabricated according to the requirements of 29 CFR 1910.23.

Provide fabricator certification for ships ladder assembly stating that the ships ladder and associated components have been fabricated according to the requirements of 29 CFR 1910.23.

1.4 QUALIFICATION OF WELDERS

Qualify welders in accordance with AWS D1.1/D1.1M. Use procedures, materials, and equipment of the type required for the work.

1.5 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new items.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Structural Carbon Steel

ASTM A36/A36M.

2.1.2 Structural Tubing

ASTM A500/A500M.

2.1.3 Steel Pipe

ASTM A53/A53M, Type E or S, Grade B.

2.1.4 Fittings for Steel Pipe

Standard malleable iron fittings ASTM A47/A47M.

2.2 FABRICATION FINISHES

2.2.1 Galvanizing

Hot-dip galvanize items specified to be zinc-coated, after fabrication where practicable. Galvanizing: ASTM A123/A123M, ASTM A153/A153M, ASTM A653/A653M or ASTM A924/A924M, G90, as applicable.

2.2.2 Galvanize

Anchor bolts, washers, and parts or devices necessary for proper installation, unless indicated otherwise.

2.2.3 Repair of Zinc-Coated Surfaces

Repair damaged surfaces with galvanizing repair method and paint conforming to ASTM A780/A780M or by application of stick or thick paste

material specifically designed for repair of galvanizing, as approved by Contracting Officer. Clean areas to be repaired and remove slag from welds. Heat surfaces to which stick or paste material is applied, with a torch to a temperature sufficient to melt the metallics in stick or paste; spread molten material uniformly over surfaces to be coated and wipe off excess material.

2.2.4 Shop Cleaning and Painting

2.2.4.1 Surface Preparation

Blast clean surfaces in accordance with SSPC SP 6/NACE No.3. Surfaces that will be exposed in spaces above ceiling or in attic spaces, crawl spaces, furred spaces, and chases may be cleaned in accordance with SSPC SP 3 in lieu of being blast cleaned. Wash cleaned surfaces which become contaminated with rust, dirt, oil, grease, or other contaminants with solvents until thoroughly clean.

2.2.4.2 Pretreatment, Priming and Painting

Apply pretreatment, primer, and paint in accordance with manufacturer's printed instructions. On surfaces concealed in the finished construction or not accessible for finish painting, apply an additional prime coat to a minimum dry film thickness of 1.0 mil. Tint additional prime coat with a small amount of tinting pigment.

2.2.5 Nonferrous Metal Surfaces

Protect by plating, anodic, or organic coatings.

2.3 LADDERS

Fabricate vertical ladders conforming to 29 CFR 1910.23 and Section 5 of ALI A14.3. Ladders shall be capable of supporting their maximum intended load. Use 2 1/2 by 3/8 inch steel flats for stringers and 3/4 inch diameter steel rods for rungs. Ladder rungs, step and cleats must be spaced not less than 10 inches and not more than 16 inches wide (measured before installation of ladder safety system), spaced no more than 14 inches apart, plug welded or shouldered and headed into stringers. Install ladders so that the maximum perpendicular distance from the centerline of the steps or rungs, or grab bars, or both, to the nearest permanent object in the back of the ladder or to the finished wall surface will not be less than 7 inches, except for the elevator pit ladders, which have a minimum perpendicular distance of 4.5 inches. Provide heavy clip angles riveted or bolted to the stringer and drilled for not less than two 1/2 inch diameter expansion bolts as indicated. Provide intermediate clip angles not over 48 inches on centers. The top rung of the ladder must be level with the top of the access level, parapet or landing served by the ladder except for hatches or wells. Extend the side rails of through or side step ladders 42 inches above the access level. Provide ladder access protective swing gates at the top of access/egress level. The drawings must indicate ladder locations and details of critical dimensions and materials.

2.3.1 Phasing out of Ladder Cages and Wells (29 CFR 1910.28, Nov 2016)

Conform to 29 CFR 1910.28 (Nov 2016).

Each ladder installed before 19 November, 2018 shall be equipped with a

personal fall arrest system, ladder safety device (climbing Ladder Fall Arrest System), cage, or well.

Each newly installed ladder over 20 feet in length shall only be equipped with a personal fall arrest system or climbing ladder fall arrest system (ladder safety device), cages and wells are prohibited. When a fixed ladder, cage, or well, or any portion of a section thereof, is replaced, a personal fall arrest system or climbing ladder fall arrest system (ladder safety device) is installed in at least that section of the fixed ladder, cage, or well where the replacement is located. On and after November 18, 2036, all fixed ladders shall only be equipped with a personal fall arrest system or a ladder safety device (climbing ladder Fall Arrest System).

2.3.2 Ladder Safety Devices (Climbing Ladder Fall Arrest Systems)

Conform to 29 CFR 1910.29, Section 7 of ALI A14.3 and ASSP Z359.16. Install ladder safety devices on ladders over 20 feet long or more. The ladder safety systems must meet the design requirement of the ladders which they serve. The ladder safety system must be capable of sustaining a minimum static load of 1,000 pounds. The applied loads transferred to the climbing ladder mounting locations as a result of a fall shall be specified by the manufacturer of the climbing ladder fall arrest system. Each ladder safety system must allow the worker to climb up and down using both hands and does not require the employee continuously, hold, push, or pull any part of the system while climbing. The connection between the carrier or lifeline and the point of attachment to the body harness does not exceed 9 inches. The ladder safety system consists of a rigid or flexible carrier. Mountings for the rigid carries are attached at each end of the carrier, with intermediate mountings spaced as necessary, along the entire length of the carrier. Mountings for flexible carrier are attached at each end of the carrier and cable guides for flexible carriers are installed at least 25 feet apart but not more than 40 feet apart along the entire length of the carrier. The design and installation of mountings and cable guides does not reduce the design strength of the ladder.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated, according to manufacturer's instructions. Verify all measurements and take all field measurements necessary before fabrication. Provide Exposed fastenings of compatible materials, generally matching in color and finish, and harmonize with the material to which fastenings are applied. Include materials and parts necessary to complete each item, even though such work is not definitely shown or specified. Poor matching of holes for fasteners will be cause for rejection. Conceal fastenings where practicable. Thickness of metal and details of assembly and supports must provide strength and stiffness. Formed joints exposed to the weather to exclude water. Items listed below require additional procedures.

3.2 WORKMANSHIP

Metalwork must be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching must produce clean true lines and surfaces. Continuously weld along the entire area of contact. Do not tack weld exposed connections of work in place. Grid smooth exposed welds. Provide smooth finish on exposed surfaces of work in

place, unless otherwise approved. Where tight fits are required, mill joints. Cope or miter corner joints, well formed, and in true alignment. Install in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

3.3 ANCHORAGE, FASTENINGS, AND CONNECTIONS

Provide anchorage where necessary for fastening metal items securely in place. Include for anchorage not otherwise specified or indicated slotted inserts, expansion anchors, and powder-actuated fasteners, when approved for concrete; toggle bolts and through bolts for masonry; machine bolts, carriage bolts and powder-actuated threaded studs for steel; through bolts, lag bolts, and screws for wood. Do not use wood plugs in any material. Provide non-ferrous attachments for non-ferrous metal. Make exposed fastenings of compatible materials, generally matching in color and finish, to which fastenings are applied. Conceal fastenings where practicable.

3.4 WELDING

Perform welding, welding inspection, and corrective welding, in accordance with AWS D1.1/D1.1M. Use continuous welds on all exposed connections. Grind visible welds smooth in the finished installation.

3.5 FINISHES

3.5.1 Dissimilar Materials

Where dissimilar metals are in contact, protect surfaces with a coat conforming to MPI 79 to prevent galvanic or corrosive action. Where aluminum is in contact with concrete, plaster, mortar, masonry, wood, or absorptive materials subject to wetting, protect with ASTM D1187/D1187M, asphalt-base emulsion.

3.5.2 Field Preparation

Remove rust preventive coating just prior to field erection, using a remover approved by the rust preventive manufacturer. Surfaces, when assembled, must be free of rust, grease, dirt and other foreign matter.

3.5.3 Environmental Conditions

Do not clean or paint surface when damp or exposed to foggy or rainy weather, when metallic surface temperature is less than 5 degrees F above the dew point of the surrounding air, or when surface temperature is below 45 degrees F or over 95 degrees F, unless approved by the Contracting Officer.

3.6 LADDERS

Secure to the adjacent construction with the clip angles attached to the stringer. Secure to masonry or concrete with not less than two 1/2 inch diameter expansion bolts. Install intermediate clip angles not over 48 inches on center. Install brackets as required for securing of ladders welded or bolted to structural steel or built into the masonry or concrete. Ends of ladders must not rest upon floor.

-- End of Section --

SECTION 05 52 00

METAL RAILINGS
02/18

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 314	(1990; R 2013) Standard Specification for Steel Anchor Bolts

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B18.2.1	(2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)
ASME B18.6.1	(2016) Wood Screws (Inch Series)
ASME B18.6.3	(2013; R 2017) Machine Screws, Tapping Screws, and Machine Drive Screws (Inch Series)
ASME B18.21.1	(2009; R 2016) Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series)

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2020) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A27/A27M	(2020) Standard Specification for Steel Castings, Carbon, for General Application
ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A47/A47M	(1999; R 2018; E 2018) Standard Specification for Ferritic Malleable Iron Castings
ASTM A53/A53M	(2020) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A108	(2013) Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
ASTM A123/A123M	(2017) Standard Specification for Zinc

	(Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2016a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A283/A283M	(2013) Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A307	(2014; E 2017) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A449	(2014) Standard Specification for Hex Cap Screws, Bolts, and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
ASTM A500/A500M	(2020) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A512	(2006; R 2012) Standard Specification for Cold-Drawn Buttweld Carbon Steel Mechanical Tubing
ASTM A575	(2020) Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades
ASTM B26/B26M	(2014; E 2015) Standard Specification for Aluminum-Alloy Sand Castings
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM C514	(2004; R 2020) Standard Specification for Nails for the Application of Gypsum Board
ASTM C636/C636M	(2013) Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
ASTM E488/E488M	(2015) Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
ASTM F3125/F3125M	(2019) Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM AMP 521	(2001; R 2012) Pipe Railing Systems Manual

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

1.2 ADMINISTRATIVE REQUIREMENTS

1.2.1 Preinstallation Meetings

Within 30 days of contract award, submit fabrication drawings to the Contracting Officer for the following items:

a. Iron and steel hardware

b. Steel shapes, plates, bars and strips

c. Steel railings and handrails

d. Aluminum railings and handrails

e. Anchorage and fastening systems

Submit manufacturer's catalog data, including two copies of manufacturers specifications, load tables, dimension diagrams, and anchor details for the following items:

a. Structural-steel plates, shapes, and bars

b. Structural-steel tubing

c. Cold-finished steel bars

d. Hot-rolled carbon steel bars

e. Cold-drawn steel tubing

f. Concrete inserts

g. Masonry anchorage devices

h. Protective coating

i. Steel railings and handrails

j. Aluminum railings and handrails

k. Anchorage and fastening systems

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to

Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication Drawings; G, AE

Iron and Steel Hardware; G, AE

Steel Shapes, Plates, Bars and Strips; G, AE

SD-03 Product Data

Environmental Product Declaration (EPD) for Steel; S

Structural-Steel Plates, Shapes, and Bars; G, AE

Structural-Steel Tubing; G, AE

Cold-Finished Steel Bars; G, AE

Hot-Rolled Carbon Steel Bars; G, AE

Cold-Drawn Steel Tubing; G, AE

Concrete Inserts; G, AE

Masonry Anchorage Devices; G, AE

Protective Coating; G, AE

Steel Railings and Handrails; G, AE

Aluminum Railings and Handrails; G, AE

Anchorage and Fastening Systems; G, AE

Recycled Content for Steel; S

SD-05 Design Data

Member And Connection Calculation

SD-07 Certificates

Welding Procedures; G, AE

Welder Qualification; G, AE

Certification Letter from Contractor's Professional Engineer; G

SD-08 Manufacturer's Instructions

Installation Instructions

1.3.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements, If available. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials: Option 2, Leadership Extraction Practices

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

c. LEED Submittal shall be submitted and reviewed concurrently with product data submittal and samples.

1.4 QUALITY CONTROL

1.4.1 Welding Procedures

Submit results of welding procedures testing in accordance with AWS D1.1/D1.1M made in the presence of the Contracting Officer and by an approved testing laboratory at the Contractor's expense.

1.4.2 Welder Qualification

Submit certified welder qualification by tests in accordance with AWS D1.1/D1.1M, or under an equivalent approved qualification test. In addition, perform tests on test pieces in positions and with clearances equivalent to those actually encountered. If a test weld fails to meet requirements, conduct an immediate retest of two test welds and ensure that each test weld passes. Failure in the immediate retest will require that the welder be retested after further practice or training and make a complete set of test welds.

1.4.3 Shop Drawings

Include plans, elevations, sections, details, and attachments to other work. Indicate sizes, spacing and locations of structural members. Include details of cuts, connections, splices, attachments, holes, and other pertinent data. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Indicate all AWS weld designations for pre-qualified full and partial penetration welds and detail all joint preparations.

Provide erection details of all field welded connections. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Detail material required for the connection of other work. The Professional Structural Engineer's signature and seal shall appear on all structural steel shop drawings (including erection drawings, piece drawings, member and connection calculations. Cloud, bubble, or otherwise highlight and identify all revisions on the drawings. Submittals which do not identify changes and revisions will be returned as "Not Reviewed". Drawings that have been renumbered will be rejected.

1.4.4 Design Calculations

Design Calculations for Metal Railings: Design Metal Railings under direct supervision of the manufacturer employed Professional Engineer. Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers and a coordinated table of contents. Design Calculations submittal shall be signed and sealed by a qualified Professional Engineer licensed in the state or district in which the project is located. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect. Design Calculations submission must be concurrent with the submission of corresponding Fabrication drawings. Fabrication drawings submitted without corresponding Design Calculations will be returned as "Not Reviewed". Design Calculations shall be submitted for information only.

1.4.4.1 Certification Letter from Contractor's Professional Engineer

Prior to the submission of Shop Drawings, Product Data, Design Calculations and other required submittals, submit a Certification Letter from the Contractor's responsible design Professional Engineer. No shop drawings will be reviewed by the Architect prior to the submission and acceptance of this Certification Letter. Certification Letter shall be submitted for information only. The Certification Letter shall include the following:

a. Signature and seal of the registered Professional Engineer (registered in the state or district in which the project is located).

b. Statement that the Professional Engineer is fully experienced in the design of Metal Railings.

c. Statement that all calculations and shop drawings are in accordance with the Contract Documents and applicable building codes and have been prepared under the direction of the Professional Engineer.

d. Statement that the Professional Engineer's signature and seal shall appear on all design calculations and on all shop drawings.

e. Statement that the design shall be in accordance with the aesthetic design intent of the project with the Architect having final authority in reference to aesthetic matters.

f. Statement that the Professional Engineer will submit an additional signed and sealed letter at the completion of the work related to this

section stating that the fabrication and installation of the Metal Railings have been performed in accordance with the Professional Engineer's design.

PART 2 PRODUCTS

2.1 FABRICATION

Preassemble items in the shop to the greatest extent possible. Disassemble units only to the extent necessary for shipping and handling. Clearly mark units for reassembly and coordinated installation.

For the fabrication of work exposed to view, use only materials that are smooth and free of surface blemishes, including pitting, seam marks, roller marks, rolled trade names, and roughness. Remove blemishes by grinding, or by welding and grinding, before cleaning, treating, and applying surface finishes, including zinc coatings.

Provide railing and handrail detail plans and elevations at not less than 1 inch to 1 foot. Provide details of sections and connections at not less than 3 inches to 1 foot. Also detail setting drawings, diagrams, templates for installation of anchorages, including concrete inserts, anchor bolts, and miscellaneous metal items having integral anchors.

Use materials of size and thicknesses indicated or, if not indicated, of the size and thickness necessary to produce adequate strength and durability in the finished product for its intended use. Work the materials to the dimensions indicated on approved detail drawings, using proven details of fabrication and support. Use the type of materials indicated or specified for the various components of work.

Form exposed work true to line and level, with accurate angles and surfaces and straight sharp edges. Ensure that all exposed edges are eased to a radius of approximately 1/32 inch. Bend metal corners to the smallest radius possible without causing grain separation or otherwise impairing the work.

Weld corners and seams continuously and in accordance with the recommendations of AWS D1.1/D1.1M. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.

Form the exposed connections with hairline joints that are flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of the type indicated or, if not indicated, use countersunk Phillips flathead screws or bolts.

Provide anchorage of the type indicated and coordinated with the supporting structure. Fabricate anchoring devices and space as indicated and as required to provide adequate support for the intended use of the work.

Use hot-rolled steel bars for work fabricated from bar stock unless work is indicated or specified to be fabricated from cold-finished or cold-rolled stock.

2.1.1 Aluminum Railings

Fabrication: Provide fabrication jointing by one of the following methods:

a. Use flush-type rail fittings, welded and ground smooth with splice locks secured with 3/8 inch recessed-head set screws.

b. Ensure that mitered and welded joints made by fitting; post to top rail; intermediate rail to post; and corners, are groove welded and ground smooth. Where allowed by the Contracting Officer, provide butt splices reinforced by a tight-fitting dowel or sleeve not less than 6 inches in length. Tack-weld or epoxy-cement the dowel or sleeve to one side of the splice.

c. Fasten fittings to pipe or tube with 1/4 or 3/8 inch stainless-steel recessed-head setscrews. Provide assembled railings with fittings only at vertical supports or at rail terminations attached to walls. Provide expansion joints at the midpoint of panels. Provide a setscrew in only one side of the slip-on sleeve. Provide alloy fittings to conform to ASTM B26/B26M.

2.1.2 Steel Railings and Handrails

Fabricate joint posts, rail, and corners by one of the following methods:

a. Flush-type rail fittings of commercial standard, welded and ground smooth, with railing splice locks secured with 3/8 inch hexagonal-recessed-head setscrews.

b. Mitered and welded joints made by fitting post to top rail and intermediate rail to post, mitering corners, groove-welding joints, and grinding smooth. Butt railing splices and reinforce them by a tight-fitting interior sleeve not less than 6 inches long.

c. Railings may be bent at corners in lieu of jointing, provided that bends are made in suitable jigs and the pipe is not crushed.

Recycled Content for Steel: Provide a minimum of 25 percent post-consumer recycled content. Submit data identifying percentage of recycled content for steel. Submit Environmental Product Declaration (EPD) for Steel, if available. Provide one of the following EPD options including Product Category Rules (PCR) standard EN 15804 or ISO 21930.

1. Product-Specific Declaration

2. Product-Specific Type III EPD

3. Industry-Wide (Generic) EPD: Provide proof manufacturer is a participant.

2.1.3 Protective Coating

Shop-prime the steelwork as indicated in accordance with Section 09 90 00 PAINTS AND COATINGS except the following:

a. steel surfaces encased in concrete

b. steel surfaces for welding

c. high-strength bolt-connected contact surfaces

2.2 COMPONENTS

2.2.1 Structural Steel Plates, Shapes And Bars

Provide structural-size shapes and plates, except plates to be bent or cold-formed, conforming to ASTM A36/A36M, unless otherwise noted.

Provide steel plates, to be bent or cold-formed, conforming to ASTM A283/A283M, Grade C.

Provide steel bars and bar-size shapes conforming to ASTM A36/A36M, unless otherwise noted.

2.2.2 Structural-Steel Tubing

Provide structural-steel tubing, hot-formed, welded or seamless, conforming to ASTM A500/A500M, Grade B, unless otherwise noted.

2.2.3 Hot-Rolled Carbon Steel Bars

Provide bars and bar-size shapes conforming to ASTM A575, grade as selected by the fabricator.

2.2.4 Cold-Finished Steel Bars

Provide cold-finished steel bars conforming to ASTM A108, grade as selected by the fabricator.

2.2.5 Cold-Drawn Steel Tubing

Provide tubing conforming to ASTM A512, sunk-drawn, butt-welded, cold-finished, and stress-relieved.

2.2.6 Steel Pipe

Provide pipe conforming to ASTM A53/A53M, type as selected, Grade B; primed finish, unless galvanizing is required; standard weight (Schedule 40).

2.2.7 Concrete Inserts

Provide threaded-type concrete inserts consisting of galvanized ferrous castings, internally threaded to receive 3/4 inch diameter machine bolts; either malleable iron conforming to ASTM A47/A47M or cast steel conforming to ASTM A27/A27M, hot-dip galvanized in accordance with ASTM A153/A153M.

Provide wedge-type concrete inserts consisting of galvanized box-type ferrous castings designed to accept 3/4 inch diameter bolts having special wedge-shaped heads, made of either malleable iron conforming to ASTM A47/A47M or cast steel conforming to ASTM A27/A27M and hot-dip galvanized in accordance with ASTM A153/A153M.

Provide carbon steel bolts having special wedge-shaped heads, nuts, washers, and shims, galvanized in accordance with ASTM A153/A153M. Provide slotted-type concrete inserts consisting of a galvanized 1/8 inch thick pressed-steel plate conforming to ASTM A283/A283M, made of box-type welded construction with a slot designed to receive 3/4 inch diameter square-head bolt with knockout cover; and hot-dip galvanized in accordance with ASTM A123/A123M.

2.2.8 Masonry Anchorage Devices

Provide masonry anchorage devices consisting of expansion shields complying with AASHTO M 314, ASTM E488/E488M and ASTM C514 as follows:

Provide lead expansion shields for machine screws and bolts 1/4 inch and smaller; head-out embedded nut type, single-unit class, Group I, Type 1, Class 1.

Provide lead expansion shields for machine screws and bolts larger than 1/4 inch in size; head-out embedded nut type, multiple-unit class, Group I, Type 1, Class 2.

Provide bolt anchor expansion shields for lag bolts; zinc-alloy, long-shield anchor class, Group II, Type 1, Class 1.

Provide bolt anchor expansion shields for bolts; closed-end bottom-bearing class, Group II, Type 2, Class 1.

Provide tumble-wing-type toggle bolts conforming to ASTM F3125/F3125M, ASTM A449 and ASTM C636/C636M, type, class, and style as required.

2.2.9 Fasteners

Provide galvanized zinc-coated fasteners in accordance with ASTM A153/A153M used for exterior applications or where built into exterior walls or floor systems. Select fasteners for the type, grade, and class required for the installation of steel stair items.

Provide standard hexagon-head bolts, conforming to ASTM A307, Grade A.

Provide square-head lag bolts conforming to ASME B18.2.1.

Provide cadmium-plated steel machine screws conforming to ASME B18.6.3.

Provide flat-head carbon steel wood screws conforming to ASME B18.6.1.

Provide plain round, general-assembly-grade, carbon steel washers conforming to ASME B18.21.1.

Provide helical spring, carbon steel lockwashers conforming to ASME B18.2.1.

2.2.10 Steel Railings And Handrails

Design handrails to resist a concentrated load of 250 lb in any direction at any point of the top of the rail or 50 lb per foot applied horizontally to the top of the rail, whichever is more severe. NAAMM AMP 521, provide the same size rail and post. Provide pipe collars of the same material and finish as the handrail and posts. Provide series 300 stainless-steel pipe collars.

2.2.10.1 Steel Handrails

Provide steel handrails, including inserts in concrete, steel pipe conforming to ASTM A53/A53M or structural tubing conforming to ASTM A500/A500M, Grade A or B of equivalent strength. Provide steel railings of of size indicated and shop-painted.

Provide kickplates between railing posts where indicated, and consisting of 1/8 inch steel flat bars not less than 6 inches high. Secure kickplates as indicated.

Galvanize exterior railings, including pipe, fittings, brackets, fasteners, and other ferrous metal components. Provide black steel pipe for interior railings.

2.2.11 Aluminum Railings And Handrails

Provide railings and handrails consisting of 1 3/4 inch square aluminum semihollow tube with rounded corners ASTM B221. Provide clear anodized aluminum railings. Ensure that all fasteners are Series 300 stainless steel.

PART 3 EXECUTION

3.1 PREPARATION

Adjust stair railings and handrails before securing in place in order to ensure proper matching at butting joints and correct alignment throughout their length. Space as indicated, but not more than 8 feet on center. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:

a. Anchor posts in concrete by means of pipe sleeves set and anchored into concrete. Provide sleeves of galvanized, standard-weight, steel pipe, not less than 6 inches long, and having an inside diameter not less than 1/2 inch greater than the outside diameter of the inserted pipe post. Provide steel plate closure secured to the bottom of the sleeve, with closure width and length not less than 1 inch greater than the outside diameter of the sleeve. After posts have been inserted into sleeves, fill the annular space between the post and sleeve with nonshrink grout ora quick-setting hydraulic cement. Cover anchorage joint with a round steel flange welded to the post.

b. Anchor posts to steel with oval steel flanges, angle type or floor type as required by conditions, welded to posts and bolted to the steel supporting members.

c. Anchor rail ends into concrete and masonry with round steel flanges welded to rail ends and anchored into the wall construction with lead expansion shields and bolts.

d. Anchor rail ends to steel with oval or round steel flanges welded to tail ends and bolted to the structural-steel members.

Secure handrails to walls by means of wall brackets and wall return fitting at handrail ends. Provide brackets of malleable iron castings, with not less than 3 inch projection from the finished wall surface to the center of the pipe, drilled to receive one 3/8 inch bolt. Locate brackets not more than 60 inches on center. Provide wall return fittings of cast iron castings, flush type, with the same projection as that specified for wall brackets. Secure wall brackets and wall return fittings to building construction as follows:

a. For concrete and solid masonry anchorage, use bolt anchor expansion shields and lag bolts.

b. For hollow masonry and stud partition anchorage, use toggle bolts having square heads.

Install toe boards and brackets where indicated. Make splices, where required, at expansion joints. Install removable sections as indicated.

3.2 INSTALLATION

Submit manufacturer's installation instructions for the following products to be used in the fabrication of steel, stair railing, and hand rail work:

a. Structural-steel plates, shapes, and bars

b. Structural-steel tubing

c. Protective coating

d. Masonry anchorage devices

e. Steel railings and handrails

f. Aluminum railings and handrails

g. Anchorage and fastening systems

Provide complete, detailed fabrication and installation drawings for all iron and steel hardware, and for all steel shapes, plates, bars, and strips used in accordance with the design specifications cited in this section.

3.2.1 Steel Handrail

Install handrail in pipe sleeves embedded in concrete and filled with nonshrink grout or quick-setting anchoring cement with anchorage covered with standard pipe collar pinned to post.by means of masonry with expansion shields and bolts or toggle bolts.by means of base plates bolted to stringers or structural-steel frame work. Secure rail ends by steel pipe flanges anchored by expansion shields and bolts.

3.2.2 Aluminum Handrail

Affix to base structure by by sliding posts of Stainless Steel insert grouted solid into concrete or masonry base. Provide Series 300 stainless-steel bolts to anchor aluminum alloy flanges, of a size appropriate to the standard product of the manufacturer. Where aluminum or alloy fittings or extrusions are to be in contact with dissimilar metals or concrete, coat the contact surface with a heavy coating of bituminous paint.

3.2.3 Touchup Painting

Immediately after installation, clean field welds, bolted connections, abraded areas of the shop paint, and exposed areas painted with the paint used for shop painting. Apply paint by brush or spray to provide a minimum dry-film thickness of 2 mils.

3.3 FIELD QUALITY CONTROL

3.3.1 Field Welding

Ensure that procedures of manual shielded metal arc welding, appearance and quality of welds made, and methods used in correcting welding work comply with AWS D1.1/D1.1M.

-- End of Section --

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SECTION 05 72 00

DECORATIVE METAL SPECIALTIES
05/18

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WELDING SOCIETY (AWS)

AWS D1.2/D1.2M	(2014; Errata 1 2014; Errata 2 2020) Structural Welding Code - Aluminum

ASTM INTERNATIONAL (ASTM)

ASTM A240/A240M	(2020) Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM A276/A276M	(2017) Standard Specification for Stainless Steel Bars and Shapes
ASTM A29/A29M	(2016) Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought
ASTM A312/A312M	(2019) Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes
ASTM A500/A500M	(2020) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A513/A513M	(2015) Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing
ASTM A554	(2016) Standard Specification for Welded Stainless Steel Mechanical Tubing
ASTM A666	(2015) Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar
ASTM A743/A743M	(2017) Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application
ASTM B633	(2019) Standard Specification for

	Electrodeposited Coatings of Zinc on Iron and Steel
ASTM C1048	(2018) Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass
ASTM C1107/C1107M	(2020) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM D1752	(2018) Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM F1941	(2010) Standard Specification for Electrodeposited Coatings on Threaded Fasteners (Unified Inch Screw Threads (UN/UNR))
ASTM F593	(2017) Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
ASTM F594	(2009; E 2015) Standard Specification for Stainless Steel Nuts
ASTM F836M	(2016, E 2018) Standard Specification for Style 1 Stainless Steel Metric Nuts (Metric)

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Existing Conditions; G

Pre-Installation Meeting

SD-02 Shop Drawings

Ornamental Metal Items; G, AE

Installation Drawings; G, AE

Glass railing plans, elevations, sections, and attachment details

Shop and Field Connections; G

Construction Details; G

SD-03 Product Data

Materials; G

Ornamental Metal Items; G

Manufacturer's product lines of glass railings assembled from standard components

Aluminum and stainless steel finishes

Grout and anchoring cement

Aluminum-Alloy Extrusions

Aluminum-Alloy Castings

SD-04 Samples

Manufacturer's Standard Color Charts; G, AE

Shop Paint; G

Finish Paint; G

Anchorage Devices and Fasteners; G

Glass Railing section of top rail; G, AE

Glass Railing Glass; G, AE

Glass Railing fittings and brackets; G, AE

Glass Railing assembly samples of railing systems, made from full-size components, including top rail, infill, and bottom bracket. Show method of finishing members at intersections. Samples need not be full height; G, AE

Metal Wall Cladding samples, minimum 6 inch square of metal same gauge, material and finish indicated for the work; G, AE

SD-06 Test Reports

Welding Tests; G

Glass Railing Product Test Reports:

Based on evaluation of comprehensive test performed by a qualified testing agency, according to ASTM E894 and ASTM E935.

Glass Railing Preconstruction Test Reports

Glass Railing Evaluation Reports: For post-installed anchors, from

ICCES.

SD-07 Certificates

Welding Procedures

Ornamental Metal Items; G

Welder Qualifications

Mill Certificates: signed by manufacturers of stainless steel products certifying that products furnished comply with requirements.

Glass Railing Qualification Data: for professional engineer and testing agency.

Metal Wall Cladding Fabricator and Installer Qualifications

SD-08 Manufacturer's Instructions

Protection

Glass Railing Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

SD-11 Warranty

Provide Manufacturer's Warranty: One year against defects in materials and workmanship.

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment, if available; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. Provide Industry-wide (generic) Environmental Product Declaration (EPD) with product submittals; if other EPD types are available, provide in addition to the industry-wide EPD.

c. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

d. LEED Submittal shall be submitted and reviewed concurrently with product data submittal and samples.

1.3 QUALITY CONTROL

1.3.1 Samples and Mockups

Submit samples for each type of anchorage devices and fasteners.

Submit samples for aluminum and stainless steel finishes, glass for glass railing, one for each type used in the project. Provide samples of standard size as used in construction. After approval, full-sized samples may be used in construction, provided that each sample is clearly identified and its location recorded.

Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups as shown on Drawings.

2. Build mockups for each form and finish railing consisting of top rail, glass panel, and anchorage system components that are full height and are not less than 24 inches in length.

3. Build mockups for typical metal wall cladding including relevant details on Drawings to verify selections, to demonstrate aesthetic effects and to set quality standards for fabrication and installation.

4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undistrubed at time of Substantial Completion.

1.3.2 Color Charts

Submit manufacturer's standard color charts for shop paint and finish paint for approval by the Contracting Officer before work begins.

1.3.3 Preconstruction Testing

Glass Railing Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on laboratory mockups. Payment for these services will be made by Contractor. Retesting of products that fail to meet specified requirements shall be done at Contractor's expense.

1. Build laboratory mockups at testing facility; use personnel, materials, and methods of construction that will be used at Project site.

2. Test railings according to ASTM E894 and ASTM E935.

3. Notify Architect seven days in advance of the dates and times when laboratory mockups will be tested.

1.3.4 Qualifications for Welding Work

Submit welding procedures and welding tests in accordance with

AWS D1.2/D1.2M. Prepare all test specimens in the presence of the Contracting Officer and have specimens tested by an approved testing laboratory at the Contractor's expense.

Submit certification of welder qualifications by tests in accordance with AWS D1.2/D1.2M. In addition, perform test on trail pieces in positions and with clearances equivalent to those actually encountered during construction. If a test weld fails to meet the requirements, complete an immediate retest of two test welds. Failure in either of the two immediate retests mandates that the welder be retested after further practice or training, and provide a complete new set of tests welds.

1.3.5 Field Measurements

Records of existing conditions may be provided by the Contracting Officer before the start of work. Submit survey data showing existing conditions before preparation of shop drawings and fabrication.

1.3.6 Other Qualifications

Submit Glass Railing Qualification Data and Metal Wall Cladding Fabricator and Installer Qualifications. The wall cladding fabricator must have a minimum 5 year record.

1.3.7 Pre-Installation Meeting

A pre-installation meeting is required.

1.4 DELIVERY, STORAGE, AND HANDLING

Store all architectural metal and glass items off the ground on clean raised platforms or pallets one level high in dry locations with adequate ventilation, such as an enclosed building or closed trailer on the project site.

Keep materials free from dirt and grease and protected from corrosion.

Store packaged materials in their original, unbroken containers in a dry area, until ready for installation.

Provide manufacturer's instructions for Glass Railing Delegated-Design Submittal. Handle products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 GLASS RAILINGS

2.1.1 Manufacturers

Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. 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. Performance characteristics are indicated by criteria subject to verification by one or more methods, including structural analysis, preconstruction testing, field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by

Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

Product Options: Drawings indicate size, profiles, and dimensional requirements of railings.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

2.1.2 PERFORMANCE REQUIREMENTS

General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. Stainless Steel: 60 percent of minimum yield strength.

2. Steel: 72 percent of minimum yield strength.

3. Glass: 25 percent of mean modulus of rupture (50 percent probability of breakage), as listed in "Mechanical Properties" in AAMA's Aluminum Curtain Wall Series No. 12, "Structural Properties of Glass."

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. Top Rails of Guards:

    a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.

    b. Concentrated load of 200 lbf (0.89 kN) 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 (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).

    b. Infill load and other loads need not be assumed to act concurrently.

3. Glass-Supported Railings: Support each section of top rail by a minimum of three glass panels or by other means so top rail will remain in place if any one panel fails.

Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 degrees F (67 degrees C), ambient; 180 degrees F (100 degrees C), material surfaces.

2.1.3 Metals, General

Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

2.1.4 Stainless Steel

Provide mill certificates.

a. Tubing: ASTM A554, Grade MT 316.

b. Pipe: ASTM A312/A312M, Grade TP 316.

c. Castings: ASTM A743/A743M, Grade CF 8 or CF 20.

d. Sheet, Strip, Plate, and Flat Bar: ASTM A666 or ASTM A240/A240M, Type 316.

e. Bars and Shapes: ASTM A276/A276M, Type 316.

2.1.5 Steel and Iron

a. Tubing: ASTM A500/A500M (cold formed) or ASTM A513/A513M.

b. Bars: Hot-rolled, carbon steel complying with ASTM A29/A29M, Grade 1010.

2.1.6 Glass Railing Glass and Glazing Materials

Safety Glazing: Glazing shall comply with 16 CFR 1201, Category II.

Tempered Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated), Type 1 (transparent flat glass), Quality-Q3. Provide products that have been tested for surface and edge compression according to ASTM C1048 and for impact strength according to 16 CFR 1201 for Category II materials.

1. Glass Color: Clear.

2. Thickness for Structural Glass Balusters: As required by structural loads, but not less than 19.0 mm.

Safety Glazing Labeling: Permanently mark glass with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

Glazing Cement and Accessories for Structural Glazing: Glazing cement, setting blocks, shims, and related accessories as recommended or supplied by railing manufacturer for installing structural glazing in metal subrails.

1. Glazing Cement: Nonshrinking organic cement designed for curing by passing an electric current through metal subrail holding glass panel, as standard with manufacturer.

Glazing Gaskets for Glass Infill Panels: Glazing gaskets and related accessories recommended or supplied by railing manufacturer for installing glass infill panels in post-supported railings.

2.1.7 Fasteners

Fastener Materials: Unless otherwise indicated, provide the following:

1. Stainless Steel Components: Type 316 stainless steel fasteners.

2. Dissimilar Metals: Type 316 stainless steel fasteners.

Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless exposed fasteners are unavoidable.

1. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

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 ICCES AC308.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941 (ASTM F1941M), Class Fe/Zn 5, unless otherwise indicated.

2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless steel bolts, ASTM F593 (ASTM F738M), and nuts, ASTM F594 (ASTM F836M).

2.1.8 Miscellaneous Materials

Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

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.

Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

1. Water-Resistant Product: At exterior locations and where indicated provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.1.9 Fabrication

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.

Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

Form work true to line and level with accurate angles and surfaces.

Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.

Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

Mechanical 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.

Form changes in direction as detailed.

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.

Close exposed ends of hollow railing members with prefabricated end fittings.

Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work where indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crushresistant fillers, or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.

Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.1.10 Glazing Panel Fabrication

General: Fabricate to sizes and shapes required; provide for proper edge clearance and bite on glazing panels.

1. Clean-cut or flat-grind edges at butt-glazed sealant joints to produce

square edges with slight chamfers at junctions of edges and faces.

2. Grind smooth exposed edges, including those at open joints, to produce square edges with slight chamfers at junctions of edges and faces.

Structural Glass Balusters: Factory-bond glass to metal base and top-rail channels in railing manufacturer's plant using glazing cement to comply with manufacturer's written specifications unless field glazing is standard with manufacturer.

Structural Balusters: Provide laminated, tempered glass panels.

2.1.11 General Finish Requirements

Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. 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.

Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.1.12 Stainless Steel Finishes

Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

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.

Directional Satin Finish: No. 4.

Dull Satin Finish: No. 6.

Satin, Reflective, Directional Polish: No. 7.

Mirrorlike Reflective, Nondirectional Polish: No. 8.

When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.2 FABRICATION

Submit fabrication drawings for ornamental metal items.

2.2.1 Ornamental Metal Items

2.2.1.1 Aluminum Joint Cover Assemblies

2.2.1.1.1 Floor Cover Plates

Provide plain floor cover plates, aluminum-alloy extrusions with smooth

surface.

Provide recessed floor cover plates, aluminum-alloy extrusions with recess to receive resilient floor covering, with a recess depth as required to provide a resilient floor covering surface flush with the finished floor elevation.

Provide nonslip floor cover plates, aluminum-alloy castings with abrasive grit embedded uniformly into the walking surface at the time of casting, with 20-grain aluminum oxide abrasive grit.

Provide floor cover plates of the patterns and widths indicated, and lengths as long as practical, with metal thickness not less than 1/4 inch. Drill and countersink fixed edge of floor cover plates to receive flathead screws, spaced not more than 3 inches from each cover plate end and not more than 18 inches on center between the end screw holes. Provide corrosion-resistant steel screws for securing floor cover plates.

2.2.1.1.2 Wall And Ceiling Joint Cover Assemblies

Provide rubber and cork composition tape filler strips with pressure-sensitive adhesive coating on one face and smooth suede surface on the exposed face, conforming to ASTM D1752, not less than 1 1/2 inches wide and a depth as required to provide a surface flush with the finished floor elevation.

Provide wall and ceiling joint cover assemblies consisting of continuous anchor strips on one side of the wall or ceiling expansion joint; wall and ceiling cover plates; and seals, anchors, and other accessories as required to complete the installation, and as follows:

a. Provide aluminum-alloy wall and ceiling anchor strip extrusions fabricated to provide an integral curb bar edge and integral lugs to receive snap-on cover plates. Field-drill fixed edge of anchor strips with holes to receive screws, spaced not more than 3 inches from each end and not more than 12 inches on center between the end screw holes. Provide cadmium-plated screws with masonry anchorage devices or toggle bolts as required by construction conditions.

b. Provide aluminum-alloy wall and ceiling cover plate extrusions of the patterns and widths indicated, designed for snap-on application over anchor strips, fabricated with integral grooves to receive sealing gaskets, and having a smooth exposed-to-view surface.

2.2.1.1.3 Frosted Finish

Provide a frosted finish with Class II clear anodized coating for exterior wall joint cover assembly that are exposed-to-view surfaces.

PART 3 EXECUTION

3.1 EXPANSION JOINT COVERS INSTALLATION

Submit installation drawings for ornamental metal items, shop and field connections and construction details showing location, dimensions, size, and weight or gauge as applicable of each ornamental item; type and location of shop and field connections; and other pertinent construction and erection details. Show on drawings location and details of anchorage devices embedded in cast-in-place concrete and masonry construction.

3.1.1 Anchorage Devices Embedded In Other Construction

Install decorative metal work in accordance with the approved shop drawings and descriptive data for each ornamental metal item, as specified.

Securely fasten decorative metal items plumb and true to horizontal and vertical lines and levels.

3.1.2 Holes for Other Work

Provide holes where indicated for securing other work to metal work.

3.1.3 Fastening to Construction-In-Place

Provide anchorage devices and fasteners where necessary for fastening ornamental metal items to construction-in-place. Include threaded fasteners for concrete inserts embedded in cast-in-place concrete; masonry anchorage devices and threaded fasteners for solid masonry and concrete-in-place; toggle bolts for hollow masonry and stud partitions; through-bolting for masonry and wood construction; lag bolts and wood screws for wood construction; and threaded fasteners for structural steel. Provide fastening as indicated and as specified. Do not fasten to wood plugs in masonry or concrete-in-place.

3.1.4 Cutting and Fitting

Perform required cutting, drilling, and fitting for the installation of ornamental metal work. Execute cutting, drilling, and fitting carefully; when required; fit in-place work before fastening.

3.1.5 Setting Masonry Anchorage Devices

Set all masonry anchorage devices in masonry or concrete-in-place construction in accordance with the anchorage device manufacturer's printed instructions. Drill anchorage holes to the depth, diameter, and size recommended by the manufacturer of the particular anchorage device used. Leave drilled anchorage holes rough, not reamed, and free of drill dust.

3.1.6 Threaded Connections

Countersink flat bolts and screw heads where anchors are exposed to view, and tightly secure threaded connections so that the threads are entirely concealed by fitting, unless otherwise specified.

3.2 GLASS RAILINGS

3.2.1 Installation General

Fit exposed connections together to form tight, hairline joints.

Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting

or fitting.

2. 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 (5 mm in 3 m).

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 and copper alloys that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

Adjust railings before anchoring to ensure matching alignment at abutting joints.

Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2.2 Railing Connections

Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

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 (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.2.3 Installing Glass Panels

Glass-Supported Railings: Install Glass Railing assembly to comply with railing manufacturer's written instructions.

1. Attach base channel to building structure, then insert and connect factory-fabricated and assembled glass panels.

2. Attach base channel to building structure, then insert glass into base channel and bond with glazing cement unless glass was bonded to base and top-rail channels in factory.

    a. Support glass panels in base channel at quarter points with channel-shaped setting blocks that also act as shims to maintain uniform space for glazing cement. Fill remaining space in base channel with glazing cement for uniform support of glass.

3. Adjust spacing of glass panels so gaps between panels are equal before securing in position.

4. Erect glass railings under direct supervision of manufacturer's authorized technical personnel.

3.3 FIELD QUALITY CONTROL

Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and to prepare test reports. Payment for these services will be made as authorized by Change Orders.

Submit Glass Railing Product Test Reports, Glass Railing Preconstruction Test Reports, and Glass Railing Evaluation Reports.

Extent and Testing Methodology: Testing agency will randomly select completed railing assemblies for testing that are representative of different railing designs and conditions in the completed Work. Test railings according to ASTM E894 and ASTM E935 for compliance with performance requirements.

Remove and replace railings where test results indicate that they do not comply with specified requirements unless they can be repaired in a manner satisfactory to Architect and comply with specified requirements.

Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

3.4 CLEANING

Clean stainless steel by washing thoroughly with water and soap, rinsing with clean water, and wiping dry.

Clean and polish glass as recommended in writing by manufacturer. Wash both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion.

3.5 PROTECTION

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.

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.

-- End of Section --

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SECTION 06 10 00

ROUGH CARPENTRY
08/16

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)

ALSC PS 20	(2015) American Softwood Lumber Standard

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B18.2.1	(2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)
ASME B18.6.1	(2016) Wood Screws (Inch Series)

AMERICAN WOOD COUNCIL (AWC)

AWC NDS	(2015) National Design Specification (NDS) for Wood Construction
AWC WFCM	(2012) Wood Frame Construction Manual for One- and Two-Family Dwellings

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA BOOK	(2015) AWPA Book of Standards
AWPA M2	(2019) Standard for the Inspection of Preservative Treated Wood Products for Industrial Use
AWPA M6	(2013) Brands Used on Preservative Treated Materials
AWPA P5	(2015) Standard for Waterborne Preservatives
AWPA P18	(2014) Nonpressure Preservatives
AWPA P49	(2015) Standard for Fire Retardant FR-1
AWPA T1	(2020) Use Category System: Processing and Treatment Standard
AWPA U1	(2020) Use Category System: User Specification for Treated Wood

APA - THE ENGINEERED WOOD ASSOCIATION (APA)

APA E30	(2016) Engineered Wood Construction Guide
APA E445	(2002) Performance Standards and Qualification Policy for Structural-Use Panels (APA PRP-108)
APA F405	(19) Product Guide: Performance Rated Panels
APA L870	(2010) Voluntary Product Standard, PS 1-09, Structural Plywood
APA S350	(2014) PS 2-10, Performance Standard for Wood-Based Structural-Use Panels

ASTM INTERNATIONAL (ASTM)

ASTM A153/A153M	(2016a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM D2898	(2010; R 2017) Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing

FOREST STEWARDSHIP COUNCIL (FSC)

FSC STD 01 001	(2015) Principles and Criteria for Forest Stewardship

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code

NATIONAL HARDWOOD LUMBER ASSOCIATION (NHLA)

NHLA Rules	(2015) Rules for the Measurement & Inspection of Hardwood & Cypress

NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)

NELMA Grading Rules	(2013) Standard Grading Rules for Northeastern Lumber

REDWOOD INSPECTION SERVICE (RIS) OF THE CALIFORNIA REDWOOD ASSOCIATION (CRA)

RIS Grade Use	(1998) Redwood Lumber Grades and Uses

SOUTHERN CYPRESS MANUFACTURERS ASSOCIATION (SCMA)

SCMA Spec	(1986; Supple. No. 1, Aug 1993) Standard Specifications for Grades of Southern Cypress

SOUTHERN PINE INSPECTION BUREAU (SPIB)

SPIB 1003	(2014) Standard Grading Rules for Southern Pine Lumber

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-1923	(Rev A; Notice 3) Shield, Expansion (Lag, Machine and Externally Threaded Wedge Bolt Anchors)
CID A-A-1924	(Rev A; Notice 3) Shield, Expansion (Self Drilling Tubular Expansion Shell Bolt Anchors
CID A-A-1925	(Rev A; Notice 3) Shield Expansion (Nail Anchors)

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

WCLIB 17	(2015) Standard Grading Rules

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

WWPA G-5	(2017) Western Lumber Grading Rules

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Nailers and Nailing Strips; G

Drawings of field erection details, including materials and methods of fastening nailers in conformance with Factory Mutual wind uplift rated systems specified in other Sections of these specifications.

SD-03 Product Data

Fire-retardant Treatment

SD-07 Certificates

Certificates of Grade

Certified Sustainably Harvested Virgin Lumber; S

Certified Sustainably Harvested Framing Lumber; S

Certified Sustainably Harvested Plywood for Other Uses; S

Preservative Treatment

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment for plywood; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Permanently installed, non-recycled wood and wood-based materials should be certified in accordance with Forest Stewardship Council Guidelines. This includes wood permanently installed in the project wood products. Submit all FSC product certification information including required Chain-of-Custody certificates and invoices tracking FSC purchase. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

4. Low-Emitting Materials - Composite Wood (installed within building waterproofing envelope). Include material cost value.

a. Submit product data for wood structural panel (plywood) stating

manufactured according to PS 1-09 or PS 2-10 (or CARB equivalent to PS 1 or PS 2) and labeled bond classification Exposure 1 or Exterior.

1.3 DELIVERY AND STORAGE

Deliver materials to the site in an undamaged condition. Store, protect, handle, and install prefabricated structural elements in accordance with manufacturer's instructions and as specified. Store materials off the ground to provide proper ventilation, with drainage to avoid standing water, and protection against ground moisture and dampness. Store materials with a moisture barrier at both the ground level and as a cover forming a well ventilated enclosure. Store wood I-beams and glue-laminated beams and joists on edge. Adhere to requirements for stacking, lifting, bracing, cutting, notching, and special fastening requirements. Do not use materials that have visible moisture or biological growth. Remove defective and damaged materials and provide new materials. Store separated reusable wood waste convenient to cutting station and area of work.

1.4 GRADING AND MARKING

1.4.1 Lumber

Mark each piece of framing and board lumber or each bundle of small pieces of lumber with the grade mark of a recognized association or independent inspection agency. Such association or agency must be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. Surfaces that are to be exposed to view must not bear grademarks, stamps, or any type of identifying mark. Hammer marking will be permitted on timbers when all surfaces will be exposed to view.

1.4.2 Plywood

Mark each sheet with the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of the plywood. The mark must identify the plywood by species group or span rating, exposure durability classification, grade, and compliance with APA L870. Surfaces that are to be exposed to view must not bear grademarks or other types of identifying marks.

1.4.3 Fire-Retardant Treated Lumber

Mark each piece in accordance with AWPA M6, except pieces that are to be natural or transparent finished. In addition, exterior fire-retardant lumber must be distinguished by a permanent penetrating blue stain. Labels of a nationally recognized independent testing agency will be accepted as evidence of conformance to the fire-retardant requirements of AWPA M6.

1.4.4 Preservative-Treated Lumber and Plywood

The Contractor is responsible for the quality of treated wood products. Each treated piece must be inspected in accordance with AWPA M2 and permanently marked or branded, by the producer, in accordance with AWPA M6. The Contractor must provide Contracting Officer's Representative (COR) with the inspection report of an approved independent inspection agency that offered products comply with applicable AWPA Standards. The appropriate Quality Mark on each piece will be accepted, in lieu of inspection reports, as evidence of compliance with applicable AWPA

treatment standards.

1.5 SIZES AND SURFACING

ALSC PS 20 for dressed sizes of yard and structural lumber. Lumber must be surfaced four sides. Size references, unless otherwise specified, are nominal sizes, and actual sizes must be within manufacturing tolerances allowed by the standard under which the product is produced. Other measurements are IP or SI standard.

1.6 MOISTURE CONTENT

Air-dry or kiln-dry lumber. Kiln-dry treated lumber after treatment. Maximum moisture content of wood products must be as follows at the time of delivery to the job site:

a. Framing lumber and board, 19 percent maximum

c. Materials other than lumber; moisture content must be in accordance with standard under which the product is produced

1.7 PRESERVATIVE TREATMENT

Treat wood products with waterborne wood preservatives conforming to AWPA P5. Pressure treatment of wood products must conform to the requirements of AWPA BOOK Use Category System Standards U1 and T1. Pressure-treated wood products must not contain arsenic, chromium, or other agents classified as carcinogenic, probably carcinogenic, or possibly carcinogenic to humans (compounds in Groups 1, 2A, or 2B) by the International Agency for Research on Cancer (IARC), Lyon, France. Pressure-treated wood products must not exceed the limits of the U.S. EPA's Toxic Characteristic Leaching Procedure (TCLP), and must not be classified as hazardous waste. Submit certification from treating plant stating chemicals and process used and net amount of preservatives retained are in conformance with specified standards. In accordance with AWPA U1 provide non-copper preservative treatment such as EL2, PTI or SBX,DOT for products in direct contact with sheet metal.

a. 0.25 pcf intended for above ground use.

b. 0.40 pcf intended for ground contact and fresh water use. 0.60 pcf intended for Ammoniacal Copper Quaternary Compound (ACQ)-treated foundations. 0.80 to 1.00 pcf intended for ACQ-treated pilings. All wood must be air or kiln dried after treatment. Specific treatments must be verified by the report of an approved independent inspection agency, or the AWPA Quality Mark on each piece. Do not incise surfaces of lumber that will be exposed. Minimize cutting and avoid breathing sawdust. Brush coat areas that are cut or drilled after treatment with either the same preservative used in the treatment or with a 2 percent copper naphthenate solution. All lumber and woodwork must be preservative treated. Plastic lumber must not be preservative treated. The following items must be preservative treated:

(1) Wood framing, woodwork, and plywood up to and including the subflooring at the first-floor level of structures having crawl spaces when the bottoms of such items are 24 inches or less from the earth underneath.

(2) Wood members that are in contact with water.

(3) Exterior wood steps, platforms, and railings; and all wood framing of open, roofed structures.

(4) Wood sills, soles, plates, furring, and sleepers that are less than 24 inches from the ground, furring and nailers that are set into or in contact with concrete or masonry.

(5) Nailers, edge strips, crickets, curbs, and cants for roof decks.

1.7.1 Existing Structures

Use borate, permathrin, or a sodium silicate wood mineralization process to treat wood. Use borate for interior applications only.

1.7.2 New Construction

Use a boron-based preservative conforming to AWPA P18, sodium silicate wood mineralization process, or Ammoniacal Copper Quaternary Compound to treat wood. Use boron-based preservatives for above-ground applications only.

1.8 FIRE-RETARDANT TREATMENT

Fire-retardant treated wood must be pressure treated with fire retardants conforming to AWPA P49. Fire retardant treatment of wood products must conform to the requirements of AWPA U1, Commodity Specification H and AWPA T1, Section H. Treatment and performance inspection must be by an independent and qualified testing agency that establishes performance ratings. Each piece or bundle of treated material must bear identification of the testing agency to indicate performance in accordance with such rating. Treated materials to be exposed to rain wetting must be subjected to an accelerated weathering technique in accordance with ASTM D2898 prior to being tested. Such items which will not be inside a building, and such items which will be exposed to heat or high humidity, must receive exterior fire-retardant treatment. Fire-retardant-treated wood products must be free of halogens, sulfates, ammonium phosphate, and formaldehyde.

1.9 QUALITY ASSURANCE

1.9.1 Humidity Requirements

Sequence work to minimize use of temporary HVAC to dry out building and control humidity.

1.10 ENVIRONMENTAL REQUIREMENTS

During and immediately after installation of treated wood, engineered wood products, and laminated wood products at interior spaces, provide temporary ventilation.

1.11 CERTIFICATIONS

1.11.1 Certified Wood Grades

Provide certificates of grade from the grading agency on graded but unmarked lumber or plywood attesting that materials meet the grade requirements specified herein.

1.11.2 Certified Sustainably Harvested Wood

Provide wood certified as sustainably harvested by FSC STD 01 001. Provide a letter of Certification of Sustainably Harvested Wood signed by the wood supplier. Identify certifying organization and their third party program name and indicate compliance with chain-of-custody program requirements. Submit sustainable wood certification data; identify each certified product on a line item basis. Submit copies of invoices bearing certification numbers.

1.11.3 Building Product Declarations

Provide plywood with EPD.

1.11.4 Indoor Air Quality for Composite Wood

Provide Wood structural panel with VOC emissions certified with one of the following:

a. PS 1-09 or PS 2-10 (or CARB equivalent to PS 1 or PS 2)

b. Labeled bond classification Exposure 1 or Exterior

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Virgin Lumber

Lumber fabricated from old growth timber is not permitted. Avoid companies who buy, sell, or use old growth timber in their operations, when possible. Provide certified sustainably harvested virgin lumber.

2.2 LUMBER

2.2.1 Framing Lumber

Framing lumber such as studs, plates, caps, collar beams, cant strips, bucks, sleepers, nailing strips, and nailers and board lumber such as subflooring and wall and roof sheathing must be one of the species listed in the table below. Minimum grade of species must be as listed. Provide certified sustainably harvested framing lumber.

Table of Grades for Framing and Board Lumber

Grading Rules	Species	Framing	Board Lumber
WWPA G-5 standard grading rules	Aspen, Douglas Fir-Larch, Douglas Fir South, Engelmann Spruce-Lodgepole Pine, Engelmann Spruce, Hem-Fir, Idaho White Pine, Lodgepole Pine, Mountain Hemlock, Mountain Hemlock-Hem-Fir, Ponderosa Pine-Sugar Pine, Ponderosa Pine-Lodgepole Pine, Subalpine Fir, White Woods, Western Woods, Western Cedars, Western Hemlock	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	All Species: No. 3 Common
WCLIB 17 standard grading rules	Douglas Fir-Larch, Hem-Fir, Mountain Hemlock, Sitka Spruce, Western Cedars, Western Hemlock	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	All Species: Standard

Table of Grades for Framing and Board Lumber

Grading Rules	Species	Framing	Board Lumber
SPIB 1003 standard grading rules	Southern Pine	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	No. 2 Boards
SCMA Spec standard specifications	Cypress	No. 2 Common	No. 2 Common
NELMA Grading Rules standard grading rules	Balsam Fir, Eastern Hemlock-Tamarack, Eastern Spruce, Eastern White Pine, Northern Pine, Northern Pine-Cedar	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	All Species: No. 3 Common except Standard for Eastern White and Northern Pine
RIS Grade Use standard specifications	Redwood	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	Construction Heart

Table of Grades for Framing and Board Lumber			
Grading Rules	Species	Framing	Board Lumber
NHLA Rules rules for the measurement and inspection of hardwood and cypress lumber	Cypress	No. 2 Dimension	No. 2 Common

2.3 PLYWOOD, STRUCTURAL-USE, AND ORIENTED STRAND BOARD (OSB) PANELS

APA L870, APA S350, APA E445, and APA F405 respectively.

2.3.1 Other Uses

2.3.1.1 Plywood

Plywood for as indicated. C-D Grade, Exposure 1. Provide certified sustainably harvested plywood for other uses.

2.4 ROUGH HARDWARE

Unless otherwise indicated or specified, rough hardware must be of the type and size necessary for the project requirements. Sizes, types, and spacing of fastenings of manufactured building materials must be as recommended by the product manufacturer unless otherwise indicated or specified. Rough hardware exposed to the weather or embedded in or in contact with preservative treated wood, exterior masonry, or concrete walls or slabs must be hot-dip zinc-coated in accordance with ASTM A153/A153M. Nails and fastenings for fire-retardant treated lumber and woodwork exposed to the weather must be copper alloy or hot-dipped galvanized fasteners as recommended by the treated wood manufacturer.

2.4.1 Expansion Shields

CID A-A-1923, CID A-A-1924, and CID A-A-1925. Except as shown otherwise, maximum size of devices must be 3/8 inch.

2.4.2 Lag Screws and Lag Bolts

ASME B18.2.1.

2.4.3 Wood Screws

ASME B18.6.1.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

Conform to AWC WFCM and install in accordance with the National Association of Home Builders (NAHB) Advanced Framing Techniques: Optimum Value Engineering, unless otherwise indicated or specified. Select lumber sizes to minimize waste. Fit framing lumber and other rough carpentry, set accurately to the required lines and levels, and secure in place in a rigid manner. Do not splice framing members between bearing points. Provide adequate support as appropriate to the application, climate, and modulus of elasticity of the product. Provide as necessary for the proper completion of the work all framing members not indicated or specified. Spiking and nailing not indicated or specified otherwise must be in accordance with the Nailing Schedule contained in ICC IBC; perform bolting in an approved manner. Spikes, nails, and bolts must be drawn up tight. Timber connections and fastenings must conform to AWC NDS. Use slate or steel shims when leveling joists, beams, and girders on masonry or concrete. Do not use shimming on wood or metal bearings. When joists, beams, and girders are placed on masonry or concrete, a wood base plate must be positioned and leveled with grout. The joist, beam, or girder must then be placed on the plate. When joists, beams, and girders are set into masonry or concrete, a pocket must be formed into the wall. The joist, beam, or girder must then be placed into the pocket and leveled with a steel shim.

3.1.1 Plywood and Structural-Use Panel Roof Sheathing

Install with the grain of the outer plies or long dimension at right angles to supports. Stagger end joints and locate over the centerlines of supports. Allow 1/8 inch spacing at panel ends and 1/4 inch at panel edges. Nail panels with 8-penny common nails or 6-penny annular rings or screw-type nails spaced 6 inches o.c. at supported edges and 12 inches o.c. at intermediate bearings. Do not use staples in roof sheathing. Where the support spacing exceeds the maximum span for an unsupported edge, provide adequate blocking, tongue-and-groove edges, or panel edge clips, in accordance with APA E30.

3.2 MISCELLANEOUS

3.2.1 Wood Roof Curbs and Cants

Provide sizes and configurations indicated or specified and anchored securely to continuous construction.

3.2.1.1 Crickets, Cants, and Curbs

Provide wood saddles or crickets, cant strips, curbs for scuttles and ventilators, and wood nailers bolted to tops of concrete or masonry curbs and at expansion joints, as indicated, specified, or necessary and of lumber.

3.2.2 Wood Blocking

Provide proper sizes and shapes at proper locations for the installation and attachment of wood and other finish materials, fixtures, equipment, and items indicated or specified.

3.2.3 Wood Furring

Provide where shown and as necessary for facing materials specified. Except as shown otherwise, furring strips must be nominal one by 3, continuous, and spaced 16 inches o.c. Erect furring vertically or

horizontally as necessary. Nail furring strips to masonry. Do not use wood plugs. Provide furring strips around openings, behind bases, and at angles and corners. Furring must be plumb, rigid, and level and must be shimmed as necessary to provide a true, even plane with surfaces suitable to receive the finish required. Form furring for cornices, offsets and breaks in walls or ceilings on 1 by 4 wood strips spaced 16 inches o.c.

3.2.4 Temporary Closures

Provide with hinged doors and padlocks and install during construction at exterior doorways and other ground level openings that are not otherwise closed. Cover windows and other unprotected openings with polyethylene or other approved material, stretched on wood frames. Provide dustproof barrier partitions to isolate areas as directed.

3.3 WASTE MANAGEMENT OF WOOD PRODUCTS

In accordance with the Waste Management Plan and as specified. Separate and reuse scrap sheet materials larger than 2 square feet , framing members larger than 16 inches , and multiple offcuts of any size larger than 12 inches . Clearly separate damaged wood and other scrap lumber for acceptable alternative uses on site, including bracing, blocking, cripples, ties, and shims.

-- End of Section --

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SECTION 06 20 00

FINISH CARPENTRY
08/16

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4	(1995; R 2004) Basic Hardboard

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)

ALSC PS 20	(2015) American Softwood Lumber Standard

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B18.2.1	(2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(2015) Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
ASME B18.6.1	(2016) Wood Screws (Inch Series)

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA M4	(2015) Standard for the Care of Preservative-Treated Wood Products
AWPA U1	(2020) Use Category System: User Specification for Treated Wood

APA - THE ENGINEERED WOOD ASSOCIATION (APA)

APA L870	(2010) Voluntary Product Standard, PS 1-09, Structural Plywood

ASTM INTERNATIONAL (ASTM)

ASTM D2898	(2010; R 2017) Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing
ASTM F547	(2017) Standard Terminology of Nails for Use with Wood and Wood-Base Materials

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.9	(2015) Cabinet Hardware

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

COMPOSITE PANEL ASSOCIATION (CPA)

CPA A208.1	(2016) Particleboard

FOREST STEWARDSHIP COUNCIL (FSC)

FSC STD 01 001	(2015) Principles and Criteria for Forest Stewardship

HARDWOOD PLYWOOD AND VENEER ASSOCIATION (HPVA)

HPVA HP-1	(2016) American National Standard for Hardwood and Decorative Plywood

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA LD 3	(2005) Standard for High-Pressure Decorative Laminates

NATIONAL HARDWOOD LUMBER ASSOCIATION (NHLA)

NHLA Rules	(2015) Rules for the Measurement & Inspection of Hardwood & Cypress

NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)

NELMA Grading Rules	(2013) Standard Grading Rules for Northeastern Lumber

REDWOOD INSPECTION SERVICE (RIS) OF THE CALIFORNIA REDWOOD ASSOCIATION (CRA)

RIS Grade Use	(1998) Redwood Lumber Grades and Uses

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

SOUTHERN PINE INSPECTION BUREAU (SPIB)

SPIB 1003	(2014) Standard Grading Rules for Southern Pine Lumber

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2013) GREENGUARD Certification Program

For Chemical Emissions For Building Materials, Finishes And Furnishings

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

WCLIB 17 (2015) Standard Grading Rules

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

WWPA G-5 (2017) Western Lumber Grading Rules

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

WDMA I.S.4 (2015A) Preservative Treatment for Millwork

WOOD MOULDING AND MILLWORK PRODUCERS ASSOCIATION (WMMPA)

WMMPA WM 6 (2007) Quality Industry Standards Booklet

WOODWORK INSTITUTE (WI)

NAAWS 3.1 (2017; 2018 Errata Edition) North American Architectural Woodwork Standards

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings Indicating All Wood Assemblies; G, AE

SD-03 Product Data

Wood Products; G, AE

Countertops; G, AE

EngineeredWood Products; G, AE

Treated Wood Products; G, AE

Soffits; G, AE

Fascias and Trim; G, AE

Hardware and Accessories; G, AE

Recycled Content for MDF/Particleboard; S

SD-04 Samples

Samples; G, AE

SD-07 Certificates

Certificates of Grade; G, AE

Certified Sustainably Harvested Wood for Trim and Frames; S

Certified Sustainably Harvested Softwood Plywood; S

Certified Sustainably Harvested Hardboard; S

Indoor Air Quality for Hardwood Plywood; S

Indoor Air Quality for MDF and Particleboard; S

Indoor Air Quality for Adhesives; S

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment for particleboard, MDF, plywood, if available; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of

the product or assembly containing the product.

b. Permanently installed, non-recycled wood and wood-based materials should be certified in accordance with Forest Stewardship Council Guidelines. This includes wood permanently installed in the project wood products. Submit all FSC product certification information including required Chain-of-Custody certificates and invoices tracking FSC purchase. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for particleboard or MDF if available that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification; Facts – NSF/ANSI 336.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

4. Low-Emitting Materials - Interior adhesives and sealants applied on site:

a. Meet the VOC emissions evaluation and meet the VOC content evaluation. The adhesives and sealants product category include all interior adhesives and sealants applied on site. Refer to Division 01 33 29 and

the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

5. Low-Emitting Materials - Composite Wood:

a. Meet the Formaldehyde emissions evaluation or salvaged and reused materials criteria. Composite wood includes all particleboard, medium density fiberboard, hardwood veneer plywood, and structural composite wood not included in the flooring, ceiling, wall panels, or furniture material categories. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full emissions requirements.

b. Salvaged and reused materials: Product is more than one year old at the time of use. If finishes are applied to the product on-site, the finishes must meet the VOC emissions evaluation AND VOC content evaluation requirements.

c. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.3 DETAIL DRAWINGS

Submit detail drawings indicating all wood assemblies proposed for use in the project. Indicate materials, species, grade, density, grain, finish details of construction, location of use in the project, finishes, types, method and arrangement of fasteners, and installation details. This includes all fabricated assemblies.

1.4 PRODUCT DATA

Submit Manufacturers printed data including proposed species, grade, density grain, and finish as applicable; sufficient to demonstrate compliance with this specification for each type of wood product specified. For treated wood products also provide documentation of environmentally safe preservatives for each type of wood product specified.

Provide Manufacturers printed data for hardware and all wood accessories including but not limited to edge banding, adhesives, and sealers.

1.5 SAMPLES

Samples indicating proposed species, grade, density grain, and finish for each type of wood product specified. Provide samples of sufficient size to show pattern and color ranges of proposed products.

1.6 DELIVERY, STORAGE, AND HANDLING

Deliver wood products to the jobsite in an undamaged condition. Stack materials to ensure ventilation and drainage. Protect against dampness before and after delivery. Store materials under cover in a well ventilated enclosure and protect against extreme changes in temperature and humidity. Keep materials wrapped and separated from off-gassing materials (such as drying paints and adhesives). Do not use materials that have visible moisture or biological growth. Do not store products in building until wet trade materials are dry and humidity of the space is within wood manufacturer's tolerance limits for storage.

1.7 QUALITY ASSURANCE

1.7.1 Certifications

1.7.1.1 Certified Wood Grades

Provide certificates of grade from the grading agency on graded but unmarked lumber or plywood attesting that materials meet the grade requirements specified herein.

1.7.1.2 Certified Sustainably Harvested Wood

Provide wood certified as sustainably harvested by FSC STD 01 001. Provide a letter of Certification of Sustainably Harvested Wood signed by the wood supplier. Identify certifying organization and their third party program name and indicate compliance with chain-of-custody program requirements. Submit sustainable wood certification data; identify each certified product on a line item basis. Submit copies of invoices bearing certification numbers.

1.7.1.3 Indoor Air Quality Certifications

1.7.1.3.1 Adhesives and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification and VOC content limits in compliance with SCAQMD Rule 1168. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

1.7.1.3.2 Composite Wood Products

Provide composite wood (particleboard, MDF) installed within the building waterproofing envelope with VOC emissions certified Ultra-Low-Emitting Formaldehyde (ULEF) or No Added Formaldehyde (NAF). Provide current product certification documentation from certification body.

Provide Wood structural panel (plywood) installed within the building waterproofing envelope with VOC emissions certified with one of the following:

a. PS 1-09 or PS 2-10 (or CARB equivalent to PS 1 or PS 2)

b. Labeled bond classification Exposure 1 or Exterior

1.7.2 Lumber

Identify each piece or each bundle of lumber, millwork, and trim by the grade mark of a recognized association or independent inspection agency certified by the Board of Review of the ALSC to grade the species.

1.7.3 Plywood

Provide each sheet of plywood with the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of the plywood. Marks must identify plywood by species group or span rating, exposure durability classification, grade, and compliance

with APA L870.

1.7.4 Hardboard

Provide materials marks or written documentation identifying the producer and the applicable standard.

1.7.5 Pressure Treated Lumber and Plywood

Inspect each treated piece in accordance with AWPA U1.

1.7.6 Non-Pressure Treated Woodwork and Millwork

Mark, stamp, or label to indicate compliance with WDMA I.S.4.

1.7.7 Fire-Retardant Treated Lumber

Each piece must bear an Underwriters Laboratories fire resistance label or comparable label of another nationally recognized independent fire retardant materials testing laboratory.

PART 2 PRODUCTS

2.1 PRODUCT SUSTAINABILITY CRITERIA

For products in this section, where applicable and to extent allowed by performance criteria, provide and document the following:

2.1.1 Certified Sustainably Harvested Wood

Certified sustainably harvested wood is identified for some products in this section; provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING. Other products listed in this section may be available as certified sustainably harvested wood; identify those products that meet project requirements for certified sustainably harvested wood, and provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING.

2.1.2 Recycled Content for Wood Products

Recycled content is identified for some products in this section; provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING. Other products listed in this section may be available with recycled content; identify those products that meet project requirements for recycled content, and provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING.

2.1.3 Reduce Volatile Organic Compounds (VOC) (Low-Emitting Materials) for Products

Reduced VOC content is identified for some products in this section; provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING paragraph REDUCE VOLATILE ORGANIC COMPOUNDS (VOC) (LOW-EMITTING MATERIALS). Other products listed in this section may be available with reduced VOC content; identify those products that meet project requirements for reduced VOC content, and provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING paragraph REDUCE VOLATILE ORGANIC COMPOUNDS (VOC) (LOW-EMITTING MATERIALS).

2.1.4 Building Product Declarations

Provide particleboard, MDF and plywood with EPD and Material Ingredient Report, if available.

2.2 WOOD PRODUCTS

2.2.1 Sizes and Patterns of Wood Products

Provide yard and board lumber sizes in accordance with ALSC PS 20. Provide shaped lumber and millwork in the patterns indicated and in standard patterns of the association covering the species. Size references, unless otherwise specified, are nominal sizes. Provide actual sizes within manufacturing tolerances allowed by the applicable standard.

2.2.2 Species and Grades

Provide in accordance with AWPA U1 Use Category System Tables unless otherwise specified herein.

2.2.3 Trim, Finish, and Frames

Provide species and grades listed in the table below for wood materials that must be painted. For materials that must be stained, have a natural, or a transparent finish, provide materials one grade higher than those listed in the table below. Provide trim, except window stools and aprons with hollow backs. Provide certified sustainably harvested wood for trim and frames.

TABLE OF GRADES FOR WOOD TO RECEIVE PAINT FINISH

Grading Rules	Species	Exterior and Interior Trim, Finish, and Frames
WWPA G-5 standard grading rules	Aspen, Douglas Fir-Larch, Douglas Fir South, Engelmann Spruce-Lodgepole Pine, Engelmann Spruce, Hem-Fir, Idaho White Pine, Lodgepole Pine, Mountain Hemlock, Mountain Hemlock-Hem-Fir, Ponderosa Pine-Sugar Pine, (Ponderosa Pine-Lodgepole Pine,) White Woods, (Western Woods,) Western Cedars, Western Hemlock	All Species: C & BTR. Select (Choice & BTR Idaho White Pine) or Superior Finish. Western Red Cedar may be graded C & BTR. Select or A & BTR in accordance with Special Western Red Cedar Rules.

TABLE OF GRADES FOR WOOD TO RECEIVE PAINT FINISH		
Grading Rules	Species	Exterior and Interior Trim, Finish, and Frames
WCLIB 17 standard grading rules	Douglas Fir-Larch, Hem-Fir, Mountain Hemlock, Sitka Spruce, Western Cedars, Western Hemlock	All Species: C & BTR VG, except A for Western Red Cedar
SPIB 1003 standard grading rules	Southern Pine	C & BTR
NHLA Rules	Cypress	C-Select
NELMA Grading Rules standard grading rules **	Balsam Fir, Eastern Hemlock-Tamarack, Eastern Spruce, Eastern White Pine, Northern Pine, Northern Pine, Northern White Cedar	All Species: C-Select except C & BTR for Eastern White Pine and Norway Pine
RIS Grade Use standard specifications	Redwood	Clear, Clear All Heart
NHLA Rules	Cypress	B Finish
	Red Gum, Soft Elm, Birch	Select or BTR (for interior use only)

Note: ** http://www.nelma.org/library/2013-standard-grading-rules-for-northeastern-lumber/

2.2.4 Utility Shelving

Provide utility shelving in a suitable species equal to or exceeding the requirements of No. 3 common white fir under WWPA G-5, 1 inch thick; or plywood, interior type, Grade A-B, 1/2 inch thick, any species group.

2.2.5 Softwood Plywood

Provide in accordance with APA L870. Provide certified sustainably harvested softwood plywood. When located on the interior of buildings, provide products with no added urea-formaldehyde resins.

a. Plywood for Soffits: Exterior type, B-B medium density overlay.

b. Plywood for Shelving: Interior type, A-B Grade, any species group.

c. Plywood for Countertops: Exterior type, A-C Grade.

2.2.6 Hardwood Plywood

HPVA HP-1, Type II (Interior) , Premium (A) Grade, hardwood veneer core construction, face veneers of White Oak, Quarter-Sawn, of thickness indicated. When located on the interior of buildings, provide products with no added urea-formaldehyde resins. For products located on the interior of the building (inside of the weatherproofing system), provide certification of indoor air quality for hardwood plywood.

2.2.7 Hardboard

AHA A135.4, tempered type, in thickness indicated. Provide certified sustainably harvested hardboard.

2.2.8 Medium Density Fiberboard (MDF) and Particleboard

CPA A208.1, Grade 2-M-2 or better. For products located on the interior of the building (inside of the weatherproofing system), provide certification of indoor air quality for MDF and particleboard.

Provide products with 85 percent total recovered materials content. Provide data identifying percentage of recycled content for MDF/particleboard.

2.3 FASCIAS AND TRIM

2.3.1 Wood

Provide species and grades for all fascia and trim, including exterior door and window casings, in accordance with AWPA U1 Use Category System Tables. Provide sizes indicated.

For new interior trim pieces scheduled to receive a transparent (natural) finish, provide new wood matching the cut and grain of the existing historic chestnut woodwork in the Central Stair. Submit samples of wood showing the range of graining to be expected for approval prior to use.

2.4 COUNTERTOPS

2.4.1 Solid Surface

For solid surface countertops refer to Section 06 61 16, SOLID POLYMER (SOLID SURFACING) FABRICATIONS.

2.5 MOISTURE CONTENT OF WOOD PRODUCTS

Air dry or kiln dry lumber. Kiln dry treated lumber after treatment. Maximum moisture content of wood products at time of delivery to the jobsite, and when installed, must be as follows:

a. Interior Paneling: 6 percent.

b. Interior Finish Lumber, Trim, and Millwork: 1-1/4 Inches Nominal or Less in Thickness: 6 percent on 85 percent of the pieces and 8 percent on remainder.

c. Exterior Treated and Untreated Finish Lumber and Trim: 4 inches Nominal or Less in Thickness: 19 percent.

d. Provide moisture content of other materials in accordance with the applicable standards.

2.6 PRESERVATIVE TREATMENT OF WOOD PRODUCTS

2.6.1 Pressure Treatment

Treat lumber and plywood used on the exterior of buildings or in contact with masonry or concrete with a waterborne preservative listed in AWPA U1 (P series is included therein by reference) as applicable, and inspected in accordance with AWPA U1. Identify treatment on each piece of material by the quality mark of an agency accredited by the Board of Review of the American Lumber Standards Committee. Provide treated plywood to a reflection level as follows:

Preservative treat exterior wood moulding and millwork that will be within 18 inches of soil or in contact with water or concrete in accordance with WMMPA WM 6. Provide a field treatment in accordance with AWPA M4 of exposed areas of treated wood that have been cut or drilled. Items of all-heart material of cedar, cypress, or redwood do not require preservative treatment except when in direct contact with soil.

2.7 FIRE-RETARDANT TREATMENT

2.7.1 Wood Products

Pressure treat fire-retardant treated lumber and plywood in accordance with AWPA U1. Comply with material use as defined in AWPA U1 for Interior Type A and B and Exterior Type. Treatment and performance inspection must be conducted by a qualified independent testing agency that establishes performance ratings. Each piece or bundle of treated material must bear identification of the testing agency to indicate performance with such rating. Subject treated materials that will be exposed to rain wetting to an accelerated weathering technique in accordance with ASTM D2898, Method A, prior to being tested for compliance with AWPA U1.

2.8 HARDWARE AND ACCESSORIES

Provide sizes, types, and spacings of hardware and accessories as recommended in writing by the wood product manufacturer, except as otherwise specified.

2.8.1 Wood Screws

ASME B18.6.1.

2.8.2 Bolts, Nuts, Lag Screws, and Studs

ASME B18.2.1 and ASME B18.2.2.

2.8.3 Nails

Use nails of a size and type best suited for each application and in accordance with ASTM F547. Use hot-dipped galvanized or aluminum nails for exterior applications. For siding, provide nails of sufficient length to extend 1-1/2 inches into supports, including wood sheathing over framing. Where nailing is impractical, provide screws of a size and type best suited for each application.

2.8.4 Heavy-Duty Adjustable Shelf Support System for built-in Classroom Storage

Surface mounted 14 gauge Type 304 stainless steel slotted super-duty pilaster standards, BHMA Grade 2 and support brackets with snap-in shelf rests.

a. Finish: Stainless Steel. Pre-drilled countersunk screws, 2 inch adjustment, 7/8 inch width by 11/16 inch depth.

b. Stainless Steel Support Brackets, 560 lb load capacity, Finish: Brushed. Refer to drawings for depth of shelves. Include snap-in shelf rests.

2.8.5 Closet Hanger Rods

Chromium plated steel rods, not less than 1 inch diameter by 18 gage. Rods may be adjustable with integral mounting brackets if smaller tube is 1 inch by 18 gage. Provide intermediate support brackets for rods more than 48 inches long.

2.9 FABRICATION

2.9.1 Quality Standards (QS)

2.9.1.1 Grades

The terms "Premium," "Custom," and "Economy" refer to the quality grades defined in NAAWS 3.1. Provide items not otherwise specified in a specific grade as "Custom" grade.

2.9.1.2 Adhesives

Select adhesives for durability and permanent bonding. Address factors such as materials that must be bonded, expansion and contraction, bond strength, fire rating, moisture resistance, and manufacturer's recommendations.

Provide adhesive products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for office space type) and VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for adhesives applied on the interior of the building (inside of the weatherproofing system).

2.9.2 Countertops

Fabricate with lumber and a core of exterior plywood , glued and screwed to form an integral unit. Bond laminated plastic under pressure to exposed surfaces, using adhesive as recommended by the plastic manufacturer, and bond a backing sheet under pressure to underside of countertop. Provide countertop units as post-formed type, no-drip nose, cove mouldings, Style A backsplash, and surfaced with ANSI/NEMA LD 3, Grade PF 42 plastic. Provide backsplashes not less than 3-1/2 inches nor more than 4-1/2 inches high.

2.9.3 Cabinets

Unless specified otherwise, provide wall and base cabinets of the same

construction, materials, and finishes as countertops. Fabricate cabinets with solid ends and frame fronts, or with frames all around. Provide frames of solid hardwood not less than 3/4 by 1-1/2 inches. Provide ends, bottoms, backs, partitions, and doors as hardwood plywood. Mortise and tenon, dovetail, or dowel and glue joints to produce a rigid unit. Cover exposed edges of plywood with hardwood strips. Provide cabinet doors, frames, and solid exposed ends 3/4 inch thick minimum. Provide cabinet bottoms, partitions, and framed ends to be 1/2 inch minimum. Provide shelves to be 5/8 inch thick minimum. Provide cabinet backs 1/4 inch thick minimum.

2.9.3.1 Cabinet Hardware

ANSI/BHMA A156.9. Provide cabinet hardware including two self, closing hinges for each door, two side mounted metal drawer slides for each drawer, and pulls for all doors and drawers as follows. Provide hardware exposed to view brushed stainless steel. Comply with the following requirements for all cabinet hardware:

a. Provide frameless concealed European style, back mounted hinges with 165 degree opening and a self closing feature when at less than 90 degrees open.

b. Provide drawer slides having a static rating capacity of 100 lbs.. Slides to have a self closing/stay closed action, zinc or epoxy coated steel finish, ball bearing rollers, and positive stop with lift out design.

c. Provide drawer pulls as as indicated.

d. Provide heavy duty magnetic drawer catches.

2.9.3.2 Finish

Provide a clear factory finish on wood surfaces after fabrication. Provide fabricator's standard natural finish equivalent to one coat of sealer, one coat of varnish on all surfaces and a second coat of varnish on surfaces exposed to view. Provide spar varnish in exterior or wet area applications. Sand lightly and wipe clean between coats.

2.9.4 Casework with Transparent Finish (CTF)

2.9.4.1 AWI Quality Grade

Premium grade.

2.9.4.2 Construction

Provide flush overlaydesign details.

2.9.4.3 Exposed Parts

As indicated to match exterior face specie, As indicated cut.

2.9.4.4 Semi-Exposed Parts

As specified in the NAAWS 3.1 for the grade selected.

2.9.5 Casework with High Pressure Laminate Finish

2.9.5.1 AWI Quality Grade

Customgrade.

2.9.5.2 Construction

Provide flush overlaydesign details.

2.9.5.3 Exposed Surfaces

High pressure plastic laminate, color and pattern as indicated.

2.9.5.4 Semi-Exposed Surfaces

As specified in the NAAWS 3.1 for the grade selected.

2.9.5.5 Edge Banding

Provide edge banding for casework doors and drawer fronts in PVC vinyl 0.125 inch thick. Provide width 15/16 inches . Match color and pattern to exposed door and drawer front laminate pattern and color.

PART 3 EXECUTION

Do not install building construction materials that show visual evidence of biological growth.

3.1 FINISH WORK

Apply primer to finish work before installing. Where practicable, shop assemble and finish millwork items. Construct joints tight and in a manner to conceal shrinkage but to avoid cupping, twisting and warping after installation. Miter trim and mouldings at exterior angles; cope at interior angles and at returns. Provide millwork and trim in maximum practical lengths. Fasten finish work with finish nails. Provide blind nailing where practicable. Set face nails for putty stopping.

3.1.1 Exterior Finish Work

Machine sand exposed flat members and square edges. Machine finish semi-exposed surfaces. Construct joints to exclude water. In addition to nailing, glue joints with waterproof glue as necessary for weather resistant construction. Evenly distribute end joints in built-up members. Provide shoulder joints in flat work. Reinforce backs of wide-faced miters with metal rings and waterproof glue. Unless otherwise indicated, provide fascia and other flat members 3/4 inch thick minimum. Provide door and window trim in single lengths. Provide braced, blocked, and rigidly anchored cornices for support and protection of vertical joints. Provide soffits in largest practical size. Align joints of plywood over centerlines of supports. Fasten soffits with aluminum or stainless steel nails. Back prime all concealed surfaces of exterior trim.

3.1.2 Interior Finish Work

After installation, sand exposed surfaces smooth. Provide window and door trim in single lengths.

3.1.3 Door Frames

Set plumb and square. Provide solid blocking at not more than 16 inches on center for each jamb. Position blocking to occur behind hinges and lock strikes. Double wedge frames and fasten with finish nails. Set nails for putty stopping.

3.2 SHELVING

Support 1 inch nominal thick wood shelf material or 3/4 or 23/32 inch thick plywood shelf material with end and intermediate supports arranged to prevent buckling and sagging. Provide hook strips 1 by 4 inches nominal and cleats 1 by 2 inches nominal. Provide cleats except where hook strips are specified or indicated. Where adjustable shelving is indicated, provide standards and brackets or shelf rests for each shelf. Anchor standards to wall at not more than 2 feet on center.

3.2.1 Storage Rooms

Unless otherwise indicated, provide storage rooms with shelves 11-1/4 inches wide, bottom shelf 18 inches above the floor, top shelf 18 inches below the ceiling, and intermediate shelves approximately 18 inches apart.

3.3 CLOTHES HANGER RODS

Provide clothes hanger rods where indicated and in closets having hook strips. Set rods parallel with front edges of shelves and support by sockets at each end and intermediate brackets spaced not more than 4 feet on center.

3.4 MISCELLANEOUS

3.4.1 Countertops

Conceal fastenings where practicable. Fit counters tight to adjoining surfaces and scribe where necessary. Provide scribed joints neat and flush. Provide counter sections in longest lengths practicable with a minimum number of joints. Where joints are necessary, provide tight joints drawn up with concealed type heavy pull-up bolts. Glue joints with water resistant glue and make rigid with screws, bolts, or other approved fastenings.

3.4.2 Cabinets

Provide cabinets level, plumb, true, and tight to adjacent walls. Secure cabinets to walls with concealed toggle bolts. Secure top to cabinet with concealed screws. Make cutouts for fixtures from templates supplied by fixture manufacturer. Locate cutouts for pipes so that edges of holes are covered by escutcheons after installation.

3.5 SOFFITS

3.5.1 Wood

Provide panels with edges at joints spaced in accordance with manufacturer's written instructions and with all edges backed by framing members. Nail panels 3/8 inch from edges at 6 inches on center and at intermediate supports at 12 inches on center. Provide panels in maximum practicable lengths.

3.6 FASCIA AND EXTERIOR TRIM

Construct, caulk, and machine sand exposed surfaces and edges to exclude water. In addition to nailing, glue joints as necessary for weather resistance. Evenly distribute end joints in built-up members. Shoulder joints in flat work. Reinforce backs of wide-faced miters with metal rings and glue. Provide fascia and other flat members in maximum practicable lengths. Braced, block, and rigidly anchor cornices for support and protection of vertical joints.

3.7 MOULDING AND INTERIOR TRIM

Install mouldings and interior trim straight, plumb, level and with closely fitted joints. Provide exposed surfaces machine sanded at the shop. Cope returns and interior angles at moulded items and miter external corners. Shoulder intersections of flatwork to ease any inherent changes in plane. Provide window and door trim in single lengths. Blind nail to the extent practicable. Set and stop face nailing with a nonstaining putty to match the applied finish. Use screws for attachment to metal; set and stop screws in accordance with the same quality requirements for nails.

-- End of Section --

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SECTION 06 41 16.00 10

PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS
08/10

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A161.2	(1998) Decorative Laminate Countertops, Performance Standards for Fabricated High Pressure

ASTM INTERNATIONAL (ASTM)

ASTM D1037	(2012) Evaluating Properties of Wood-Base Fiber and Particle Panel Materials
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM F547	(2017) Standard Terminology of Nails for Use with Wood and Wood-Base Materials

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.9	(2015) Cabinet Hardware

COMPOSITE PANEL ASSOCIATION (CPA)

CPA A208.1	(2016) Particleboard
CPA A208.2	(2016) Medium Density Fiberboard (MDF) for Interior Applications

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA LD 3	(2005) Standard for High-Pressure Decorative Laminates

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BD+C	(2009; R 2010) Leadership in Energy and Environmental Design(tm) Building Design and Construction (LEED-NC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

ANSI/WDMA I.S.1A	(2013) Interior Architectural Wood Flush Doors

WOODWORK INSTITUTE (WI)

NAAWS 3.1	(2017; 2018 Errata Edition) North American Architectural Woodwork Standards

1.2 SYSTEM DESCRIPTION

Work in this section includes laminate clad custom casework as shown on the drawings and as described in this specification. This Section includes high-pressure laminate surfacing and cabinet hardware. Comply with EPA requirements in accordance with Section 01 33 29 SUSTAINABILITY REPORTING. All exposed and semi-exposed surfaces, whose finish is not otherwise noted on the drawings or finish schedule, shall be sanded smooth and shall receive a clear finish of polyurethane. Wood finish may be shop finished or field applied in accordance with Section 09 90 00 PAINTS AND COATINGS.

1.3 SUSTAINABILITY REPORTING

Materials in this technical specification may contribute towards contract compliance with sustainability requirements. See Section 01 33 29 SUSTAINABILITY REPORTING for project LEED BD+C low-emitting materials, recycled content, certified wood, biobased materials, and LEED documentation requirements.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings; G
Installation; G

SD-03 Product Data

Wood Materials
Wood Finishes
Finish Schedule
Certification; S

SD-04 Samples

Plastic Laminates; G
Cabinet Hardware; G

SD-07 Certificates

Quality Assurance
Laminate Clad Casework

SD-11 Closeout Submittals

LEED Documentation; S

1.4.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Permanently installed, non-recycled wood and wood-based materials should be certified in accordance with Forest Stewardship Council Guidelines. This includes wood permanently installed in the project wood products. Submit all FSC product certification information including required Chain-of-Custody certificates and invoices tracking FSC purchase. Refer to Division 01 33 29 and the LEED BDC Ref Guide

v4 for full requirements.

c. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for laminate, particleboard, MDF, and plywood that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification; Facts – NSF/ANSI 336.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

4. Low-Emitting Materials - Interior adhesives, caulks and sealants applied on site:

a. Meet the VOC emissions evaluation and meet the VOC content evaluation. The adhesives and sealants product category include all interior adhesives and sealants applied on site. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

5. Low-Emitting Materials - Composite Wood (installed within building waterproofing envelope). Include material cost value.

a. Submit certificate for particleboard, medium density fiberboard (MDF), hardwood plywood for Ultra-Low-Emitting Formaldehyde (ULEF) or No Added Formaldehyde (NAF) demonstrating one of the following.

1) EPA Toxic Substances Control Act, Formaldehyde Emission Standards for Composite Wood Products (TSCA, Title VI).

2) California Air Resources (CARB) Airborne Toxic Control Measure (ATCM).

b. Submit product data for wood structural panel (plywood) stating manufactured according to PS 1-09 or PS 2-10 (or CARB equivalent to PS 1 or PS 2) and labeled bond classification Exposure 1 or Exterior.

c. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.5 QUALITY ASSURANCE

1.5.1 General Requirements

Unless otherwise noted on the drawings, all materials, construction methods, and fabrication shall conform to and comply with the premium grade quality standards as outlined in NAAWS 3.1, Section for laminate clad cabinets. These standards shall apply in lieu of omissions or specific requirements in this specification. Contractors and their personnel engaged in the work shall be able to demonstrate successful experience with work of comparable extent, complexity and quality to that shown and specified. Submit a quality control statement which illustrates compliance with and understanding of NAAWS 3.1 requirements, in general, and the specific NAAWS 3.1 requirements provided in this specification. The quality control statement shall also certify a minimum of ten years Contractor's experience in laminate clad casework fabrication and construction. The quality control statement shall provide a list of a minimum of five successfully completed projects of a similar scope, size, and complexity.

1.5.2 Mock-ups

Prior to final approval of shop drawings, provide a full-size mock-up of a typical floor cabinet and wall cabinet, including all components and hardware necessary to illustrate a completed unit with a minimum of one door and one drawer assembly. The completed mock-up shall include countertops and back splashes where specified. The mock-up shall utilize specified finishes in the patterns and colors as indicated . Upon disapproval, rework or remake the mock-up until approval is secured. Remove rejected units from the jobsite. Approved mock-up may remain as part of the finished work. Submit shop drawings showing all fabricated casework items in plan view, elevations and cross-sections to accurately indicate materials used, details of construction, dimensions, methods of fastening and erection, and installation methods proposed. Shop drawing casework items shall be clearly cross-referenced to casework items located on the project drawings. Shop drawings shall include a color schedule of all casework items to include all countertop, exposed, and semi-exposed cabinet finishes to include finish material manufacturer, pattern, and color.

1.5.3 Sustainable Design Certification

Building Product Declarations: Provide laminate, particleboard, MDF and

plywood with EPD and Material Ingredient Report, if available.

Indoor Air Quality for Composite Wood: Provide composite wood (particleboard, MDF, hardwood plywood) installed within the building waterproofing envelope with VOC emissions certified Ultra-Low-Emitting Formaldehyde (ULEF) or No Added Formaldehyde (NAF).

Provide Wood structural panel (plywood) installed within the building waterproofing envelope with VOC emissions certified with one of the following:

a. PS 1-09 or PS 2-10 (or CARB equivalent to PS 1 or PS 2)

b. Labeled bond classification Exposure 1 or Exterior

Indoor Air Quality for Adhesives, Caulks, and Sealants: Provide adhesives, caulks, and sealants applied within waterproofing envelope with VOC emissions certified in compliance with California Department of Public Health (CDPH) Standard Method and VOC content in compliance with limits of SCAQMD Rule 1168.

Certified Sustainably Harvested Wood: Provide sustainability harvested solid wood lumber components certified in compliance with FSC Standard-01-001.

1.6 DELIVERY, STORAGE, AND HANDLING

Casework may be delivered knockdown or fully assembled. Deliver all units to the site in undamaged condition, stored off the ground in fully enclosed areas, and protected from damage. The storage area shall be well ventilated and not subject to extreme changes in temperature or humidity.

1.7 SEQUENCING AND SCHEDULING

Coordinate work with other trades. Units shall not be installed in any room or space until painting, and ceiling installation are complete within the room where the units are located. Floor cabinets shall be installed before finished flooring materials are installed.

PART 2 PRODUCTS

2.1 WOOD MATERIALS

2.1.1 Lumber

a. All framing lumber shall be kiln-dried Grade III to dimensions as shown on the drawings. Frame front, where indicated on the drawings, shall be nominal 3/4 inch hardwood.

b. Standing or running trim casework components, which are specified to receive a transparent finish, shall be white oak hardwood species, flat sawn. AWI grade shall be premium. Location, shape, and dimensions shall be as indicated on the drawings.

2.1.2 Panel Products

2.1.2.1 Plywood

All plywood panels used for framing purposes shall be veneer core hardwood

plywood, NAAWS 3.1 Grade AA. Nominal thickness of plywood panels shall be as indicated in this specification and on the drawings.

2.1.2.2 Particleboard

All particleboard shall be industrial grade, medium density (40 to 50 pounds per cubic foot), 3/4 inch thick. A moisture-resistant particleboard in grade Type 2-M-2 or 2-M-3 shall be used as the substrate for plastic laminate covered components as located on the drawings and other areas subjected to moisture. Particleboard shall meet the minimum standards listed in ASTM D1037 and CPA A208.1.

2.1.2.3 Medium Density Fiberboard

Medium density fiberboard (MDF) shall be an acceptable panel substrate where noted on the drawings. Medium density fiberboard shall meet the minimum standards listed in CPA A208.2.

2.2 SOLID POLYMER MATERIAL

Solid surfacing casework components shall conform to the requirements of Section 06 61 16 SOLID SURFACING FABRICATIONS.

2.3 HIGH PRESSURE DECORATIVE LAMINATE (HPDL)

All plastic laminates shall meet the requirements of ANSI/NEMA LD 3 and ANSI A161.2 for high-pressure decorative laminates. Design, colors, surface finish and texture, and locations shall be as indicated on the drawings. Submit two samples of each plastic laminate pattern and color. Samples shall be a minimum of 5 by 7 inches in size. Plastic laminate types and nominal minimum thicknesses for casework components shall be as indicated in the following paragraphs.

2.3.1 Horizontal General Purpose Standard (HGS) Grade

Horizontal general purpose standard grade plastic laminate shall be 0.048 inches (plus or minus 0.005 inches) in thickness. This laminate grade is intended for horizontal surfaces where postforming is not required.

2.3.2 Vertical General Purpose Standard (VGS) Grade

Vertical general purpose standard grade plastic laminate shall be 0.028 inches (plus or minus 0.004 inches) in thickness. This laminate grade is intended for exposed exterior vertical surfaces of casework components where postforming is not required.

2.3.3 Horizontal General Purpose Postformable (HGP) Grade

Horizontal general purpose postformable grade plastic laminate shall be 0.042 inches (plus or minus 0.005 inches) in thickness. This laminate grade is intended for horizontal surfaces where post forming is required.

2.3.4 Vertical General Purpose Postformable (VGP) Grade

Vertical general purpose postformable grade plastic laminate shall be 0.028 inches (plus or minus 0.004 inches) in thickness. This laminate grade is intended for exposed exterior vertical surfaces of components where postforming is required for curved surfaces.

2.3.5 Horizontal General Purpose Fire Rated (HGF) Grade

Horizontal general purpose fire rated grade plastic laminate shall be 0.048 inches (plus or minus 0.005 inches) in thickness. Laminate grade shall have a class 1, class A fire rating in accordance with ASTM E84.

2.3.6 Vertical General Purpose Fire Rated (VGF) Grade

Vertical general purpose fire rated grade plastic laminate shall be 0.028 inches (plus or minus 0.004 inches) in thickness. This laminate grade shall have a class 1, class A fire rating in accordance with ASTM E84.

2.3.7 Cabinet Liner Standard (CLS) Grade

Cabinet liner standard grade plastic laminate shall be 0.020 inches in thickness. This laminate grade is intended for light duty semi-exposed interior surfaces of casework components.

2.3.8 Backing Sheet (BK) Grade

Undecorated backing sheet grade laminate is formulated specifically to be used on the backside of plastic laminated panel substrates to enhance dimensional stability of the substrate. Backing sheet thickness shall be 0.020 inches. Backing sheets shall be provided for all laminated casework components where plastic laminate finish is applied to only one surface of the component substrate.

2.4 THERMOSET DECORATIVE OVERLAYS (MELAMINE)

Thermoset decorative overlays (melamine panels) shall be used for casework cabinet interior and drawer interior surfaces as indicated in the drawings.

2.5 CABINET HARDWARE

Submit one sample of each cabinet hardware item specified to include hinges, pulls, and drawer glides. All hardware shall conform to ANSI/BHMA A156.9, unless otherwise noted, and shall consist of the following components:

2.5.1 Door Hinges

Brushed satin finish type, BHMA No. 654.

2.5.2 Cabinet Pulls

Brushed satin finish type, BHMA No. 654.

2.5.3 Drawer Slide

Side mounted Brushed satin finish type, BHMA No. 654 with full extension and a minimum 100 pound load capacity. Slides shall include an positive stop to avoid accidental drawer removal.

2.5.4 Adjustable Shelf Support System

Support clips for the standards shall be open type, BHMA No. B04091 closed type, BHMA No. B04081, finish: Brushed satin. Multiple holes with metal pin supports.

2.6 FASTENERS

Nails, screws, and other suitable fasteners shall be the size and type best suited for the purpose and shall conform to ASTM F547 where applicable.

2.7 ADHESIVES, CAULKS, AND SEALANTS

2.7.1 Adhesives

Adhesives shall be of a formula and type recommended by AWI. Adhesives shall be selected for their ability to provide a durable, permanent bond and shall take into consideration such factors as materials to be bonded, expansion and contraction, bond strength, fire rating, and moisture resistance. Adhesives shall meet local regulations regarding VOC emissions and off-gassing.

2.7.1.1 Wood Joinery

Adhesives used to bond wood members shall be a Type II for interior use polyvinyl acetate resin emulsion. Adhesives shall withstand a bond test as described in ANSI/WDMA I.S.1A.

2.7.1.2 Laminate Adhesive

Adhesive used to join high-pressure decorative laminate to wood shall be contain no added urea formaldehyde. PVC edgebanding shall be adhered using a polymer-based hot melt glue.

2.7.2 Caulk

Caulk used to fill voids and joints between laminated components and between laminated components and adjacent surfaces shall be clear, 100 percent silicone.

2.7.3 Sealant

Sealant shall be of a type and composition recommended by the substrate manufacturer to provide a moisture barrier at sink cutouts and all other locations where unfinished substrate edges may be subjected to moisture.

2.8 WOOD FINISHES

Paint, stain, varnish and their applications required for laminate clad casework components shall be wood stain finish. Color and location shall be as indicated on the drawings.

2.9 ACCESSORIES

2.9.1 Glass and Glazing

Glass required in laminated casework shall be referenced by type in accordance with Section 08 81 00 GLAZING. Glass shall be one of the following:

a. Safety glass: Clear, fully tempered, 1/4-inch thick minimum.

2.9.2 Grommets

Grommets shall be metal material for cutouts with a diameter of 2 inches. Locations shall be as indicated on the drawings.

2.10 FABRICATION

Verify field measurements as indicated in the shop drawings before fabrication. Fabrication and assembly of components shall be accomplished at the shop site to the maximum extent possible. Construction and fabrication of cabinets and their components shall meet or exceed the requirements for AWI premium grade unless otherwise indicated in this specification. Cabinet style, in accordance with NAAWS 3.1, Section 400-G descriptions, shall be as indicated on the drawings.

2.10.1 Base and Wall Cabinet Case Body

2.10.1.1 Cabinet Components

Frame members shall be glued-together, kiln-dried hardwood lumber. Top corners, bottom corners, and cabinet bottoms shall be braced with either hardwood blocks or water-resistant glue and nailed in place metal or plastic corner braces. Cabinet components shall be constructed from the following materials and thicknesses:

2.10.1.1.1 Body Members (Ends, Divisions, Bottoms, and Tops)

3/4 inch veneer core plywood panel product

2.10.1.1.2 Face Frames and Rails

3/4 inch hardwood lumber

2.10.1.1.3 Shelving

3/4 inch particleboard panel product

2.10.1.1.4 Cabinet Backs

1/4 inch particleboard panel product

2.10.1.1.5 Drawer Sides, Backs, and Subfronts

1/2 inch hardwood lumber

2.10.1.1.6 Drawer Bottoms

1/4 inch particleboard panel product

2.10.1.1.7 Door and Drawer Fronts

3/4-inch particleboard panel product

2.10.1.2 Joinery Method for Case Body Members

2.10.1.2.1 Tops, Exposed Ends, and Bottoms

a. Steel "European" assembly screws (1-1/2 inch from end, 5 inch on center, fasteners will not be visible on exposed parts).

b. Doweled, glued under pressure (approx. 4 dowels per 12 inches of joint).

c. Stop dado, glued under pressure, and either nailed, stapled or screwed (fasteners will not be visible on exposed parts).

d. Spline or biscuit, glued under pressure.

2.10.1.2.2 Exposed End Corner and Face Frame Attachment

2.10.1.2.2.1 Mitered Joint

lock miter or spline or biscuit, glued under pressure (no visible fasteners)

2.10.1.2.2.2 Non-Mitered Joint (90 degree)

butt joint glued under pressure (no visible fasteners)

2.10.1.2.2.3 Butt Joint

glued and nailed

2.10.1.2.3 Cabinet Backs (Wall Hung Cabinets)

Wall hung cabinet backs must not be relied upon to support the full weight of the cabinet and its anticipated load for hanging/mounting purposes. Method of back joinery and hanging/mounting mechanisms should transfer the load to case body members. Fabrication method shall be:

2.10.1.2.3.1 Full Bound

Full bound, captured in grooves on cabinet sides, top, and bottom. Cabinet backs for floor standing cabinets shall be side bound, captured in grooves; glued and fastened to top and bottom.

2.10.1.2.3.2 Full Overlay

Full overlay, plant-on backs with minimum back thickness of 1/2 inchand minimum No. 12 plated (no case hardened) screws spaced a minimum 3 inches on center. Edge of back shall not be exposed on finished sides. Anchor strips are not required when so attached.

2.10.1.2.3.3 Side Bound

Side bound, captured in groove or rabbetts; glued and fastened.

2.10.1.2.4 Cabinet Backs (Floor Standing Cabinets)

2.10.1.2.4.1 Side Bound

Side bound, captured in grooves; glued and fastened to top and bottom.

2.10.1.2.4.2 Full Overlay

Full overlay, plant-on backs with minimum back thickness of 1/2 inch and minimum No. 12 plated (no case hardened) screws spaced a minimum 3 inches on center. Edge of back shall not be exposed on finished sides. Anchor

strips are not required when so attached.

2.10.1.2.4.3 Side Bound with Rabbetts

Side bound, placed in rabbetts; glued and fastened in rabbetts.

2.10.1.2.5 Wall Anchor Strips

Wall Anchor Strips shall be required for all cabinets with backs less than 1/2 inch thick. Strips shall consist of minimum 1/2 inch thick lumber, minimum 2-1/2 inches width; securely attached to wall side of cabinet back - top and bottom for wall hung cabinets, top only for floor standing cabinets.

2.10.2 Cabinet Floor Base

Floor cabinets shall be mounted on a base constructed of nominal 2 inch thick lumber and 3/4 inch veneer core exterior plywood. Base assembly components shall be treated lumber. Finished height for each cabinet base shall be as indicated on the drawings. Bottom edge of the cabinet door or drawer face shall be flush with top of base.

2.10.3 Cabinet Door and Drawer Fronts

Door and drawer fronts shall be fabricated from 3/4 inch medium density particleboard. All door and drawer front edges shall be surfaced with high pressure plastic laminate, color and pattern as indicated on the drawings.

2.10.4 Drawer Assembly

2.10.4.1 Drawer Components

Drawer components shall consist of a removable drawer front, sides, backs, and bottom. Drawer components shall be constructed of the following materials and thicknesses:

2.10.4.1.1 Drawer Sides and Back For Thermoset Decorative Overlay (Melamine) Finish

1/2 inch thick medium density particleboard or MDF fiberboard substrate

2.10.4.1.2 Drawer Bottom

1/4 inch thick thermoset decorative overlay melamine panel product

2.10.4.2 Drawer Assembly Joinery Method

a. Multiple dovetail (all corners) or French dovetail front/dadoed back, glued under pressure.

b. Doweled, glued under pressure.

c. Lock shoulder, glued and pin nailed.

d. Bottoms shall be set into sides, front, and back, 1/4 inch deep groove with a minimum 3/8 inch standing shoulder.

2.10.5 Shelving

2.10.5.1 General Requirements

Shelving shall be fabricated from 3/4 inch medium density fiberboard (MDF or 3/4 inch hard wood. Shelving top and bottom surfaces shall be finished with HPDL plastic laminate, thermoset decorative overlay (melamine) or wood stain. Shelf edges shall be finished in a HPDL plastic laminate, thermoset decorative overlay (melamine), or wood stain, as indicated on drawings.

2.10.5.2 Shelf Support System

The shelf support system shall be:

2.10.5.2.1 Pin Hole Method

Drill holes on the interior surface of the cabinet side walls. Evenly space holes in two vertical columns Space the holes in each column at 1 inch increments starting 6 inches from the cabinet interior bottom and extending to within 6 inches of the top interior surface of the cabinet. Drill holes to provide a level, stable surface when the shelf is resting on the shelf pins. Coordinate hole diameter with pin insert size to provide a firm, tight fit.

2.10.6 Laminate Application

Laminate application to substrates shall follow the recommended procedures and instructions of the laminate manufacturer and ANSI/NEMA LD 3, using tools and devices specifically designed for laminate fabrication and application. Provide a balanced backer sheet (Grade BK) wherever only one surface of the component substrate requires a plastic laminate finish. Apply required grade of laminate in full uninterrupted sheets consistent with manufactured sizes using one piece for full length only, using adhesives specified herein or as recommended by the manufacturer. Fit corners and joints hairline. All laminate edges shall be machined flush, filed, sanded, or buffed to remove machine marks and eased (sharp corners removed). Clean up at easing shall be such that no overlap of the member eased is visible. Fabrication shall conform to ANSI A161.2. Laminate types and grades for component surfaces shall be as follows unless otherwise indicated on the drawings:

2.10.6.1 Base/Wall Cabinet Case Body

a. Exterior (exposed) surfaces to include exposed and semi-exposed face frame surfaces: HPDL Grade VGS .

b. Interior (semi-exposed) surfaces to include interior back wall, bottom, and side walls: HPDL Grade CLS or Thermoset Decorative Overlay (melamine) as indicated on drawings.

2.10.6.2 Adjustable Shelving

2.10.6.2.1 Top and Bottom Surfaces

Thermoset Decorative Overlay (melamine)

2.10.6.2.2 All Edges

Thermoset Decorative Overlay (melamine)

2.10.6.3 Fixed Shelving

2.10.6.3.1 Top and Bottom Surfaces

HPDL Grade HGS

2.10.6.3.2 Exposed Edges

HPDL Grade VGS

2.10.6.4 Door, Drawer Fronts, Access Panels

2.10.6.4.1 Exterior (Exposed) and Interior (Semi-Exposed) Faces

HPDL Grade VGS

2.10.6.4.2 Edges

HPDL Grade VGS

2.10.6.5 Drawer Assembly

All interior and exterior surfaces: Thermoset Decorative Overlay (melamine).

2.10.6.6 Tolerances

Flushness, flatness, and joint tolerances of laminated surfaces shall meet the NAAWS 3.1 premium grade requirements.

2.10.7 Finishing

2.10.7.1 Filling

No fasteners shall be exposed on laminated surfaces. All nails, screws, and other fasteners in non-laminated cabinet components shall be countersunk and the holes filled with wood filler consistent in color with the wood species.

2.10.7.2 Sanding

All surfaces requiring coatings shall be prepared by sanding with a grit and in a manner that scratches will not show in the final system.

2.10.7.3 Coatings

Types, method of application and location of casework finishes shall be in accordance with the finish schedule, drawings and Section 09 90 00 PAINTS AND COATINGS. All cabinet reveals shall be painted. Submit descriptive data which provides narrative written verification of all types of construction materials and finishes, methods of construction, etc. not clearly illustrated on the submitted shop drawings. Data shall provide written verification of conformance with NAAWS 3.1 for the quality indicated to include materials, tolerances, and types of construction. Both the manufacturer of materials and the fabricator shall submit available literature which describes re-cycled product content, operations

and processes in place that support efficient use of natural resources, energy efficiency, emissions of ozone depleting chemicals, management of water and operational waste, indoor environmental quality, and other production techniques supporting sustainable design and products.

PART 3 EXECUTION

3.1 INSTALLATION

Installation shall comply with applicable requirements for NAAWS 3.1 premium quality standards. Countertops and fabricated assemblies shall be installed level, plumb, and true to line, in locations shown on the drawings. Cabinets and other laminate clad casework assemblies shall be attached and anchored securely to the floor and walls with mechanical fasteners that are appropriate for the wall and floor construction.

3.1.1 Anchoring Systems

3.1.1.1 Floor

Base cabinets shall utilize a floor anchoring system as detailed on the drawings. Anchoring and mechanical fasteners shall not be visible from the finished side of the casework assembly. Cabinet assemblies shall be attached to anchored bases without visible fasteners as indicated in the drawings. Where assembly abuts a wall surface, anchoring shall include a minimum 1/2 inch thick lumber or panel product hanging strip, minimum 2-1/2 inch width; securely attached to the top of the wall side of the cabinet back.

3.1.1.2 Wall

Cabinet to be wall mounted shall utilize minimum 1/2 inch thick lumber or panel product hanging strips, minimum 2-1/2 inch width; securely attached to the wall side of the cabinet back, both top and bottom.

3.1.2 Hardware

Casework hardware shall be installed in types and locations as indicated on the drawings. Where fully concealed European-style hinges are specified to be used with particleboard or fiberboard doors, the use of plastic or synthetic insertion dowels shall be used to receive 3/16 inch "Euroscrews". The use of wood screws without insertion dowels is prohibited.

3.1.3 Doors, Drawers and Removable Panels

The fitting of doors, drawers and removable panels shall be accomplished within target fitting tolerances for gaps and flushness in accordance with NAAWS 3.1 premium grade requirements.

3.1.4 Plumbing Fixtures

Install sinks, sink hardware, and other plumbing fixtures in locations as indicated on the drawings and in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE .

3.1.5 Glass

Install glass and glazing in the casework using methods and materials

specified in Section 08 81 00 GLAZING in locations as indicated on the drawings.

-- End of Section --

SECTION 06 61 16

SOLID SURFACING FABRICATIONS
08/20

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM D570	(1998; E 2010; R 2010) Standard Test Method for Water Absorption of Plastics
ASTM D638	(2014) Standard Test Method for Tensile Properties of Plastics
ASTM D696	(2016) Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C With a Vitreous Silica Dilatometer
ASTM D790	(2017) Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D2583	(2013a) Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM G21	(2015) Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

INTERNATIONAL CAST POLYMER ASSOCIATION (ICPA)

ICPA SS-1	(2001) Performance Standard for Solid Surface Materials

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA LD 3	(2005) Standard for High-Pressure Decorative Laminates

NSF INTERNATIONAL (NSF)

NSF/ANSI 51	(2012) Food Equipment Materials

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

1.2 SYSTEM DESCRIPTION

a. Work under this section includes counter tops and window sills and other items utilizing solid surfacing material fabrications as indicated on the drawings and as described in this specification. Do not change source of supply for materials after work has started, if the appearance of finished work would be affected.

b. In most instances, installation of solid surfacing material fabricated components and assemblies requires strong correctly located structural support provided by other trades. To provide a stable, sound, secure installation, close coordination is required between the solid surfacing material fabricator/installer and other trades to ensure that necessary structural wall support, cabinet counter top structural support, proper clearances, and other supporting components are provided for the installation of wall panels, counter tops, shelving, and all other solid surfacing material fabrications to the degree and extent recommended by the solid surfacing material manufacturer.

c. Provide appropriate staging areas for solid surfacing material fabrications. Allow variation in component size and location of openings of plus or minus 1/8 inch.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Fabrication Drawings; G, AE

Installation; G, AE

SD-03 Product Data

Solid Polymer; G, AE

Indoor air quality for solid surface seam and sealant products; S

SD-04 Samples

Material; G, AE

Counter Tops; G

Window Sills; G, AE

SD-06 Test Reports

Test Report Results

SD-07 Certificates

Qualifications

SD-10 Operation and Maintenance Data

Solid Polymer, Data Package 1; G, AE

1.3.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for manufacturers that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

4. Low-Emitting Materials - Interior adhesives and sealants applied on site:

a. Meet the VOC emissions evaluation and meet the VOC content evaluation. The adhesives and sealants product category include all interior adhesives and sealants applied on site. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.4 QUALITY ASSURANCE

1.4.1 Qualifications

To ensure warranty coverage, provide manufacturer certified solid surfacing fabricators to fabricate the solid surfacing material being utilized. Mark all fabrications with the fabricator's certification label affixed in an inconspicuous location. Minimum of 5 years of experience working with solid surfacing materials is required of fabricators. Submit solid surfacing material manufacturer's certification attesting to fabricator qualification approval.

1.4.2 Mock-ups

Submit Detail Fabrication Drawings indicating locations, dimensions, component sizes, fabrication and joint details, attachment provisions, installation details, and coordination requirements with adjacent work. Prior to final approval of shop drawings, provide a full-size mock-up of a typical counter top and window sill where multiple units are required. Include all solid surfacing material components required to provide a completed unit. Utilize finishes in patterns and colors as indicated on drawings; colors listed are not intended to limit the selection of equal colors from other manufacturers. in the mock-up. Should the mock-up not be approved, re-work or remake it until approval is secured. Remove rejected units from the jobsite. Approved mock-up may remain as part of the finished work.

1.5 DELIVERY, STORAGE, AND HANDLING

Do not deliver materials to project site until areas are ready for installation. Deliver components and materials to the site undamaged, in containers clearly marked and labeled with manufacturer's name. Store materials indoors and take adequate precautions to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation, for duration of project.

1.6 WARRANTY

Provide manufacturer's warranty to repair or replace defective materials and workmanship for a period of 5 years from date of final acceptance of the work.

PART 2 PRODUCTS

2.1 MATERIAL

Submit detail fabrication drawings and installation drawings of each solid surfacing fabrication indicated. Include elevations, dimensions, clearances, details of construction and anchorage, and details of joints and connections.

Submit manufacturers' descriptive product data for each type of solid polymer fabrication indicated. Include manufacturers' literature, finishes, profiles and thicknesses of materials.

Submit manufacturers' operations and maintenance data for each type of

solid polymer fabrication in accordance with Section 01 78 23 OPERATIONS AND MAINTENANCE DATA.

Building Product Declarations: Provide solid surfacing materials with EPD and Material Ingredient Report.

2.1.1 Solid Surfacing Material

Provide solid polymer that is a homogeneous filled solid polymer; not coated, laminated or of a composite construction, complying with ICPA SS-1. Provide material that meets or exceeds the minimum physical and performance properties specified. Superficial damage to a depth of 0.01 inch must be repairable by sanding or polishing. Material thickness is as indicated on the drawings. Submit a minimum 4 inch by 4 inch sample of each color and pattern for approval; include full range of color and pattern variation. Retain approved samples as a standard for this work. Submit test report results from an independent testing laboratory attesting that the submitted solid surfacing materials meet or exceed each of the specified performance requirements.

a. Horizontal Surfaces: 3/4 inch thick material

b. Provide recycled content in solid surfacing material to the maximum extent feasible.

2.1.2 Cast, 100 Percent Acrylic Polymer Solid Surfacing Material

Cast, 100 percent acrylic solid polymer material composed of acrylic polymer, mineral fillers, and pigments. Provide acrylic polymer that meets or exceeds the following minimum performance requirements:

PROPERTY	REQUIREMENT (min. or max.)	TEST PROCEDURE
Tensile Strength	4000 psi (max.)	ASTM D638
Hardness	55-Barcol Impressor (min.)	ASTM D2583
Thermal Expansion	.000023 in/in/F (max.)	ASTM D696
Boiling Water Surface Resistance	No Change	ANSI/NEMA LD 3-3.05
High Temperature Resistance	No Change	ANSI/NEMA LD 3-3.06
Impact Resistance (Ball drop)		ANSI/NEMA LD 3-303
1/4 inch sheet	36-inches, 1/2 lb ball, no failure	
1/2 inch sheet	140-inches, 1/2 lb ball, no failure	

PROPERTY	REQUIREMENT (min. or max.)	TEST PROCEDURE
3/4 inch sheet	200-inches, 1/2 lb ball, no failure	
Mold & Mildew Growth	No growth	ASTM G21
Bacteria Growth	No growth	ASTM G21
Liquid Absorption (Weight in 24 hrs.)	0.1 percent max.	ASTM D570
Flammability		ASTM E84
Flame Spread	25 max.	
Smoke Developed	30 max.	
Sanitation	"Food Contact" approval	NSF/ANSI 51
Flexural Strength	10,400 psi (min.)	ASTM D790

2.1.3 Material Patterns and Colors

Provide pattern and color for all solid surfacing material components and fabrications as indicated on drawings; colors listed are not intended to limit the selection of equal colors from other manufacturers. Provide products with consistent patterned color throughout thickness of the product.

2.1.4 Surface Finish

Provide a uniform appearance on exposed finished surfaces and edges. Exposed surface finish is matte; gloss rating of 5-20 or semigloss; gloss rating of 25-50.

2.2 ACCESSORY PRODUCTS

Provide accessory products, as specified below, as manufactured by the solid surfacing material manufacturer or as approved by the solid surfacing material manufacturer for use with the solid surfacing materials being specified.

2.2.1 Adhesives

Provide a two-part seam adhesive kit to create permanent, inconspicuous, non-porous, hard seams and joints by chemical bond between solid surfacing materials and components to create a monolithic appearance of the fabrication. Provide adhesive approved by the solid surfacing material manufacturer. Color-match adhesive to the surfaces being bonded where solid-colored, solid surfacing materials are being bonded together. Provide clear or color matched seam adhesive where particulate patterned, solid surfacing materials are being bonded together.

2.2.2 Seam and Sealant Emissions

Provide seam adhesives and sealants applied within the building interior

with VOC emissions certified in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method and VOC content in compliance with limits of SCAQMD Rule 1168. Provide validation of indoor air quality for solid surface seam and sealant products.

2.2.3 Silicone Sealant

Provide silicone sealant, mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, acid-curing; ASTM C920, Type S, Grade NS, Class 25, Use NT; clear formulation; approved for use by the solid surfacing material manufacturer.

2.2.4 Conductive Tape

Provide manufacturer's standard conductive foil tape, 4 mils thick, applied around the edges of cut outs containing hot or cold appliances.

2.2.5 Insulating Tape

Provide manufacturer's standard insulating tape for use with drop-in food wells used in commercial food service applications to insulate solid surfacing material from hot or cold appliances.

2.2.6 Heat Reflective Tape

Provide heat reflective tape as recommended by the solid surfacing material manufacturer for use with cutouts for heat sources.

2.2.7 Mounting Hardware

Provide mounting hardware, including sink/bowl clips, inserts and fasteners for attachment of undermount sinks and lavatories.

2.3 FABRICATIONS

Provide factory or shop fabricate components to sizes and shapes indicated, to the greatest extent practical, in accordance with approved Shop Drawings and manufacturer's requirements. Provide factory cutouts for sinks, lavatories, and plumbing fixtures where indicated on the drawings. Contours and radii must be routed to template, with edges smooth. Defective and inaccurate work will be rejected. Submit product data indicating product description, fabrication information, and compliance with specified performance requirements for solid surfacing material, joint adhesive, sealants, and heat reflective tape. Both the manufacturer of materials and the fabricator are required to submit a detailed description of operations and processes in place that support efficient use of natural resources, energy efficiency, emissions of ozone depleting chemicals, management of water and operational waste, indoor environmental quality, and other production techniques supporting sustainable design and products.

2.3.1 Joints and Seams

Form joints and seams between solid surfacing material components using manufacturer's approved seam adhesive. Provide inconspicuous joints in appearance without voids to create a monolithic appearance.

2.3.2 Edge Finishing

Rout and finish component edges to a smooth, uniform appearance and finish. Provide edge shapes and treatments, including any inserts, as detailed on the drawings. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.

2.3.3 Counter Top Splashes

Fabricate backsplashes and end splashes from 3/4 inch thick solid surfacing material to be 4 inches high in conformance with dimensions and shapes as indicated. Provide backsplashes and end splashes for all counter tops. Shop fabricate backsplashes and provide loose, to be field attached.

2.3.3.1 End Splashes

Provide end splashes loose for installation at the jobsite after horizontal surfaces to which they are to be attached have been installed.

2.3.4 Window Sill

Fabricate window stools from 3/4 inch thick solid surfacing material; dimensions, edge shape, and other details as indicated equal to the width of the window opening by a 1/2 inch overhang of the window sill depth. Provide square edge profile.

2.3.5 Counter Tops

Fabricate all solid surfacing material, counter top components from 3/4 inch thick material. Indicate details, dimensions, locations, and quantities on the drawings. Provide counter tops with 4 inch high loose as indicated. Attach 2 inch wide reinforcing strip of solid surfacing material under each horizontal counter top seam. Submit a minimum 1 foot wide by 6 inch deep, full size sample for each type of counter top shown on the project drawings; include the edge profile and backsplash as detailed on the drawings and at least one seam. Retain approved sample as standard for this work. Provide square edge profile.

2.3.5.1 Counter Tops with Sinks

a. Provide stainless steel or vitreous china sink; include cutouts to template for counter tops with sinks as furnished by the sink manufacturer. Provide manufacturer's standard sink mounting hardware for stainless steel and vitreous china installation. Seal between sink and counter top with specified silicone sealant. Provide sink, faucet, and plumbing requirements in accordance with Section 22 00 00 PLUMBING,GENERAL PURPOSE.

b. Provide manufacturer's standard solid polymer sinks, pre-molded product specifically designed for attachment to solid surfacing material counter tops. See paragraph SOLID POLYMER SINKS for additional requirements.

2.3.5.2 Counter Tops with Bowls

a. Include cutouts to template for counter tops with vitreous china bowls as furnished by the sink manufacturer. Provide manufacturer's standard sink mounting hardware for vitreous china installation. Seal

between sink and counter top with specified silicone sealant. Provide sink, faucet, and plumbing requirements in accordance with Section 22 00 00 PLUMBING,GENERAL PURPOSE.

b. Provide manufacturer's standard solid polymer bowls, pre-molded product specifically designed for attachment to solid surfacing material counter tops. See paragraph SOLID POLYMER BOWLS for additional requirements

c. Provide manufacturer's standard pre-fabricated one-piece counter top and bowl fabrications. Each unit includes a counter top with integral backsplash and sink bowl. See paragraph SOLID POLYMER BOWLS for additional requirements.

2.3.5.3 Cafeteria Counter Tops

Include cutouts for cold or hot appliances to templates furnished by the equipment manufacturers. Reinforce joints and cutouts as recommended by the solid surfacing material manufacturer. Provide insulation between the solid surface material and all appliances, hot or cold. Thermally isolate hot applications from cold applications in accordance with the solid surfacing material manufacturer's recommendations. Provide expansion joints as necessary to accommodate hot appliances. Provide adequate ventilation for cabinets beneath counter tops to prevent heat build-up.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Components

Install all components and fabricated units plumb, level, and rigid. Make field joints between solid surfacing material components using solid surfacing material manufacturer's approved seam adhesives, to provide a monolithic appearance with joints inconspicuous in the finished work. Attach metal or vitreous china sinks and lavatory bowls to counter tops using solid surfacing material manufacturer's recommended clear silicone sealant and mounting hardware. Install solid polymer sinks and bowls using a color-matched seam adhesive.

3.1.1.1 Loose Counter Top Splashes

Mount loose splashes in the locations noted on the drawings. Adhere loose splashes to the counter top with a color matched silicone sealant when the solid surfacing material components are solid colors. Use a clear silicone sealant to provide adhesion of particulate patterned solid surfacing material splashes to counter tops.

3.1.2 Silicone Sealant

Use specified silicone sealant to seal all expansion joints between solid surfacing material components and all joints between solid surfacing material components and other adjacent surfaces such as walls, floors, ceiling, and plumbing fixtures. Provide sealant bead smooth and uniform in appearance and minimum size necessary to bridge any gaps between the solid surfacing material and the adjacent surface. Provide continuous bead and run the entire length of the joint being sealed.

3.1.3 Plumbing

Make plumbing connections to sinks and lavatories in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.

3.2 CLEAN-UP

Components must be cleaned after installation and covered to protect against damage during completion of the remaining project items. Damaged components must be repaired or replaced at the Contractor's sole expense.

-- End of Section --

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SECTION 07 13 53

ELASTOMERIC SHEET WATERPROOFING
02/16, CHG 1: 08/17

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM D412	(2016) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D429	(2014) Rubber Property-Adhesion to Rigid Substrates
ASTM D570	(1998; E 2010; R 2010) Standard Test Method for Water Absorption of Plastics
ASTM D638	(2014) Standard Test Method for Tensile Properties of Plastics
ASTM D751	(2006; R 2011) Coated Fabrics
ASTM D1004	(2013) Initial Tear Resistance of Plastic Film and Sheeting
ASTM D1204	(2014; R 2020) Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature
ASTM D2136	(2002; R 2012) Coated Fabrics - Low-Temperature Bend Test
ASTM D3045	(1992; R 2010) Practice for Heat Aging of Plastics Without Load

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code

1.2 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Manufacturer's Standard Details; G

Elastomeric Waterproofing Sheet Material; G

Protection Board; G

Primers, Adhesives, and Mastics; G

SD-06 Test Reports

Elastomeric Waterproofing Sheet Material; G

Field Quality Control documentation; G

Protective Covering; G

SD-07 Certificates

Elastomeric Waterproofing Sheet Material; G

Primers, Adhesives, and Mastics; G

Protective Coverings; G

Draft Special Warranties; G

Final Special Warranties; G

SD-08 Manufacturer's Instructions

Primers, Adhesives, and Mastics; G

SD-11 Closeout Submittals

Warranty; G

1.3 MANUFACTURER'S DETAILS

Submit manufacturer's standard details indicating methods of attachment and spacing, transition and termination details, and installation details. Include verification of existing conditions.

1.4 PRODUCT DATA

Include data for material descriptions, recommendations for product shelf life, requirements for protective coverings, and manufacturer's Safety Data Sheets (SDS) for primers, adhesives, and mastics.

1.5 CODE REQUIREMENTS

Provide membrane waterproofing system in accordance with ICC IBC Section 1805 Dampproofing and Waterproofing.

1.6 DELIVERY, STORAGE, HANDLING, IDENTIFICATION

Deliver and store materials in accordance with manufacturer's printed instructions, out of the weather, in manufacturer's original packaging with brand name and product identification clearly marked. Keep materials wrapped and separated from off-gassing materials (such as drying paints

and adhesives). Do not use materials that have visible moisture or biological growth. Do not permit unidentified materials in the work area or in the project.

1.7 ENVIRONMENTAL CONDITIONS

Do not apply waterproofing during inclement weather or when there is ice, frost, surface moisture, or visible dampness on the surface to receive waterproofing for when ambient and surface temperatures are 40 degrees F or below. The restriction on the application of waterproofing materials when ambient and surface temperatures are below 40 degrees F will be waived if the Contractor devises a means, approved by the Contracting Officer in writing, of maintaining the surface and ambient temperatures above 40 degrees F.

1.8 SPECIAL WARRANTIES

1.8.1 Guarantee

Guarantee waterproofing membrane installation against failure due to leaks for a period of two years from the date of Beneficial Occupancy. Submit draft and final guarantees in accordance with Sections 01 78 00 CLOSEOUT SUBMITTALS and 01 78 23 OPERATION AND MAINTENANCE DATA.

1.8.2 Warranty

Provide manufacturer's material warranty for all system components for a period of ten years from the date of Beneficial Occupancy. Submit draft and final warranties in accordance with Sections 01 78 00 CLOSEOUT SUBMITTALS and 01 78 23 OPERATION AND MAINTENANCE DATA.

PART 2 PRODUCTS

2.1 MATERIALS

Provide one of the types of elastomeric waterproofing sheet material and related primers, adhesives, and mastics as specified herein. Ensure compatibility of waterproofing materials with each other, and with materials on which they are applied. Provide materials that comply with applicable requirements cited below when tested in accordance with the referenced ASTM publications.

2.2 THERMOPLASTIC MEMBRANE: POLYVINYL CHLORIDE (PVC)

Polyvinyl chloride (PVC) flexible sheets with non-woven fiberglass reinforcing not less than 60 mils minimum thickness.

2.2.1 Thermoplastic Membrane Performance Requirements

a. Overall thickness, ASTM D751: .059 inches minimum

b. Tensile strength, ASTM D638: 1600 psi minimum

c. Elongation at break, ASTM D638: 250 percent minimum

d. Seam strength, ASTM D638: 90 percent minimum of tensile strength

e. Retention of properties after heat aging, ASTM D3045

f. Tensile strength, ASTM D638: 95 percent of original

g. Elongation, ASTM D638: 95 percent of original

h. Tear resistance, ASTM D1004: 17 lbf

i. Low Temperature Bend, ASTM D2136: minus 40 degrees F

j. Liner Dimensional Change, ASTM D1204: 0.002 percent

k. Weight Change After Immersion in Water, ASTM D570: 2.0 percent maximum

2.2.2 Adhesives

a. Adhesive for thermoplastic flashings as recommended by manufacturer.

b. Adhesive for Sub-Membrane Grid: 100 percent solids, two part urethane, with minimum tensile strength of 150 psi, in accordance with ASTM D412 and adhesion to concrete of 12 ply in accordance with ASTM D429 as recommended by manufacturer.

2.2.3 Accessories

Securement Strip: 14 gauge stainless steel metal bar 1 inch wide, pre-punched 1 inch on center for securement.

2.3 PROTECTION BOARD

Provide protection board that is compatible with the waterproofing membrane. Use a minimum 1 inch for polystyrene protection board as recommended by the manufacturer.

Three dimensional, high impact resistant polymeric grid with woven monofilament drainage fabric bonded to the grid.

PART 3 EXECUTION

3.1 VERIFICATION OF CONDITIONS

Before starting the work, verify surfaces that must be waterproofed are in satisfactory condition. Notify the Contracting Officer of defects or conditions anticipated to prevent a satisfactory application. Do not start application until defects and conditions have been corrected.

3.2 SURFACE PREPARATION

Ensure surfaces to receive treatment are clean, dry, smooth, and free from deleterious materials and projections. Thoroughly wet holes, joints, cracks, and voids in masonry with water and fill with Portland cement mortar, strike flush, and permit to dry. Cut off high spots or grind smooth. Finish top surfaces of projecting masonry or concrete ledges below grade, except footings, to a steep bevel with Portland cement mortar. Sweep surfaces to receive covering before applying waterproofing to remove dust and foreign matter. Cure concrete by a method compatible with the waterproofing system.

3.3 APPLICATION

3.3.1 Building Envelope Requirements

Provide a continuous waterproofing system at all material and building transitions. Lap, wrap, fasten and seal products in accordance with manufacturer's printed instructions. Envelope assembly variations are not permitted without written approval from the Contracting Officer's Representative.

3.3.2 General Installation Requirements

Provide sheet waterproofing in accordance with manufacturer's printed installation instructions. Ensure the surface to receive membrane is clean, smooth and dry without surface irregularities; correct deficiencies prior to installation. When using solvent welding liquid, avoid prolonged contact with skin and breathing of vapor and provide adequate ventilation. Carry waterproofing of horizontal surfaces up abutting vertical surfaces and adhere solid to the substrate. Avoid wrinkles and buckles in applying membrane and joint reinforcement.

3.3.2.1 Self-Adhering Membrane

Apply composite, self-adhering membrane on surfaces primed at a uniform coverage rate in accordance with membrane manufacturer's printed instructions. Remove release sheet and apply with tacky surface in contact with dried primer.

3.3.3 Thermoplastic Membrane (PVC)

Consult with membrane manufacturer prior to grid application. Install 12 inches wide sub-membrane containment grid as required by manufacturer. Provide the containment grid at intervals across the width and length of the substrate, at the base of all transitions, walls, curbs, penetrations, and at the perimeter of each deck/substrate section. Fully adhere strips to the deck in a full bedding of two-part urethane adhesive. Weld adjacent sheets in accordance with manufacturer's instructions. Hot-air weld all side and end lap joints. Provide lap area a minimum of 3 inch wide when machine welding, and a minimum of 4 inch wide when hand welding but not less than recommended by the manufacturer. Orient overlaps with the direction of flow of water.

3.4 FLASHING

Flash penetrations through membrane. Seal all penetrations where reinforcing bars penetrate a waterproofing membrane with the appropriate sealant or mastic flashing component. Embed elastomeric membrane in a heavy coat of adhesive, except for self-adhering membrane. Position continuous metal reglets horizontally on footing and vertically on intersecting and connecting walls, and as specified in Section 07 60 00 FLASHING AND SHEET METAL. Metal reglets are to receive exposed edges of membrane waterproofing. Secure membrane into reglets by lead wedges and fill with cement as recommended in writing by manufacturer of waterproofing materials. Counterflash upper edge of membrane waterproofing and protective covering as specified in Section 07 60 00 FLASHING AND SHEET METAL.

3.5 FIELD QUALITY CONTROL

Notify the Contracting Officer 5 working days prior to date of performing tests. Before concealment, cover elastomeric waterproofing on horizontal surfaces over finished spaces with 3 inches of ponded water for 24 hours. Do not add water after start of 24 hour period. Accurately measure water level at beginning and end of 24 hour period. If water level falls, remove water and inspect waterproofing membrane. Make repairs or replacement as directed, and repeat test. Do not proceed with work that conceals membrane waterproofing before receiving approval and acceptance of the Contracting Officer.

3.6 PROTECTIVE COVERING

After installation has been inspected and approved by the Contracting Officer, apply a protective covering to the membrane waterproofing prior to backfilling. Protect vertical membrane waterproofing with with protection board compatible with the self adhered membrane as specified.

-- End of Section --

SECTION 07 14 00

FLUID-APPLIED WATERPROOFING
02/12

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM C33/C33M	(2018) Standard Specification for Concrete Aggregates
ASTM C578	(2019) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C836/C836M	(2015) High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use With Separate Wearing Course
ASTM D1056	(2014) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Fluid-Applied Membrane

Membrane Primer

Elastomeric Sheet

Flexible Foam-Backed Elastomeric Sheet

Solvent

Moisture Meter

Protection Board

Bond Breaker

Submit material description and physical properties, application details, and recommendations regarding shelf life, application procedures, and precautions on flammability and toxicity.

SD-11 Closeout Submittals

Warranty

Information Card

Instructions To Government Personnel

Include copies of Safety Data Sheets for maintenance/repair materials.

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment for insulation, waterproofing and elastomeric sheet, if available; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for insulation, waterproofing and elastomeric sheet, if available, that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

1.3 PREWATERPROOFING CONFERENCE

Prior to starting application of waterproofing system, arrange and attend a prewaterproofing conference to ensure a clear understanding of drawings and specifications. Give the Contracting Officer 7 days advance written notice of the time and place of meeting. Ensure that the mechanical and electrical subcontractor, flashing and sheetmetal subcontractor, and other trades that may perform other types of work on or over the membrane after installation, attend this conference.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver waterproofing materials in manufacturer's original, unopened containers, with labels intact and legible. Containers of materials covered by a referenced specification number shall bear the specification number, type, and class of the contents. Deliver materials in sufficient quantity to continue work without interruption. Store and protect materials in accordance with manufacturer's instructions, and use within their indicated shelf life. When hazardous materials are involved, adhere to special precautions of the manufacturer, unless precautions conflict with local, state, and federal regulations. Promptly remove from the site materials or incomplete work adversely affected by exposure to moisture or freezing. Store materials on pallets and cover from top to bottom with canvas tarpaulins.

1.5 ENVIRONMENTAL CONDITIONS

Apply materials when ambient temperature is 40 degrees F or above for a period of 24 hours prior to the application and when there is no ice, frost, surface moisture, or visible dampness on the substrate surface. Apply materials when air temperature is expected to remain above 40 degrees F during the cure period recommended by the manufacturer. Moisture test for substrate is specified under paragraph entitled "Moisture Test." Work may be performed within heated enclosures, provided the surface temperature of the substrate is maintained at a minimum of 40 degrees F for 24 hours prior to the application of the waterproofing, and remains above that temperature during the cure period recommended by the manufacturer.

1.6 WARRANTY

Provide roof system material and workmanship warranties meeting specified requirements. Provide revisions or amendment to standard membrane manufacturer warranty to comply with the specified requirements. Minimum manufacturer warranty shall have no dollar limit, cover full system water-tightness, and shall have a minimum duration of 20 years.

1.6.1 Roof Membrane Manufacturer Warranty

Furnish the roof membrane manufacturer's 20-year no dollar limit roof system materials and installation workmanship warranty, including flashing, insulation, and accessories necessary for a watertight roof system construction. Write the warranty directly to the Government commencing at time of Government's acceptance of the roof work. Provide the the following statements for such warranty:

a. If within the warranty period the roof system, as installed for its intended use in the normal climatic and environmental conditions of the facility, becomes non-watertight, shows evidence of moisture intrusion within the assembly, blisters, splits, tears, cracks, delaminates, separates at the seams, or shows evidence of excessive weathering due to defective materials or installation workmanship, the repair or replacement of the defective and damaged materials of the roof system assembly and correction of defective workmanship are the responsibility of the roof membrane manufacturer. All cost associated with the repair or replacement work are the responsibility of the roof membrane manufacturer.

b. The warranty must remain in full force and effect, including emergency

temporary repairs performed by others, when the manufacturer or his approved applicator fail to perform the repairs within 72 hours of notification.

1.6.2 Roofing System Installer Warranty

The roof system installer must warrant for a minimum period of two years that the roof system, as installed, is free from defects in installation workmanship, to include the roof membrane, flashing, insulation, accessories, attachments, and sheet metal installation integral to a complete watertight roof system assembly. Write the warranty directly to the Government. The roof system installer is responsible for correction of defective workmanship and replacement of damaged or affected materials. The roof system installer is responsible for all costs associated with the repair or replacement work.

1.6.3 Continuance of Warranty

Approve repair or replacement work that becomes necessary within the warranty period and accomplished in a manner so as to restore the integrity of the roof system assembly and validity of the roof membrane manufacturer warranty for the remainder of the manufacturer warranty period.

PART 2 PRODUCTS

2.1 FLUID-APPLIED MEMBRANE

ASTM C836/C836M.

2.2 MEMBRANE PRIMER

As recommended by the fluid-applied membrane manufacturer unless specifically prohibited by the manufacturer of the fluid-applied membrane.

2.3 SEALANT

As specified in Section 07 92 00 JOINT SEALANTS.

2.4 SEALANT PRIMER

As specified in Section 07 92 00 JOINT SEALANTS.

2.5 BACKING MATERIAL

Premolded, closed-cell, polyethylene, or polyurethane foam rod having a diameter 25 percent larger than joint width before being compressed into joint. Provide bond breaker of polyethylene film or other suitable material between backing material and sealant.

2.6 JOINT FILLER

As specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.

2.7 BOND BREAKER

As recommended by the fluid-applied membrane manufacturer. Bond breaker shall not interfere with the curing process or other performance properties of the fluid-applied membrane.

2.8 ELASTOMERIC SHEET

Preformed; as recommended by the fluid-applied membrane manufacturer. Bond strength between the fluid-applied membrane and the preformed elastomeric sheet shall be a minimum of one psi when tested in accordance with ASTM C836/C836M.

2.9 ELASTOMERIC SHEET ADHESIVE

As recommended by the elastomeric sheet manufacturer.

2.10 FLEXIBLE FOAM-BACKED ELASTOMERIC SHEET

Flexible foam-backed elastomeric sheet for protection over preformed elastomeric sheet at expansion joints shall be 1/2 inch thick, minimum, closed cell foam conforming to ASTM D1056, Type 2, Class B, Grades 2 or 3, factory-bonded to 1/16 inch thick, minimum, preformed elastomeric sheet.

2.11 PROTECTION BOARD

Premolded bitumen composition board, 1/8 inch minimum thickness or other composition board compatible with the fluid-applied membrane.

2.12 DRAINAGE COURSE AGGREGATE

ASTM C33/C33M, size No. 8.

2.13 INSULATION

Polystyrene foam conforming to ASTM C578, Class IV, thickness as indicated.

PART 3 EXECUTION

3.1 PREPARATION

Coordinate work with that of other trades to ensure that components to be incorporated into the waterproofing system are available when needed. Inspect and approve surfaces immediately before application of waterproofing materials. Remove laitance, loose aggregate, sharp projections, grease, oil, dirt, curing compounds, and other contaminants which could adversely affect the complete bonding of the fluid-applied membrane to the concrete surface.

3.1.1 Flashings

Make penetrations through sleeves in concrete slab watertight before application of waterproofing. After flashing is completed, cover elastomeric sheet with fluid-applied waterproofing during waterproofing application.

3.1.1.1 Drains

Make drain flanges flush with surface of structural slab. Apply a full elastomeric sheet around the drain, with edges fully adhered to drain flange and to structural slab. Do not adhere elastomeric sheet over joint between drain and concrete slab. Do not plug drainage or weep holes. Cover elastomeric sheet with fluid-applied waterproofing during waterproofing application. Lap elastomeric sheet a minimum of 4 inches

onto concrete slab.

3.1.1.2 Penetrations and Projections

Flash penetrations and projections through structural slab with an elastomeric sheet adhered to the concrete slab and the penetration. Leave elastomeric sheet unadhered for one inch over joint between penetration and concrete slab. Adhere elastomeric sheet a minimum of 4 inches onto horizontal deck.

3.1.1.3 Walls and Vertical Surfaces

Flash wall intersections which are not of monolithic pour or constructed with reinforced concrete joints with an elastomeric sheet adhered to both vertical wall surfaces and concrete slab. Flash intersections which are monolithically poured or constructed with reinforced concrete joints with either an elastomeric sheet or a vertical grade of fluid-applied waterproofing adhered to vertical wall surfaces and concrete slab. Leave sheet unadhered for a distance of one inch from the corner on both vertical and horizontal surfaces.

3.1.2 Cracks and Joints

Prepare visible cracks and joints in substrate to receive fluid-applied waterproofing membrane by placing a bond breaker and an elastomeric slip sheet between membrane and substrate. Cracks that show movement shall receive a 2 inch bond breaker followed by an elastomeric sheet adhered to the deck. Nonmoving cracks shall be double coated with fluid-applied waterproofing.

3.1.3 Priming

Prime surfaces to receive fluid-applied waterproofing membrane. Apply primer as required by membrane manufacturer's printed instructions.

3.2 SPECIAL PRECAUTIONS

Protect waterproofing materials during transport and application. Do not dilute primers and other materials, unless specifically recommended by materials manufacturer. Keep containers closed except when removing contents. Do not mix remains of unlike materials. Thoroughly remove residual materials before using application equipment for mixing and transporting materials. Do not permit equipment on the project site that has residue of materials used on previous projects. Use cleaners only for cleaning, not for thinning primers or membrane materials. Ensure that workers and others who walk on cured membrane wear clean, soft-soled shoes to avoid damaging the waterproofing materials.

3.3 APPLICATION

Over primed surfaces, provide a uniform, wet, monolithic coating of fluid-applied membrane, 60 mils thick, plus or minus 5 mils by following manufacturer's printed instructions. Apply material by trowel, squeegee, roller, brush, spray apparatus, or other method recommended by membrane manufacturer. Check wet film thickness as specified in paragraph entitled "Film Thickness" and adjust application rate as necessary to provide a uniform coating of the thickness specified. Where possible, mark off surface to be coated in equal units to facilitate proper coverage. At expansion joints, control joints, prepared cracks, flashing, and

terminations, carry membrane over preformed elastomeric sheet in a uniform 60 mil thick, plus or minus 5 mils, wet thickness to provide a monolithic coating. If membrane cures before next application, wipe previously applied membrane with a solvent to remove dirt and dust that could inhibit adhesion of overlapping membrane coat. Use solvent recommended by the membrane manufacturer, as approved.

3.3.1 Work Sequence

Perform work so that protection board is installed prior to using the waterproofed surface. Do not permanently install protection board until the membrane has passed the flood test specified under paragraph entitled "Flood Test." Move material storage areas as work progresses to prevent abuse of membrane and overloading of structural deck.

3.3.2 Protection Board

Protect fluid-applied membrane by placing protection board over membrane at a time recommended by the membrane manufacturer. Protect membrane application when protection board is not placed immediately. Butt protection boards together and do not overlap.

3.3.3 Drainage Course

Place drainage course where shown after flood tests are completed and concrete protection slab or wearing course is ready to be installed.

3.3.4 Insulation

Place insulation of thickness indicated, on top of drainage course just prior to placement of concrete protection slab.

3.4 FIELD QUALITY CONTROL

3.4.1 Moisture Test

Prior to application of fluid-applied waterproofing, measure moisture content of substrate with a moisture meter in the presence of the Contracting Officer. Do not begin application until meter reading indicates "dry" range.

3.4.2 Film Thickness

Measure wet film thickness every 100 square feetduring application by placing flat metal plates on the substrate or using a mil-thickness gage especially manufactured for the purpose.

3.4.3 Flood Test

After application and curing is complete, plug drains and fill waterproofed area with water to a depth of 2 inches. A minimum 48 hour cure time, or longer cure time if recommended by the membrane manufacturer, shall be required prior to flood testing. Allow water to stand 24 hours. Test watertightness by measuring water level at beginning and end of the 24 hour period. If water level falls, drain water, allow installation to dry, and inspect. Make repairs or replace as required and repeat the test. Work shall not proceed before approval of repairs or replacement.

3.5 INSTRUCTIONS TO GOVERNMENT PERSONNEL

Furnish written and verbal instructions on proper maintenance procedures to designated Government personnel. Furnish instructions by a competent representative of the roof membrane manufacturer and include a minimum of 4 hours on maintenance and emergency repair of the membrane. Include a demonstration of membrane repair, and give sources of required special tools. Furnish information on safety requirements during maintenance and emergency repair operations.

3.6 INFORMATION CARD

For each roof application, furnish a minimum 8-1/2 inch by 11 inch information card for facility records and a card laminated in plastic and framed for interior display at roof access point, or a photoengraved 0.032 inch thick aluminum card for exterior display. Identify facility name and number; location; contract number; approximate roof area; detailed roof system description, including deck type, membrane, number of plies, method of application, manufacturer, insulation and cover board system and thickness; presence of tapered insulation for primary drainage, presence of vapor retarder; date of completion; installing contractor identification and contract information; membrane manufacturer warranty expiration, warranty reference number, and contact information. Install card at roof top or access location as directed by the Contracting Officer and provide a paper copy to the Contracting Officer.

FORM 1
FLUID-APPLIED WATERPROOFING SYSTEM COMPONENTS
1. Contract Number
2. Date Work Completed
3. Project Specification Designation
4. Substrate Material
5. Slope of Substrate
6. Drains Type/Manufacturer
7. Waterproofing
a. Membrane
b. Sealant
c. Elastomeric Sheet
d. Materials Manufacturer(s)
8. Protection Board
a. Type
b. Thickness
c. Manufacturer's Name
9. Drainage Course Material Graduation
10. Insulation
a. Type
b. Thickness
c. Manufacturer's Name
11. Protection Slab
a. Material
b. Thickness
c. Support

FORM 1	
FLUID-APPLIED WATERPROOFING SYSTEM COMPONENTS	
d. Joint System	
12. Wearing Course	
a. Type	
b. Slope	
c. Joint System	
d. Sealant/Gasket Type	
13. Wearing Surface Type	
Manufacturer's Name	
14. Warranty	
a. Manufacturer warranty expiration	
b. Warranty reference number	
15. Statement of Compliance or Exception	
Contractor's Signature	Date Signed
Inspector's Signature	Date Signed

-- End of Section --

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SECTION 07 21 13

BOARD AND BLOCK INSULATION
02/16

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM C165	(2007; R 2017) Standard Test Method for Measuring Compressive Properties of Thermal Insulations
ASTM C272/C272M	(2016) Standard Test Method for Water Absorption of Core Materials for Sandwich Constructions
ASTM C578	(2019) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C612	(2014; R 2019) Standard Specification for Mineral Fiber Block and Board Thermal Insulation
ASTM C930	(2019) Standard Classification of Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories
ASTM D1621	(2016) Standard Test Method for Compressive Properties of Rigid Cellular Plastics
ASTM D3833/D3833M	(1996; R 2011) Water Vapor Transmission of Pressure-Sensitive Tapes
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

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 31	(2020) Standard for the Installation of Oil-Burning Equipment

NFPA 54	(2018) National Fuel Gas Code
NFPA 70	(2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code
NFPA 211	(2019) Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

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

29 CFR 1910.134	Respiratory Protection

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Manufacturer's Standard Details; G, AE

Block or Board Insulation; G, AE

Pressure Sensitive Tape; G

Protection Board or Coatings; G

Accessories including sealants; G, AE

Recycled Content for Block or Board Insulation; S

SD-07 Certificates

Block or Board Insulation; G, AE

Protection Board or Coating; G

Draft Special Warranties; G, AE

Final Special Warranties; G, AE

Indoor Air Quality For Block Or Board Insulation; S

Indoor Air Quality for Adhesives; S

Energy Star Certificate for Extruded Cellular Polystyrene Insulation; S

SD-08 Manufacturer's Instructions

Block or Board Insulation

Adhesive

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for insulation, if available, that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification; Facts – NSF/ANSI 336.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

1.3 MANUFACTURER'S DETAILS

Submit manufacturer's standard details indicating methods of attachment and spacing, transition and termination details, and installation details. Include verification of existing conditions.

1.4 PRODUCT DATA

Include data for material descriptions, recommendations for product shelf life, requirements for protection board or coatings, and precautions for flammability and toxicity. Include data to verify compatibility of sealants with insulation.

1.5 CERTIFICATIONS

1.5.1 Building Product Declarations

Provide insulation with EPD and Material Ingredient Report, if available.

1.5.2 ENERGY STAR Certification

Provide Energy Star Certificate for Extruded Cellular Polystyrene Insulation to validate product is qualified as an ENERGY STAR product.

1.6 DELIVERY, STORAGE, AND HANDLING

1.6.1 Delivery

Deliver materials to the site in original sealed wrapping bearing manufacturer's name and brand designation, specification number, type, grade, R-value, and class. Store and handle to protect from damage. Do not allow insulation materials to become wet, soiled, crushed, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storing, and protecting of materials before and during installation.

1.6.2 Storage

Inspect materials delivered to the site for damage and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling. Keep materials wrapped and separated from off-gassing materials (such as drying paints and adhesives). Do not use materials that have visible moisture or biological growth. Comply with manufacturer's recommendations for handling, storage, and protection of materials before and during installation.

1.7 SAFETY PRECAUTIONS

1.7.1 Respirators

Provide installers with dust/mist respirators, training in their use, and protective clothing, all approved by the National Institute for Occupational Safety and Health (NIOSH)/Mine Safety and Health Administration (MSHA) and in accordance with 29 CFR 1910.134.

1.7.2 Other Safety Considerations

Comply with the safety requirements of ASTM C930.

1.8 SPECIAL WARRANTIES

1.8.1 Guarantee

Guarantee insulation installation against failure due to ultraviolet light exposure for a period of three years from the date of Beneficial Occupancy or Substantial Completion. Submit draft and final guarantees in accordance with Sections 01 78 00 CLOSEOUT SUBMITTALS and 01 78 23 OPERATION AND MAINTENANCE DATA.

1.8.2 Warranty

Provide manufacturer's material warranty for all system components for a period of three years from the date of Beneficial Occupancy or Substantial Completion. Submit draft and final warranties in accordance with Sections 01 78 00 CLOSEOUT SUBMITTALS and 01 78 23 OPERATION AND MAINTENANCE DATA.

PART 2 PRODUCTS

2.1 BLOCK OR BOARD INSULATION

Provide thermal insulating materials as recommended by manufacturer for each type of application indicated. Provide insulation with the following

physical properties and in accordance with the following standards:

a. Extruded Preformed Cellular Polystyrene: ASTM C578 REV A

b. Mineral Fiber Block and Board: ASTM C612

2.1.1 Thermal Resistance

As indicated on drawings.

2.1.2 Fire Protection Requirements

a. Flame spread index of 75 or less when tested in accordance with ASTM E84.

b. Smoke developed index of 165 or less when tested in accordance with ASTM E84.

c. Provide insulated assemblies in accordance ICC IBC Chapter Fire and Smoke Protection Features.

2.1.3 Other Material Properties

Provide thermal insulating materials with the following properties:

a. Rigid cellular plastics: Compressive Resistance at Yield: Not less than 25 pounds per square inch (psi) when measured according to ASTM D1621.

b. Mineral fiber board: Compressive strength: Minimum load required to produce a reduction in thickness of 10 percent pounds per square foot (lbf/sf): 1000 when tested according to ASTM C165.

c. Water Vapor Permeance: Not more than 1.5 Perms or less when measured according to ASTM E96/E96M, desiccant method, in the thickness required to provide the specified thermal resistance, including facings, if any.

d. Water Absorption: Not more than 0.3 percent by total immersion, by volume, when measured according to ASTM C272/C272M.

2.1.4 Recycled Materials

Provide thermal insulation containing recycled materials to the extent practicable, provided that the material meets all other requirements of this section. The minimum required recycled material contents (by weight, not volume) are:

Polyisocyanurate/Polyurethane:	9 percent
Phenolic Rigid Foam:	5 percent
Perlite Board:	75 percent post consumer paper

Provide data identifying percentage of recycled content for block or board

insulation and in accordance with Section 01 33 29.

2.1.5 Indoor Air Quality

Provide certification of indoor air quality for block or board insulation.

2.1.6 Prohibited Materials

Do not provide materials containing asbestos.

2.2 PRESSURE SENSITIVE TAPE

As recommended by manufacturer of vapor retarder(s). Match water vapor permeance rating for each vapor retarder specified. Provide tape in accordance with ASTM D3833/D3833M.

2.3 PROTECTION BOARD OR COATING

As recommended by insulation manufacturer.

2.4 ACCESSORIES

2.4.1 Adhesive

As recommended by insulation manufacturer. Provide validation of indoor air quality for adhesives.

2.4.2 Mechanical Fasteners

Corrosion resistant fasteners as recommended by the insulation manufacturer.

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

Prior to installation, ensure all areas that are in contact with the insulation are dry and free of projections that could cause voids, compressed insulation, or punctured vapor retarders. For foundation perimeter or under slab applications, check that subsurface fill is flat, smooth, dry, and well tamped. Do not proceed with installation if moisture or other conditions are present, and notify the Contracting Officer of such conditions. Do not proceed with the work until conditions have been corrected and verified to be dry.

3.2 PREPARATION

3.2.1 Blocking Around Heat Producing Devices

Provide noncombustible blocking at all spaces between heat producing devices and the floors, ceilings and roofs through which they pass. Provide in accordance with ICC IBC Section 2111.12 Fireplace Blocking and with the following clearances:

a. Recessed lighting fixtures, including wiring compartments, ballasts, and other heat producing devices, unless certified for installation surrounded by insulation: 3 inches from outside face of fixtures and devices or as required by NFPA 70 and, if insulation is placed above fixture or device, 24 inches above fixture.

b. Masonry chimneys or masonry enclosing a flue: 2 inches from outside face of masonry. Masonry chimneys for medium and high heat operating appliances: Minimum clearances required by NFPA 211.

c. Vents and vent connectors used for venting products of combustion, flues, and chimneys other than masonry chimneys: Minimum clearances as required by NFPA 211.

d. Gas Fired Appliances: Clearances as required in NFPA 54.

e. Oil Fired Appliances: Clearances as required in NFPA 31.

Blocking is not required if chimneys or flues are certified in writing by the chimney or flue manufacturer for use in contact with specific insulating materials.

3.3 INSTALLATION

3.3.1 Installation and Handling

Provide insulation in accordance with the manufacturer's printed installation instructions. Keep material dry and free of extraneous materials.

3.3.2 Electrical Wiring

Do not install insulation in a manner that would enclose electrical wiring between two layers of insulation.

3.3.3 Cold Climate Requirement

Place insulation on the outside of pipes.

3.3.4 Continuity of Insulation

Butt tightly against adjoining boards, studs, rafters, joists, sill plates, headers and obstructions. Provide continuity and integrity of insulation at corners, wall to ceiling joint, roof, and floor. Avoid creating thermal bridges and voids. Provide and verify continuity of insulative barrier throughout the building enclosure.

3.3.5 Coordination

Verify final installed insulation thicknesses comply with thicknesses indicated, R-values specified herein, and with the approved insulation submittal(s).

3.4 INSTALLATION ON WALLS

3.4.1 Installation using Furring Strips

Install insulation between members as recommended by insulation manufacturer.

3.4.2 Installation on Masonry Walls

Apply board directly to masonry with adhesive or fasteners as recommended by the insulation manufacturer. Fit between obstructions without impaling

board on ties or anchors. Apply in parallel courses with joints breaking midway over course below. Place boards in moderate contact with adjoining insulation without forcing and without gaps. Cut and shape as required to fit around wall penetrations, projections or openings to accommodate conduit or other utilities. Seal around cutouts with sealant. Install insulation in wall cavities so that it leaves at least a nominal 1 inch air space outside of the insulation to allow for cavity drainage.

3.4.3 Adhesive Attachment to Concrete and Masonry Walls

Apply adhesive to wall and completely cover wall with insulation.

a. As recommended by the insulation manufacturer.

3.4.4 Mechanical Attachment on Concrete and Masonry Walls

Cut insulation to cover walls. Apply adhesive to wall and set clip or other mechanical fastener in adhesive as recommended by manufacturer. After curing of adhesive, install insulation over fasteners and bend split prongs to provide a flush condition with the insulation. Butt all edges of insulation and seal with tape.

3.5 PERIMETER AND UNDER SLAB INSULATION

Install perimeter thermal insulation where heated spaces are adjacent to exterior walls, slab edges in slab-on-grade, or floating slab construction.

3.5.1 Manufacturer's Instructions

Layout insulation, tape edges, provide vapor retarder and other required accessories to protection against vermin, insects, and damage in accordance with manufacturer's printed instructions.

3.5.2 Insulation on Vertical Surfaces

Provide thermal insulation as indicated on the documents.

3.5.3 Protection of Insulation

Protect insulation from damage during construction and back filling by application of protection board or a coating. Do not leave installed vertical insulation unprotected overnight. Protect installed insulation from weather, including rain and ultraviolet light, from mechanical abuse, compression, and dislocation.

-- End of Section --

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SECTION 07 21 16

MINERAL FIBER BLANKET INSULATION
11/11

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM C665	(2017) Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
ASTM C930	(2019) Standard Classification of Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories
ASTM D3833/D3833M	(1996; R 2011) Water Vapor Transmission of Pressure-Sensitive Tapes
ASTM D5359	(2015) Standard Specification for Glass Cullet Recovered from Waste for Use in Manufacture of Glass Fiber
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E136	(2019a) Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 31	(2020) Standard for the Installation of Oil-Burning Equipment
NFPA 54	(2018) National Fuel Gas Code
NFPA 70	(2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code

NFPA 211	(2019) Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

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

29 CFR 1910.134	Respiratory Protection

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Blanket Insulation

Recycled Content for Insulation Materials; S

Pressure Sensitive Tape

Accessories

SD-07 Certificates

Indoor Air Quality for Insulation Materials; S

Indoor Air Quality for Adhesives; S

SD-08 Manufacturer's Instructions

Insulation

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for insulation that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification; Facts – NSF/ANSI 336.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

4. Low-Emitting Materials - Interior adhesives and sealants applied on site:

a. Meet the VOC emissions evaluation and meet the VOC content evaluation. The adhesives and sealants product category include all interior adhesives and sealants applied on site. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

5. Low-Emitting Materials - Insulation:

a. Meet the VOC emissions evaluation for all insulation products. The insulation material category includes all thermal and acoustic boards, batts, rolls, blankets, sound attenuation fire blankets, foamed-in place, loose-fill, blown, and sprayed insulation. Insulation for HVAC ducts and plumbing piping are excluded. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.3 CERTIFICATIONS

Submit required indoor air quality certifications and validations in one submittal package. Submit in accordance with 01 33 29 SUSTAINABILITY REPORTING.

Building Product Declarations: Provide insulation with EPD and Material Ingredient Report.

1.3.1 Insulation Products

Provide insulation installed within the building interior with VOC emissions certified in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method.

1.3.2 Adhesives and Sealants

Provide adhesives and sealants applied within the building interior with VOC emissions certified in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method and VOC content in compliance with limits of SCAQMD Rule 1168.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

Deliver materials to site in original sealed wrapping bearing manufacturer's name and brand designation, specification number, type, grade, R-value, and class. Store and handle to protect from damage. Do not allow insulation materials to become wet, soiled, crushed, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storing, and protecting of materials before and during installation.

1.4.2 Storage

Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling.

1.5 SAFETY PRECAUTIONS

1.5.1 Respirators

Provide installers with dust/mist respirators, training in their use, and protective clothing, all approved by National Institute for Occupational Safety and Health (NIOSH)/Mine Safety and Health Administration (MSHA) in accordance with 29 CFR 1910.134.

1.5.2 Other Safety Concerns

Consider other safety concerns and measures as outlined in ASTM C930.

PART 2 PRODUCTS

2.1 BLANKET INSULATION

ASTM C665, Type I, blankets without membrane coverings ; except a flame spread rating of 25 or less and a smoke developed rating of 150 or less when tested in accordance with ASTM E84.

2.1.1 Thermal Resistance Value (R-VALUE)

The R-Value must be 3.7/inch.

2.1.2 Recycled Materials

Provide insulation materials containing the following minimum percentage of recycled material content by weight:

Fiberglass: 20 percent glass cullet complying with ASTM D5359

Mineral Fiber: 75% recycled content.

Provide data identifying percentage of recycled content for insulation materials in accordance with Section 01 33 29 SUSTAINABILITY REPORTING.

2.1.3 Prohibited Materials

Do not provide asbestos-containing materials.

2.1.4 Reduced Volatile Organic Compounds (VOC) for Insulation Materials

Provide certification of indoor air quality for insulation materials.

2.2 SOUND ATTENUATION BLANKETS (SAFB)

Refer to Section 09 29 00 GYPSUM BOARD.

2.3 HIGH-THERMAL RESISTANCE BLANKET INSULATION

Provide 1" thin profile, high thermal-resistance blanket were indicated. Product description: Fire-resistant, reinforced silicon aerogel insulation blanket, high water permeability, hydrophobic and does not settle over time.

R-Value: 9.8/ inch.

2.4 BLOCKING

Wood, metal, unfaced mineral fiber blankets in accordance with ASTM C665, Type I, or other approved materials. Use only non-combustible materials meeting the requirements of ASTM E136 for blocking around chimneys and heat producing devices.

2.5 PRESSURE SENSITIVE TAPE

As recommended by the vapor retarder manufacturer and having a water vapor permeance rating of one perm or less when tested in accordance with ASTM D3833/D3833M.

2.6 ACCESSORIES

2.6.1 Adhesive

As recommended by the insulation manufacturer. Provide adhesives applied within the building interior with VOC emissions certified in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method and VOC content in compliance with limits of SCAQMD Rule 1168.
Provide certification or validation of indoor air quality for adhesives.

2.6.2 Mechanical Fasteners

Corrosion resistant fasteners as recommended by the insulation manufacturer.

2.6.3 Wire Mesh

Corrosion resistant and as recommended by the insulation manufacturer.

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

Before installing insulation, ensure that areas that will be in contact with the insulation are dry and free of projections which could cause voids, compressed insulation, or punctured vapor retarders. If moisture or other conditions are found that do not allow the workmanlike installation of the insulation, do not proceed but notify Contracting

Officer of such conditions.

3.2 PREPARATION

3.2.1 Blocking Around Heat Producing Devices

Install non-combustible blocking around heat producing devices to provide the following clearances:

a. Recessed lighting fixtures, including wiring compartments, ballasts, and other heat producing devices, unless these are certified by the manufacturer for installation surrounded by insulation: 3 inches from outside face of fixtures and devices or as required by NFPA 70 and, if insulation is to be placed above fixture or device, 24 inches above fixture.

b. Masonry chimneys or masonry enclosing a flue: 2 inches from outside face of masonry. Masonry chimneys for medium and high heat operating appliances: Minimum clearances required by NFPA 211.

c. Vents and vent connectors used for venting the products of combustion, flues, and chimneys other than masonry chimneys: Minimum clearances as required by NFPA 211.

d. Gas Fired Appliances: Clearances as required in NFPA 54.

e. Oil Fired Appliances: Clearances as required in NFPA 31.

Blocking around flues and chimneys is not required when insulation blanket, including any attached vapor retarder, passed ASTM E136, in addition to meeting all other requirements stipulated in Part 2. Blocking is also not required if the chimneys are certified by the manufacturer for use in contact with insulating materials.

3.3 INSTALLATION

3.3.1 Insulation

Install and handle insulation in accordance with manufacturer's instructions. Keep material dry and free of extraneous materials. Any materials that show visual evidence of biological growth due to presence of moisture must not be installed on the building project. Ensure personal protective clothing and respiratory equipment is used as required. Observe safe work practices.

3.3.1.1 Electrical wiring

Do not install insulation in a manner that would sandwich electrical wiring between two layers of insulation.

3.3.1.2 Continuity of Insulation

Install blanket insulation to butt tightly against adjoining blankets and to studs, rafters, joists, sill plates, headers and any obstructions. Provide continuity and integrity of insulation at corners, wall to ceiling joints, roof, and floor. Avoid creating thermal bridges.

3.3.1.3 Sizing of Blankets

Provide only full width blankets when insulating between trusses, joists, or studs. Size width of blankets for a snug fit where trusses, joists or studs are irregularly spaced.

3.3.1.4 Special Requirements for Ceilings

Place insulation under electrical wiring occurring across joists. Pack insulation into narrowly spaced framing. Do not block flow of air through soffit vents. Attach insulation to attic door by adhesive or staples.

3.3.1.5 Access Panels and Doors

Affix blanket insulation to access panels greater than one square foot and access doors in insulated floors and ceilings. Use insulation with same R-Value as that for floor or ceiling.

-- End of Section --

SECTION 07 22 00

ROOF AND DECK INSULATION
02/16

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM C1177/C1177M	(2017) Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
ASTM C1289	(2019) Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
ASTM D41/D41M	(2011; R 2016) Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
ASTM D4263	(1983; R 2018) Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
ASTM D4586/D4586M	(2007; E 2012; R 2012) Asphalt Roof Cement, Asbestos-Free
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials

FM GLOBAL (FM)

FM 4450	(1989) Approval Standard for Class 1 Insulated Steel Deck Roofs
FM 4470	(2016) Single-Ply, Polymer-Modified Bitumen Sheet, Built-up Roof (BUR), and Liquid Applied Roof Assemblies for Use in Class 1 and Noncombustible Roof Deck Construction
FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for

UNDERWRITERS LABORATORIES (UL)

UL 1256 (2002; Reprint Jul 2013) Fire Test of Roof Deck Constructions

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Insulation Board Layout and Attachment; G

Verification of Existing Conditions; G

SD-03 Product Data
Insulation
Cover Board; G

Fasteners; G

Moisture Control; G

Combined Air Barrier and Vapor Retarder; G

Recycled Content For Insulation; S

SD-06 Test Reports

Flame Spread Rating; G

SD-07 Certificates

Installer Qualifications; G

Certificates Of Compliance For Felt Materials; G

SD-08 Manufacturer's Instructions

Nails and Fasteners; G

Roof Insulation; G

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment for insulation if available; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform

to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for insulation, if available, that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose

ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

1.3 SHOP DRAWINGS

Submit insulation board layout and attachment indicating methods of attachment and spacing, transitions, tapered components, thicknesses of materials, and closure and termination conditions. Show locations of ridges, valleys, crickets, interface with, and slope to, roof drains. Base shop drawings on verified field measurements and include verification of existing conditions. Show wood nailers..

1.4 PRODUCT DATA

Include data for material descriptions, recommendations for product shelf life, requirements for cover board or coatings, and precautions for flammability and toxicity. Include data to verify compatibility of sealants with insulation.

1.5 MANUFACTURER'S INSTRUCTIONS

Include field of roof and perimeter attachment requirements.

Provide a complete description of installation sequencing for each phase of the roofing system. Include weatherproofing procedures.

1.6 QUALITY CONTROL

Provide certification of installer qualifications from the insulation manufacturer confirming the specific installer has the required qualifications for installing the specific roof insulation system(s) indicated.

Provide certificates of compliance for felt materials.

1.7 FIRE PERFORMANCE REQUIREMENTS

1.7.1 Insulation in Roof Systems

Comply with the requirements of ICC IBC or UL 1256 or FM 4450. Roof insulation to have a flame spread rating of 75 or less when tested in accordance with ASTM E84. Additional documentation of compliance with flame spread rating is not required when insulation of the type used for

this project as part of the specific roof assembly is listed and labeled as FM Class 1 approved. Only roof assemblies that pass FM 4450 may be used.

1.7.2 Fire Resistance Ratings for Roofs

Provide in accordance with ICC IBC Chapter 7 and Table 721.1(3) Min Fire and Smoke Protection For Floor and Roof Systems.

1.8 CERTIFICATIONS

Building Product Declarations: Provide insulation with EPD and Material Ingredient Report, if available.

1.9 DELIVERY, STORAGE, AND HANDLING

1.9.1 Delivery

Deliver materials to the project site in manufacturer's unopened and undamaged standard commercial containers bearing the following legible information:

a. Name of manufacturer

b. Brand designation

c. Specification number, type, and class, as applicable, where materials are covered by a referenced specification

Deliver materials in sufficient quantity to allow continuity of the work.

1.9.2 Storage and Handling

Store and handle materials in accordance with manufacturer's printed instructions. Protect from damage, exposure to open flame or other ignition sources, wetting, condensation, and moisture absorption. Keep materials wrapped and separated from off-gassing materials (such as drying paints and adhesives). Do not use materials that have visible moisture or biological growth. Store in an enclosed building or trailer that provides a dry, adequately ventilated environment. Store felt rolls on ends. For the 24 hours immediately before application of felts, store felts in an area maintained at a temperature no lower than 50 degrees F above grade and having ventilation on all sides. Replace damaged material with new material.

1.10 ENVIRONMENTAL CONDITIONS

Do not install roof insulation during inclement weather or when air temperature is below 40 degrees F and interior humidity is 45 percent or greater, or when there is visible ice, frost, or moisture on the roof deck.

1.11 PROTECTION

1.11.1 Special Protection

Provide special protection as approved by the insulation manufacturer.

1.11.2 Completed Work

Cover completed work with cover board for the duration of construction. Avoid traffic on completed work particularly when ambient temperature is above 80 degrees F. Replace crushed or damaged insulation prior to roof surface installation.

PART 2 PRODUCTS

2.1 INSULATION

2.1.1 Insulation Types

Provide the following roof insulation materials. Provide roof insulation that is compatible with attachment methods for the specified insulation and roof membrane.

a. Polyisocyanurate Board: Provide in accordance with ASTM C1289 REV A Type II, fibrous felt or glass mat membrane both sides, except minimum compressive strength of 25 pounds per square inch (psi).

2.1.2 Recycled Materials

Provide thermal insulation materials containing recycled content. Unless specified otherwise, the minimum required recycled content for listed materials are:

Polyisocyanurate/polyurethane:	9 percent recovered material
Wood Fiberboard:	100 percent recovered material
Fiber (felt) or Fiber composite:	75 percent recovered content
Rubber:	90 percent recovered content
Plastic or Plastic/Rubber composite:	90 percent recovered content
Wood/Plastic Composite:	90 percent total recovered content

Provide data identifying percentage of recycled content for insulation.

2.1.3 Insulation Thickness

As necessary to provide the thermal resistance (R-value) indicated. Base calculation on the R-value for aged insulation..

2.1.4 Tapered Roof Insulation

One layer of the tapered roof insulation assembly must be factory tapered to a slope of not less than one in 1/2 inch per foot. Factory fabricate mitered joints from two diagonally cut boards or one board shaped to provide required slopes.

2.1.5 Cants and Tapered Edge Strips

Provide preformed cants and tapered edge strips of the same material as the roof insulation. When unavailable, provide pressure-preservative

treated wood, wood fiberboard, or rigid perlite board cants and edge strips as recommended by the roofing manufacturer for the specific application, unless otherwise indicated. Face of cant strips to incline at 45 degrees with a minimum vertical height of 4 inches. Taper edge strips at a rate of one to 1 1/2 inch per foot down to approximately 1/8 inch thick.

2.2 COVER BOARD

For use as a thermal barrier (underlayment), fire barrier (overlayment), or cover board for adhesive-applied roofing membrane over roof insulation.

2.2.1 Glass Mat Gypsum Roof Board

ASTM C1177/C1177M, 0 Flame Spread and 0 Smoke Developed when tested in accordance with ASTM E84, 500 psi, Class A, non-combustible, 1/2 inch thick, 4 by 8 feet board size.

2.3 BITUMENS

2.3.1 Asphalt Primer

Provide in accordance with ASTM D41/D41M.

2.3.2 Asphalt Roof Cement

Provide in accordance with ASTM D4586/D4586M, Type I, for horizontal surfaces and surfaces sloped from 0 to 3 inches per foot. Type II for vertical and surfaces sloped more than 3 inches per foot.

2.4 MOISTURE CONTROL

2.4.1 Combined Air Barrier and Vapor Retarder

a. At metal deck roofs without concrete fill provide a combined air barrier and vapor retarder Class III on glass mat Gypsum roof board with a moisture vapor permeability of 5 perms or greater, refer to specification section 07 27 10.00 10 - BUILDING AIR BARRIER SYSTEM.

b. At existing concrete roof decks provide a combined air barrier and vapor retarder Class I with a moisture vapor permeability of 0.1 or less, refer to specification section 07 27 10.00 10 - BUILDING AIR BARRIER SYSTEM.

2.5 FASTENERS

Provide flush-driven fasteners through flat round or hexagonal steel or plastic plates. Provide zinc-coated steel plates, flat round not less than 1 3/8 inch diameter, hexagonal not less than 28 gage. Provide high-density plastic plates, molded thermoplastic with smooth top surface, reinforcing ribs and not less than 3 inches in diameter. Fully recess fastener head into plastic plate after it is driven. Form plates to prevent dishing. Do not use bell or cup shaped plates. Provide fasteners in accordance with insulation manufacturer's recommendations for holding power when driven, or a minimum of 120 pounds each in steel deck, whichever is the higher minimum. Provide fasteners for steel or concrete decks in accordance with FM APP GUIDE (http://www.approvalguide.com/) for Class I roof deck construction, and spaced to withstand uplift pressure of 90 pounds per square foot.

2.5.1 Fasteners for Steel Decks

Approved hardened penetrating fasteners or screws in accordance with FM 4450 and listed in FM APP GUIDE for Class I roof deck construction. Quantity and placement to withstand a minimum uplift pressure of 90 psf in accordance with FM APP GUIDE.

2.5.2 Fasteners for Poured Concrete Decks

Approved hardened fasteners or screws to penetrate deck at least 1 inch but not more than 1 1/2 inches, in accordance with FM 4470, and listed in FM APP GUIDE for Class I roof deck construction. Quantity and placement to withstand an uplift pressure of 90 psf in accordance with FM APP GUIDE.

2.6 WOOD NAILERS

Pressure-preservative treated as specified in Section 06 10 00 ROUGH CARPENTRY.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

3.1.1 Surface Inspection

Ensure surfaces are clean, smooth, and dry prior to application. Ensure surfaces receiving vapor retarder are free of projections that might puncture the vapor retarder. Check roof deck surfaces, including surfaces sloped to roof drains and outlets, for defects before starting work.

The Contractor and Roofing Manufacturer must inspect and approve the surfaces immediately before starting installation. Prior to installing vapor retarder, perform the following:

a. Examine steel decks to ensure that panels are properly secured to structural members and to each other and that surfaces of top flanges are flat or slightly convex.

b. Prior to installing any roof system on a concrete deck, moisture test the deck in accordance with ASTM D4263. The deck is acceptable for roof system application when there is no visible moisture on underside of plastic sheet after 24 hours.

3.1.2 Surface Preparation

Correct defects and inaccuracies in roof deck surface to eliminate poor drainage from hollow or low spots, perform the following:

a. Provide wood nailers of the same thickness as the insulation at eaves, edges, curbs, walls, and roof openings for securing of cant strips, gravel stops, and flashing flanges. Space nailers in accordance with approved shop drawings.

b. Cover steel decks with a layer of glass mat Gypsum roof board.

c. Solidly apply asphalt primer to poured or existing concrete decks at the rate of 1 gallon per 100 square feet of roof surface. Allow

primer to dry thoroughly.

3.2 INSTALLATION OF VAPOR RETARDER

Install air barrier/vapor retarder Class I in direct contact with roof deck surface. Unless otherwise specified, air barrier/vapor retarder Class I to consist of either two plies of No. 15 asphalt-saturated felt, two plies of asphalt-coated glass felt , or one layer of asphalt-saturated felt base sheet. Lay vapor retarder at right angles to direction of slope. Install first ply of felt or base sheet as specified herein for the specific deck. Apply second ply of 2-ply vapor retarder system using asphalt at rate of 20 to 35 lbs per 100 square feet, applied within plus or minus 25 degrees F of EVT. Completely seal side and end laps. Asphalt must be visible beyond all edges of each ply as it is being installed. Lay plies free of wrinkles, buckles, creases or fishmouths. Do not walk on mopped surfaces while asphalt is sticky. Press out air bubbles to obtain complete adhesion between surfaces. At walls, eaves, rakes, and other vertical surfaces, extend vapor retarder organic felts or separate plies 9 inches, with not less than 9 inches on the substrate, and the extended portion turned back and mopped in over the top of the insulation. At roof penetrations other than walls, eaves and rakes, and vertical surfaces, extend vapor retarder or separate plies 9 inches to form a lap folded back over the edge of the insulation. Provide asphalt roof cement under the vapor retarder for at least 9 inches from walls, eaves, rakes and other penetrations.

3.2.1 Air Barrier/Vapor Retarder Class I on Poured Concrete Decks

Evenly mop primed substrate with asphalt at a rate of 20 to 35 lbs per 100 square feet before installing air barrier/vapor retarder. Lay first ply of two-ply system with each sheet lapping 19 inches over the preceding sheet. Lap ends not less than 4 inches. Stagger laps a minimum of 12 inches. For an air barrier/vapor retarder consisting of one layer of asphalt base sheet, provide side and end laps not less than 4 inches. Stagger laps a minimum of 12 inches. Cement base sheets together with a solid mopping of asphalt.

3.2.2 Air Barrier/Vapor Retarder Class III on Steel Decks

Mechanically secure protection board to metal decking and install air barrier/vapor retarder Class III per manufacturers instructions and requirements.

3.3 INSULATION INSTALLATION

Apply insulation in two layers with staggered joints when total required thickness of insulation exceeds 1/2 inch. Lay insulation so that continuous longitudinal joints are perpendicular to direction of roofing and end joints of each course are staggered with those of adjoining courses. When using multiple layers of insulation, provide joints of each succeeding layer that are parallel and offset in both directions with respect to the layer below. Keep insulation 1/2 inch clear of vertical surfaces penetrating and projecting from roof surface. Verify required slopes to each roof drain.

3.3.1 Installation Using Only Mechanical Fasteners

Secure total thickness of insulation and cover board with penetrating type fasteners.

3.3.2 Special Precautions for Installation of Foam Insulation

3.3.2.1 Polyisocyanurate Insulation

Where polyisocyanurate foam board insulation is provided, install glass mat gypsum roof board over top surface of foam board insulation. Stagger joints of insulation with respect to foam board insulation below.

3.3.3 Cant Strips

Where indicated, provide cant strips at intersections of roof with walls, parapets, and curbs extending above roof. Wood cant strips must bear on and be anchored to wood blocking. Fit cant strips flush to vertical surfaces. Where possible, nail cant strips to adjoining surfaces. Where cant strips are installed against non-nailable materials, install in an approved adhesive.

3.3.4 Tapered Edge Strips

Where indicated, provide edge strips in the right angle formed by the juncture of roof and wood nailing strips that extend above the level of the roof. Install edge strips flush to vertical surfaces of wood nailing strips. Where possible, nail edge strips to adjoining surfaces. Where installed against non-nailable materials, install in an approved adhesive.

3.4 PROTECTION

3.4.1 Protection of Applied Insulation

Completely cover each day's installation of insulation with finished roofing specified in Section 07 52 00 MODIFIED BITUMINOUS MEMBRANE ROOFING on same day. Phased construction is not permitted. Protect open spaces between insulation and parapets or other walls and spaces at curbs, scuttles, and expansion joints, until permanent roofing and flashing are applied. Storing, walking, wheeling, or trucking directly on insulation or on roofed surfaces is not permitted. Provide smooth, clean board or plank walkways, runways, and platforms near supports, as necessary, to distribute weight in accordance with indicated live load limits of roof construction . Protect exposed edges of insulation with cutoffs at the end of each work day or whenever precipitation is imminent. Cutoffs must be two layers of bituminous-saturated felt set in plastic bituminous cement set in roof cement. Fill all profile voids in cutoffs to prevent trapping moisture below the membrane. Remove cutoffs when work resumes.

3.4.2 Damaged Work and Materials

Restore work and materials that become damaged during construction to original condition or replace with new materials.

3.5 INSPECTION

Establish and maintain inspection procedures to assure compliance of the installed roof insulation with contract requirements. Remove, replace, correct in an approved manner, any work found not in compliance. Quality control must include, but is not limited to, the following:

a. Observation of environmental conditions; number and skill level of insulation workers; start and end time of work.

b. Verification of certification, listing or label compliance with FM Data Sheets. (https://www.fmglobal.com/fmglobalregistration/Downloads.aspx)

c. Verification of proper storage and handling of insulation and vapor retarder materials before, during, and after installation.

d. Inspection of vapor retarder application, including edge envelopes and mechanical fastening.

e. Inspection of mechanical fasteners; type, number, length, and spacing.

f. Coordination with other materials, cants, sleepers, and nailing strips.

g. Inspection of insulation joint orientation and laps between layers, joint width and bearing of edges of insulation on deck.

h. Installation of cutoffs and proper joining of work on subsequent days.

i. Continuation of complete roofing system installation to cover insulation installed same day.

j. Verification of required slope to each roof drain.

-- End of Section --

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SECTION 07 27 10.00 10

BUILDING AIR BARRIER SYSTEM
08/19

PART 1 GENERAL

1.1 SUMMARY

This Section specifies the construction and quality control of the installation of an air barrier system. Construct the air barrier system indicated, taking responsibity for the means, methods, and workmanship of the installation of the air barrier system. The air barrier must be contiguous and connected across all surfaces of the enclosed air barrier envelope indicated. The maximum leakage requirements of individual air barrier components and materials are specified in the other specification sections covering these items.

This section also defines the maximum allowable leakage of the final air barrier system. The workmanship must be adequate to meet the maximum allowable leakage requirements of this specification. Test the assembled air barrier system to demonstrate that the building envelope is properly sealed and insulated.

1.2 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM D4541	(2017) Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM E96/E96M	(2016) Standard Test Methods for Water Vapor Transmission of Materials
ASTM E2178	(2021a) Standard Test Method for Air Permeance of Building Materials
ASTM E2357	(2017) Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 285	(2012) Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

1.3 DEFINITIONS

The following terms as they apply to this section:

1.3.1 Air Barrier Accessory

Products designated to maintain air tightness between air barrier materials, air barrier assemblies and air barrier components, to fasten them to the structure of the building, or both (e.g., sealants, tapes, backer rods, transition membranes, fasteners, strapping, primers).

1.3.2 Air Barrier Assembly

The combination of air barrier materials and air barrier accessories that are designated and designed within the environmental separator to act as a continuous barrier to the movement of air through the environmental separator.

1.3.3 Air Barrier Component

Pre-manufactured elements such as windows, doors, dampers and service elements that are installed in the environmental separator.

1.3.4 Air Barrier Envelope

The combination of air barrier assemblies and air barrier components, connected by air barrier accessories that are designed to provide a continuous barrier to the movement of air through an environmental separator. There may be more than one air barrier envelope in a single building. Also known as Air Barrier System.

1.3.5 Air Barrier Material

A building material that is designed, tested and/or produced to provide the primary resistance to airflow through an air barrier assembly of a wall system.

1.3.6 Air Barrier System

Same as AIR BARRIER ENVELOPE.

1.3.7 Air Leakage Rate

The rate of airflow (CFM) driven through a unit surface area (sq.ft.) of an assembly or system by a unit static pressure difference (Pa) across the assembly. (example: 0.25 CFM/sq.ft. @ 75 Pa)

1.3.8 Air Leakage

The total airflow (CFM) driven through the air barrier system by a unit static pressure difference (Pa) across the air barrier envelope. (example: 6500 CFM @ 75 Pa)

1.3.9 Air Permeance

The tested rate of airflow (CFM) through a unit area (sq.ft.) of a material driven by unit static pressure difference (Pa) across the material (example: 0.004 CFM/sq.ft. @ 75 Pa) as established by ASTM E2178.

1.3.10 Environmental Separator

The parts of a building that separate the controlled interior environment

from the uncontrolled exterior environment, or that separate spaces within a building that have dissimilar environments. Also known as the Control Layer.

1.3.11 Vapor Permeance

Vapor permeance is separated into three classes based on the water vapor permeance of a material as tested via ASTM E96/E96M

Class I Vapor Barrier/Retarder 0.1 perm or less

Class II Vapor Barrier/Retarder 0.1 perm to 1.0 perm

Class III Vapor Barrier/Retarder 1.0 perm to 10 perm

1.4 PREPARATORY PHASE OR PRECONSTRUCTION CONFERENCE

Organize pre-construction conferences between the air barrier inspector and the sub-contractors involved in the construction of or penetration of the air barrier system to discuss where the work of each sub-contractor begins and ends, the sequence of installation, and each sub-contractor's responsibility to ensure airtight joints, junctures, penetrations and transitions between materials. Discuss the products, and assemblies of products specified in the different sections to be installed by the different sub-contractors.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Air Barrier System Shop Drawings; G, RO, Manufacturer produced warranted air barrier system

SD-03 Product Data

Air Barrier System Product Data; G, RO

SD-04 Samples

Material Samples For Air Barrier System; G, RO

SD-05 Design Data

Design Data And Calculations For The Air Barrier System; G, RO, Manufacturer produced warranted air barrier system

SD-06 Test Reports

Design Review Report; G, RO

Testing and Inspection; G, RO

SD-07 Certificates

Air Barrier Inspector; G, RO

1.6 AIR BARRIER ENVELOPE SURFACE AREA AND LEAKAGE REQUIREMENTS

The building air barrier systems must meet the following leakage requirements. The allowable leakage rate and the maximum leakage are at a differential test pressure of 75 Pa.

1.7 AIR BARRIER INSPECTOR

Employ a designated Air Barrier Inspector on this project. The Air Barrier Inspector performs a Design Review, oversees quality control testing specified in these specifications, performs quality control air barrier inspection as specified, interfaces with the designer and product manufacturer's representatives to assure all installation requirements are met, and verifies that the constructed work is in accordance with both the manufacturer's recommendations for products used, the content of this specification and other contract drawings or docouments. Qualification for the Air Barrier Inspector are as follows:

a. Training and certification as an Air Barrier Auditor from the Air Barrier Association of America (ABAA) or other third party air barrier association.

b. Or, provide documentation in resume format that demonstrates that the individual proposed has the experience, knowledge, skills and abilities to fulfill the above stated duties as the air barrier inspector.

c. It is acceptable that this individual be employed by the firm who will be performing the building pressurization test or another independent third party entity, provided they meet the above requirements but shall not be a member of the installing contractor or firm.

Provide copies of Air Barrier Inspector qualifications 30 days after Notice to Proceed.

1.8 DESIGN REVIEW

Review the Contract Plans and Specifications and advise the Contracting Officer of any deficiencies that would prevent the construction of an effective air barrier system. Provide a Design Review Report individually listing each deficiency and the corresponding proposed corrective action necessary for proper air barrier system. Provide copies of the Design Review Report not later than 14 days after approval of the Air Barrier Inspector Qualifications. Submit design data and calculations for the Air Barrier System for a manufacturer produced warranted air barrier system.

PART 2 PRODUCTS

2.1 AIR BARRIER

Provide air barrier system of compatible parts from one or several manufacturers coordinated by the contractor or provide a single warranted

system provided by a primary manufacturer. The air barrier system as part of a tested exterior wall assembly must meet the conditions of acceptance as tested in accordance with NFPA 285. Materials used for roof assembly air barrier must conform to the appropriate UL and FM wind and fire requirements for the specified roof assemblies.

If a complete air barrier system from a single manufacturer is utilized, weather warranted on not warranted, the air barrier system must conform to ASTM E2357.

Materials in the following categories as used in the air barrier system or assembly of the exterior wall system are tested and are required to conform to ASTM E2178: Self-adhered sheet membranes, fluid applied membranes, spray polyurethane foam, mechanically fastened commercial building wrap, factory bonded membranes to sheathing, and adhesive backed commercial building wrap and accessory products.

Other materials used as an air barrier such as concrete, glass, wood, metal or gypsum board may or may not conform to ASTM E2178 but are acceptable provided that when integrated into the air barrier system or assemblies that they are not subject to material or environmental induced degradation in their final produced state and once incorporated in the permanent construction.

All materials used must be identifiable through manufacturer testing data and/or literature to be compatible with all the attached or adjoining materials or substrates used in the system.

Provide Air Barrier System Shop Drawings, Material Samples for Air Barrier System and Air Barrier System Product Data.

PART 3 EXECUTION

3.1 QUALITY CONTROL

3.1.1 Documentation and Reporting

Document the entire installation process on daily job site reports. These reports include information on the Installer, substrates, substrate preparation, products used, ambient and substrate temperature, the location of the air barrier installation, the results of the quality control procedures, and testing results.

3.1.2 Quality Control Testing And Inspection

Conduct the following tests and inspections as applicable in the presence of the Contracting Officer during installation of the air barrier system, and submit quality control reports as indicated below.

a. Provide a Daily Report of Observations with a copy to the Contracting Officer.

b. Inspect to assure continuity of the air barrier system throughout the building enclosure and that all gaps are covered, the covering is structurally sound, and all penetrations are sealed allowing for no infiltration or exfiltration through the air barrier system.

c. Inspect to assure structural support of the air barrier system to withstand design air pressures.

d. Inspect to assure masonry surfaces receiving air barrier materials are smooth, clean, and free of cavities, protrusions and mortar droppings, with mortar joints struck flush or as required by the manufacturer of the air barrier material.

e. Inspect and test to assure site conditions for application temperature, and dryness of substrates are within guidelines.

f. Inspect to assure substrate surfaces are properly primed if applicable and in accordance with manufacturer's instructions. Priming must extend at least 2 inches beyond the air barrier material to make it obvious that the primer was applied to the substrate before the air barrier material.

g. Inspect to assure laps in materials are at least a 2-inch minimum, shingled in the correct direction or mastic applied in accordance with manufacturer's recommendations, and with no fishmouths.

h. Inspect to assure that a roller has been used to enhance adhesion. Identify any defects such as fishmouths, wrinkles, areas of lost adhesion, and improper curing. Note the intended remedy for the deficiencies.

i. Measure application thickness of liquid applied materials to assure that manufacturer's specifications for the specific substrate are met.

j. Inspect to assure that the correct materials are installed for compatibility.

k. Inspect to assure proper transitions for change in direction and structural support at gaps.

l. Inspect to assure proper connection between assemblies (membrane and sealants) for cleaning, preparation and priming of surfaces, structural support, integrity and continuity of seal.

m. Perform adhesion tests for fluid-applied and self-adhered air barrier membranes to assure that the manufacturer's specified adhesion strength properties are met. Determine the bond strength of coatings to substrate in accordance with ASTM D4541.

n. Provide cohesion tests for spray polyurethane foam (SPF). Perform the tests in accordance with the specification sections which specify these materials. Perform adhesion tests as follows: Using a coring tool remove a sample and determine the relative adhesion quality of the foam. If the foam is hard to remove and leaves small bits of foam on the substrate it is called cohesive foam failure and is considered the best adhesion. If the foam comes away from the substrate with some force but is clean, it is called a mechanical bond. If it comes away easily from the substrate, the adhesion is poor. Cohesive foam failure and a good mechanical bond are acceptable.

o. Provide written test reports of all tests performed.

3.2 REPAIR AND PROTECTION

Upon completion of inspection, testing, sample removal and similar services, repair damaged construction and restore substrates, coatings and

finishes. Protect construction exposed by or for quality control service activities, and protect repaired construction.

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SECTION 07 27 19.01

SELF-ADHERING AIR BARRIERS
05/17, CHG 2: 08/20

PART 1 GENERAL

1.1 REFERENCES

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

AIR BARRIER ASSOCIATION OF AMERICA (ABAA)

ABAA Accreditation	Accreditation
ABAA QAP	Quality Assurance Program

ASTM INTERNATIONAL (ASTM)

ASTM D146/D146M	(2004; E 2012; R 2012) Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing
ASTM D412	(2016) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D570	(1998; E 2010; R 2010) Standard Test Method for Water Absorption of Plastics
ASTM D903	(1998; R 2017) Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
ASTM D1876	(2008; R 2015; E 2015) Standard Test Method for Peel Resistance of Adhesives (T-Peel Test)
ASTM D4263	(1983; R 2018) Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
ASTM D4541	(2017) Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
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 E154/E154M	(2008a; R 2013; E 2013) Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground

Cover

ASTM E283	(2019) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E331	(2000; R 2016) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E2178	(2021a) Standard Test Method for Air Permeance of Building Materials
ASTM E2357	(2017) Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 285	(2012) Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

1.2 RELATED REQUIREMENTS

Coordinate the requirements of Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM and other building enclosure sections to provide a complete building air barrier system. Submit all materials, components, and assemblies of the air barrier system together as one complete submittal package.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Qualifications of Manufacturer; G

Qualifications of Installer; G

SD-02 Shop Drawings

Self-adhering Air Barrier; G

SD-03 Product Data

Self-adhering Air Barrier; G

Primers, Adhesives, and Mastics; G

Safety Data Sheets; G

SD-04 Samples

Self-adhering Air Barrier Mockup; G

SD-06 Test Reports

Field Peel Adhesion Test; G

Flame Propagation of Wall Assemblies; G

Flame Spread and Smoke Developed Index Ratings; G

SD-07 Certificates

Self-adhering Air Barrier; G

SD-08 Manufacturer's Instructions

Self-adhering Air Barrier; G

Primers, Adhesives, and Mastics; G

1.4 MISCELLANEOUS REQUIREMENTS

For self-adhering air barrier provide the following:

1.4.1 Product Data

Submit manufacturer's technical data indicating compliance with performance and environmental requirements, manufacturer's printed instructions for evaluating, preparing, and treating substrates, temperature and other limitations of installation conditions, safety requirements for installation, and Safety Data Sheets. Indicate flame and smoke spread ratings for all products.

1.4.2 Test Reports

Submit test reports indicating that field peel-adhesion tests on all materials have been performed and the changes made, if required, in order to achieve successful and lasting adhesion. Submit test reports for flame propagation of wall assemblies tested in accordance with NFPA 285. Submit test reports for flame spread and smoke developed index ratings of barrier system materials tested in accordance with ASTM E84.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery

Deliver and store materials in sufficient quantity to allow for uninterrupted flow of work. Inspect materials delivered to the site for damage and store out of weather. Deliver materials to the jobsite in their original unopened packages, clearly marked with the manufacturer's name, brand designation, description of contents, and shelf life of containerized materials. Store and handle to protect from damage.

1.5.2 Storage

Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling. Protect stored materials from direct sunlight. Keep materials sealed and separated from absorptive materials, such as wood and insulation.

1.6 FIELD PEEL ADHESION TEST

Perform a field peel-adhesion test on the construction mockup. Test the self-adhering air barrier for adhesion in accordance with ASTM D4541 using a Type II pull tester except use a disk that is 4 inches in diameter and cut through the membrane to separate the material attached to the dish from the surrounding material. Perform test after curing period in accordance with manufacturer's written recommendations. Record mode of failure and area which failed in accordance with ASTM D4541. Compare adhesion values with the manufacturer's established minimum values for the particular combination of material and substrate. Indicate on the inspection report whether the manufacturer's requirement has been met. Where the manufacturer has not declared a minimum adhesion value for their product and substrate combination, the inspector must record actual values.

1.7 QUALITY ASSURANCE

1.7.1 Qualifications of Manufacturer

Submit documentation verifying that the manufacturer of the self-adhering air barrier is currently accredited by Air Barrier Association of America (ABAA Accreditation https://www.airbarrier.org/).

1.7.2 Qualifications of Installer

Submit documentation verifying that installers of the self-adhering air barrier are currently certified in accordance with the ABAA QAP Quality Assurance Program (https://www.airbarrier.org/qap/).

1.8 ENVIRONMENTAL CONDITIONS

1.8.1 Temperature

Install air barrier within the range of ambient and substrate temperatures as recommended in writing by the air barrier manufacturer. Verify that the surface to receive self-adhering air barrier is dry for a minimum of 48 hours prior to the installation of the barrier. Do not apply air barrier to damp or wet substrates. Do not apply during inclement weather or when ice, frost, surface moisture, or visible dampness is present on surfaces to be covered, or when precipitation is imminent.

1.8.2 Exposure to Weather and Ultraviolet Light

Protect air barrier products from direct exposure to rain, snow, sunlight, mist, and other extreme weather conditions. Replace, at no additional cost to the government, barrier products that have been exposed to ultraviolet (sun)light longer than allowed by manufacturer's written requirements.

PART 2 PRODUCTS

2.1 SELF ADHERING AIR BARRIER

Provide minimum 0.040 inch thick self-adhering, vapor, air barrier membrane consisting of a cross-laminated high density polyethylene (HDPE) film, fully coated with rubberized asphalt adhesive. Provide membrane in rolls of various widths interleaved with disposable silicone release paper. Self-adhering air barrier must exhibit no visible water leakage when tested in accordance with ASTM E331 and must perform as a liquid water drainage plane flashed to discharge to the exterior any incidental condensation or water penetration. Use regular or low temperature formulation depending on site conditions, within temperature ranges specified by manufacturer.

2.1.1 Physical Properties

a. Air Permeance (ASTM E2178): Less than 0.004 CFM per sf at 1.57 psf.

b. Air Leakage (ASTM E2357, ASTM E283): less than 0.004 CFM per sf at 1.57 psf at one inch.

c. Tensile Strength (ASTM D412 die C modified): Not less than 400 psi.

d. Tensile Elongation (ASTM D412 die C modified): Not less than 200 percent.

e. Puncture Resistance (ASTM E154/E154M): Not less than 40 lbs.

f. Pliability (ASTM D146/D146M): Unaffected at minus 25 degrees F, 0.063 inch mandrel.

g. Lap Adhesion (ASTM D1876 modified): Not less than 4.0 lbs per inch.

h. Peel Adhesion (ASTM D903): Not less than 5.0 lbs per inch.

i. Water Vapor Permeance (Vapor Impermeable Air Barrier) (ASTM E96/E96M, desiccant method A): 0.1 perms or less.

j. Water Absorption (ASTM D570): Not to exceed 0.12 percent by weight.

k. Flame propagation of wall assemblies (NFPA 285): Pass

l. Surface Burning Characteristics (ASTM E84):

(1) Flame Spread Index Rating not higher than 75.

(2) Smoke Developed Index Rating not higher than 150.

2.2 PRIMERS, ADHESIVES, AND MASTICS

Provide primers, adhesives, mastics and other accessory materials as recommended in writing by the manufacturer of the self-adhering air barrier for adequate bonding to each type of substrate.

2.3 SHEET METAL FLASHING

Provide as specified in Section 07 60 00 FLASHING AND SHEET METAL.

2.4 JOINT SEALANTS

Provide as specified in Section 07 92 00 JOINT SEALANTS. Verify compatibility with adjacent products that are or will be in contact with one another.

PART 3 EXECUTION

3.1 EXAMINATION

Before installing air barrier, examine substrates, areas, and conditions under which air barrier assemblies will be applied, with Installer present, for compliance with requirements. Ensure the following conditions are met:

a. Surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants.

b. Concrete surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions.

c. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method in accordance with ASTM D4263 and take suitable measures until substrate passes moisture test.

d. Verify sealants used in sheathing are compatible with membrane proposed for use. Perform field peel adhesion test on materials to which sealants are adhered.

3.2 PREPARATION

Clean, prepare, and treat substrate in accordance with manufacturer's written instructions. Ensure clean, dust-free, and dry substrate for air barrier application.

a. Prime masonry and concrete substrates with conditioning primer.

b. Prime gypsum sheathing an adequate number of coats to achieve required bond, with adequate drying time between coats.

c. Prime wood, metal, and painted substrates with primer.

d. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through air barrier and at protrusions.

3.3 INSTALLATION

3.3.1 Installation of Self-adhering Air Barrier

Install materials in accordance with manufacturer's recommendations and the following:

a. Apply primer at rate recommended by manufacturer prior to membrane installation. Allow primer to dry completely before membrane application. Apply as many coats as necessary for proper adhesion.

b. When membrane is properly positioned, press into place and roll membrane with roller immediately after placement.

c. Apply membrane sheets to shed water naturally without interception by a sheet edge, unless that edge is sealed with permanently flexible termination mastic.

d. Position subsequent sheets of membrane applied above so that membrane overlaps the membrane sheet below by a minimum of 2-1/2 inches, unless greater overlap is recommended by manufacturer. Roll into place with roller.

e. Make all side laps a minimum of 2-1/2 inches and all end laps a minimum of 5 inches, unless greater overlap is recommended by manufacturer. Roll seams with roller.

f. Roll membrane to adhere to substrate. Cover corners and joints with two layers of reinforcement by first applying a 12 inch width of membrane centered along the axis. Flash drains and projections with a second ply of membrane for a distance of 6 inches from the drain or projection.

g. Seal around all penetrations through the air barrier resulting from pipes, vents, conduit, electrical fixtures, structural members, or other construction passing through it. Seal with termination mastic, extruded silicone sealant, membrane counterflashing or other sealing methods in accordance with manufacturer's written recommendations.

h. Continuously connect the air barrier between walls, roof, floor and below grade assemblies to form a continuous integrated air barrier system around the entire building enclosure. Extend the air barrier membrane into rough openings such as doors, windows, louvers, and other exterior penetrations. Seal edges of barrier at junctures with rough openings.

i. At changes in substrate plane, provide transition material (e.g. bead of sealant, mastic, extruded silicone sealant, membrane counterflashing or other material recommended by manufacturer) under membrane to eliminate all sharp 90 degree inside corners and to make a smooth transition from one plane to another.

j. Provide mechanically fastened non-corrosive metal sheet to span gaps in substrate plane and to make a smooth transition from one plane to the other. Continuously support membrane with substrate.

k. At deflection and control joints, provide backup for the membrane to accommodate anticipated movement.

l. At expansion and seismic joints provide transition to the joint assemblies.

m. Apply a bead or trowel coat of mastic along membrane seams at reverse lapped seams, rough cuts, and as recommended by the manufacturer.

n. At end of each working day, seal top edge of membrane to substrate with termination mastic.

o. Do not allow materials to come in contact with chemically incompatible materials.

p. Counterflash upper edge of thru-wall flashing and air barrier.

Counter flashing and thru-wall flashing are specified in Section 07 60 00 FLASHING AND SHEET METAL.

3.4 FIELD PEEL ADHESION TEST

Conduct in accordance with test protocol indicated in Part 1, paragraph FIELD PEEL ADHESION TEST.

3.5 PROTECTION AND CLEANING

3.5.1 Protection

3.5.1.1 Adjacent Surfaces

Protect exposed adjacent surfaces that could be damaged by primers and adhesives associated with air barrier membrane. Provide protection during application and the remainder of construction in accordance with manufacturer's written instructions.

3.5.1.2 The Air Barrier Assembly

Protect finished portions of the air barrier assembly from damage during ongoing application and throughout the remainder of the construction period in accordance with manufacturer's written instructions. Coordinate timing of installation of materials that will cover the air barrier membrane to ensure the exposure period does not exceed that recommended by the air barrier manufacturer's written installation instructions. Remove and replace, at no additional cost to the government, membrane products that exceed the manufacturer's allowed exposure limits.

3.5.2 Cleaning

Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction and as acceptable to the primary material manufacturer.

-- End of Section --

SECTION 07 27 36

SPRAY FOAM AIR BARRIERS
05/17

PART 1 GENERAL

1.1 REFERENCES

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

AIR BARRIER ASSOCIATION OF AMERICA (ABAA)

ABAA Accreditation	Accreditation
ABAA QAP	Quality Assurance Program

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP Z9.2	(2018) Fundamentals Governing the Design and Operation of Local Exhaust Ventilation Systems
ASSP Z88.2	(2015) American National Standard Practices for Respiratory Protection

ASTM INTERNATIONAL (ASTM)

ASTM C518	(2017) Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
ASTM C1029	(2015) Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation
ASTM C1060	(2015) Standard Practice for Thermographic Inspection of Insulation Installations in Envelope Cavities of Frame Buildings
ASTM C1303/C1303M	(2015) Standard Test Method for Predicting Long-Term Thermal Resistance of Closed-Cell Foam Insulation
ASTM C1338	(2014) Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings
ASTM D1621	(2016) Standard Test Method for Compressive Properties of Rigid Cellular Plastics
ASTM D1622	(2014) Apparent Density of Rigid Cellular Plastics

ASTM D1623	(2017) Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
ASTM D2126	(2009) Response of Rigid Cellular Plastics to Thermal and Humid Aging
ASTM D2842	(2012) Water Absorption of Rigid Cellular Plastics
ASTM D4541	(2017) Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM D6226	(2015) Standard Test Method for Open Cell Content of Rigid Cellular Plastics
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 E283	(2019) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E736	(2000; R 2011) Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
ASTM E2178	(2021a) Standard Test Method for Air Permeance of Building Materials
ASTM E2357	(2017) Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

ICC EVALUATION SERVICE, INC. (ICC-ES)

ICC-ES AC377	(2016) Acceptance Criteria for Spray-Applied Foam Plastic Insulation

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code
ICC IECC	(2015) International Energy Conservation Code

INTERNATIONAL SAFETY EQUIPMENT ASSOCIATION (ISEA)

ANSI/ISEA Z87.1	(2020) Occupational and Educational Personal Eye and Face Protection Devices

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10	(2018; ERTA 1-2 2018) Standard for Portable Fire Extinguishers
NFPA 31	(2020) Standard for the Installation of Oil-Burning Equipment
NFPA 54	(2018) National Fuel Gas Code
NFPA 70	(2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code
NFPA 211	(2019) Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances
NFPA 275	(2017) Standard Method of Fire Tests for the Evaluation of Thermal Barriers
NFPA 285	(2012) Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

SPRAY POLYURETHANE FOAM ALLIANCE (SPFA)

SPFA TechDocs	(2015) SPFA Technical Documents Library, four categories: General, Insulation, Roofing, Specialty

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-600-01	(2016; with Change 3, 2019) Fire Protection Engineering for Facilities

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

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

29 CFR 1910.132	Personal Protective Equipment
29 CFR 1910.133	Eye and Face Protection
29 CFR 1910.134	Respiratory Protection

UNDERWRITERS LABORATORIES OF CANADA (ULC)

ULC S705.2	(2005) Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Application

1.2 RELATED REQUIREMENTS

Coordinate the requirements of Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM and other building envelope sections to provide a complete air barrier system. Submit all materials, components, and assemblies of the air barrier system together as one complete submittal package.

1.3 DEFINITIONS

1.3.1 Long Term Thermal Resistance (LTTR)

The thermal resistance value of a closed cell foam insulation product measured using accelerated aging ASTM C1303/C1303M equivalent to the time-weighted average thermal resistance value over 15 years. Loss in thermal resistance is attributable to changes in cell gas composition caused by diffusion of air into and blowing agent out of the foam cells.

1.3.2 SPFA TechDocs

Reformatted documents, named SPFA TechDocs (http://www.sprayfoam.org/technical/spfa-technical-documents), places each document in one of four categories for easy reference and identification: Roofing, Insulation, Specialty and General.

Spray Polyurethane Foam: Thermal and air barrier system consisting of sprayed polyurethane foam (SPF).

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Qualification of Manufacturer; G, RO

Qualification of Installer; G, RO

Quality Control Plan; G, RO

Safety Plan; G, RO

Fire Prevention Plan; G, RO

Respirator Plan; G, RO

SD-02 Shop Drawings

Spray Foam Air Barrier System

Foam Air Barrier System; G, RO

Fire-Rated Assemblies; G, RO

SD-03 Product Data

Closed Cell SPF; G, RO

Transition Membrane; G, RO

Primers, Adhesives, and Mastics; G, RO

Sealants; G, RO

Safety Data Sheets; G, RO

Thermal Barrier Materials; G, RO

Accessories; G, RO

Recycled Content for Closed Cell Spray Foam Air Barrier; S

SD-04 Samples

Spray Foam Air Barrier Mockup; G, RO

SD-06 Test Reports

Field Peel Adhesion Test; G, RO

Thermographic Test; G, RO

Air Barrier Test; G, RO

Primers; G, RO

Fire-Ratings Of Thermal Barrier Materials; G, RO

Flame Spread And Smoke Developed Index Ratings Of SPF Products; G, RO

Flame Propagation Of Wall Assemblies; G, RO

Site Inspections Reports; G, RO

SD-07 Certificates

Closed cell SPF; G, RO

Transition Membrane; G, RO

Indoor Air Quality for Spray Foam Air Barrier; S

SD-08 Manufacturer's Instructions

SPF Handling, Storage, and Spray Procedures; G, RO

Substrate Preparation; G, RO

Thermal Barrier; G, RO

Transition Membrane; G, RO

Primers, Adhesives, and Mastics; G, RO

SD-09 Manufacturer's Field Reports

Core Samples; G, RO

Daily Work Record; G, RO

Visual Inspection and Thermal Scanning; G, RO

1.4.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment for spray foam insulation; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of

the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for spray foam insulation, if available, that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

4. Low-Emitting Materials - Interior mastics, primers, adhesives and sealants applied on site:

a. Meet the VOC emissions evaluation and meet the VOC content evaluation. The mastics, primers, adhesives and sealants product category include all interior adhesives and sealants applied on site. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

5. Low-Emitting Materials - Insulation:

a. Meet the VOC emissions evaluation for all insulation products. The insulation material category includes all thermal and acoustic boards,

batts, rolls, blankets, sound attenuation fire blankets, foamed-in place, loose-fill, blown, and sprayed insulation. Insulation for HVAC ducts and plumbing piping are excluded. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.5 MISCELLANEOUS REQUIREMENTS

For the spray foam air barrier system provide the following:

1.5.1 Shop Drawings

Submit spray foam air barrier shop drawings showing locations, detailing, and extent of spray foam air barrier assemblies. Provide details of all typical conditions, intersections with other envelope assemblies and materials, membrane counter-flashings. Provide details for fire-rated assemblies and indicate materials for thermal barriers. Show details for bridging of gaps in construction, treatment of inside and outside corners, expansion joints, methods of attachment of materials covering the SPF without compromising the barrier. Indicate how miscellaneous penetrations such as conduit, pipes, electric boxes, brick ties, and similar items will be sealed.

1.5.2 Product Data

Submit manufacturer's technical data indicating compliance with performance and environmental requirements, manufacturer's printed instructions for evaluating, preparing, and treating substrates, temperature and other limitations of installation conditions, safety requirements for installation, and Safety Data Sheets. Indicate flame and smoke spread ratings for all products. Submit thermal barrier literature including material description, physical properties, and fire-ratings.

1.5.3 Mockup

Provide a mockup of each foam system specified. Apply foam in an area designated by the Contracting Officer. Apply an area of not less than 50 square feet. Include all components specified for the finished assembly including primers, support components, expansion and contraction joints, thermal barriers, and other accessories as representative of the complete system. Isolate the area and protect workers as required by 29 CFR 1910.132, 29 CFR 1910.133 and 29 CFR 1910.134. Notify the Contracting Officer a minimum of 48 hours prior to the test application. Select a test area representative of conditions to be sprayed including window or door openings, wall to ceiling transitions, flashings, and penetrations, as applicable.

1.5.4 Test Reports

Submit test reports indicating that field peel adhesion tests on all materials have been performed and the changes made, if required, in order to achieve successful and lasting adhesion. Submit test reports for flame spread and smoke developed index ratings of SPF products tested in accordance with ASTM E84. Submit test reports for flame propagation of wall assemblies tested in accordance with NFPA 285. Submit test reports for fire-ratings of thermal barrier materials tested in accordance with ASTM E84.

1.6 DELIVERY, STORAGE, AND HANDLING

1.6.1 Delivery

Deliver and store materials in sufficient quantity to allow for uninterrupted flow of work. Inspect materials delivered to the site for damage; unload and store out of weather. Deliver materials to the jobsite in their original unopened packages, clearly marked with the manufacturer's name, brand designation, description of contents, and shelf life of containerized materials. Store and handle to protect from damage. Submit SPF Handling, Storage, and Spray Procedures in accordance with submittal procedures.

1.6.2 Storage

Store materials in clean, dry areas, away from excessive heat, sparks, and open flame. Maintain temperatures in the storage area below the materials' flash point(s) and within limits recommended by the manufacturer's printed instructions. Provide ventilation in accordance with ASSP Z9.2 to prevent build-up of flammable gases. Store MDI (A-side) drums in locations that limit the risk of contact with water, acids, caustics (such as lye), alcohols, and strong oxidizing and reducing agents.

1.6.3 Handling

Handle materials and containers safely and in accordance with manufacturer's recommendations. Store liquids in airtight containers and keep containers closed except when removing materials. Do not use equipment or containers containing remains of dissimilar materials. Do not expose foam component containers to direct sunlight. Do not use materials from containers with content temperatures in excess of 80 degrees F.

Containers exposed to long periods of cold may also exhibit separation and poor performance. Do not use materials exposed to temperature ranges outside of manufacturer's instructions for exposure limits.

Mark and remove from job site materials which have been exposed to moisture, that exceed shelf life limits, or that have been exposed to temperature extremes.

1.6.3.1 Venting and Handling of Material Containers

Partially unscrew material container and drum caps to gradually vent the containers prior to opening. Do not inhale vapors. Decontaminate empty component containers by filling with water and allowing to stand for 48 hours with bung caps removed. Do not, under any circumstances seal, stop, or close containers which have been emptied of foam components.

1.7 FIELD PEEL ADHESION TEST

Perform a field peel adhesion test on the construction mockup. Test the SPF for adhesion in accordance with ASTM D4541 using a Type II pull tester except use a disk that is 4 inches in diameter and cut through the membrane to separate the material attached to the dish from the surrounding material. Perform test after curing period in accordance with manufacturer's written recommendations. Record mode of failure and area which failed in accordance with ASTM D4541. Compare adhesion values with

the manufacturer's established minimum values for the particular combination of material and substrate. Indicate on the inspection report whether the manufacturer's requirement has been met. Where the manufacturer has not declared a minimum adhesion value for their product and substrate combination, the inspector must record actual values.

1.8 AIR BARRIER TESTING

Perform air barrier testing in accordance with Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM.

1.9 SAFETY PROVISIONS

1.9.1 Fire Prevention

Provide a written fire prevention plan for the SPF application. Address specific fire hazards such as spontaneous combustion from exothermic heat build-up of SPF components during curing. Provide a continuous fire watch during mixing and spraying of SPF and for a minimum of two hours after completion of work at the end of each day. Maintain fire watch for additional time as required to ensure no potential ignition conditions exist.

1.9.1.1 Fire Extinguishers

Furnish two fire extinguishers of minimum 15 pounds capacity each, in accordance with NFPA 10, in the immediate vicinity of the work. CAUTION: Do not discharge high pressure carbon dioxide extinguishers where explosive vapors exist since the discharge can cause a spark which will ignite the vapors.

1.9.2 Respirator Plan

Provide a written respirator plan in accordance with OSHA regulations that protects installers during application and addresses separation of the area to prevent other workers from entering the work area during spraying.

1.9.3 Isolation

Isolate the work area as recommended by spray foam manufacturer's written requirements. Prevent workers without respiratory, skin, and eye Personal Protective Equipment (PPE) or training from entering the work area or otherwise being exposed to off-gassing of the insulation in excess of permissible exposure limits.

1.9.4 Respirators and Eye Protection

Respiratory protective devices (respirators) must meet the requirements of ASSP Z88.2. Eye and face protective equipment must meet the requirements of ANSI/ISEA Z87.1. Additionally, sprayers and workers in the immediate vicinity of the spray must wear NIOSH-approved, full-face, supplied air respirators (SAR) operated in positive pressure or continuous flow mode. Workers not in the immediate vicinity of the sprayer must wear air purifying respirators (APR) with an organic gas / P100 particulate cartridge. Instruct personnel in the use of devices. Maintain such equipment and inspect regularly. All workers are required to have undergone pulmonary function testing and fit testing and must provide certification that they have done so. Change APR cartridges in accordance with manufacturer's written recommendations.

1.9.5 Clothing and Gloves

Sprayers and workers must wear protective clothing and gloves in accordance with OSHA requirements during materials application. Disposable coveralls must be worn and must cover all exposed skin. Sprayers and workers must wear fabric gloves coated with nitrile, neoprene, butyl or PVC.

1.9.6 Additional Requirements

Require personnel to review the Health, Safety and Environmental Aspects of Spray Polyurethane Foam and Coverings published by the Spray Polyurethane Foam Alliance (SPFA). Verify compliance prior to allowing personnel on site for installation work. http://www.sprayfoam.org.

1.10 QUALITY ASSURANCE

1.10.1 Qualification of Manufacturer

Submit documentation verifying that the manufacturer of the SPF is currently accredited by the Air Barrier Association of America (ABAA Accreditation https://www.airbarrier.org/) and by the Spray Polyurethane Foam Alliance (SPFA).

1.10.2 Qualification of Installer

Submit documentation verifying that installers of the spray foam air barrier are currently certified by ABAA/BPQI (Building Performance Quality Institute) or by the Spray Polyurethane Foam Alliance (SPFA) Professional Certification Program (PCP). Installers must provide photo identification certification cards for inspection upon request.

1.10.3 General Quality Requirements

Provide all products and installation in accordance with SPFA TechDocs requirements (http://www.sprayfoam.org/technical/spfa-technical-documents) and documented best practices.

1.11 PRECONSTRUCTION MEETING

Conduct a preconstruction meeting after approval of submittals and a minimum of two weeks prior to commencing work specified in this Section. Attendance is required by the Contracting Officer's designated personnel, Contractor, and representatives of related trades including covering materials, substrate materials, adjacent materials, and materials and components of the air/vapor/thermal barrier system. Agenda must include, at a minimum, the following items:

a. Drawings, specifications and submittals related to the SPF work;

b. Sequence of construction;

c. Coordination with substrate preparation work and responsibility of repairing defects in substrates. Determine method of ensuring SPF work does not begin until substrates have been inspected and accepted;

d. Compatibility of materials;

e. Construction and testing of construction mockup;

f. Application of self-adhering air barrier transitions strips and primer as required for sealing the spray foam air barrier system at openings including but not limited to windows, doors and louvers;

g. Spray foam air barrier system installation; including methods to be used to provide a continuous barrier at thru-wall flashing, penetrations, and covering of embed items;

h. Quality control plan including methods of applying the product so that a consistent thickness across the face of the substrate is achieved.

i. Procedures for SPF manufacturer's technical representative's onsite inspection and acceptance of substrates, contact info for the representative, frequency of visits, and distribution of copies of inspection reports. Determine where core samples will be taken and review procedures for daily documentation of SPF application.

j. Property protection measures, including isolation of the work, and prevention of overspray and clean-up should overspray occur.

k. Safety requirements, including review of PPE, fire prevention, safety plan, respirator plan, ventilation and separation of the work area, fall protection, and posting of warning signs. Provide a complete schedule and a detailed, written fire protection plan including temporary isolation of the product and the work area until permanent isolation or thermal barrier is in place.

1.12 ENVIRONMENTAL CONDITIONS

1.12.1 Temperature and Weather

Install SPF within the range of ambient and substrate surface temperatures in accordance with manufacturer's written instructions. Do not apply SPF to damp or wet substrates. Do not apply SPF during inclement weather or when ice, frost, surface moisture, or visible dampness is present on surfaces to be covered, or when precipitation is imminent. Do not apply SPF to exterior building surfaces when wind speeds exceed 25 miles per hour. Use moisture measuring methods and equipment to verify that the moisture conditions of substrate surfaces are in accordance with SPF manufacturer requirements prior to application. Substrate temperatures must be within limits recommended by the manufacturer's printed instructions.

1.12.2 Conditions for Primers

Follow manufacturer's printed application and curing instructions. Do not apply primer when ambient temperature is below 40 degrees F or when ambient temperature is expected to fall below 35 degrees F for the duration of the drying or curing period.

1.12.3 Conditions for Ignition Barriers

Ensure that sprayed surfaces comply with manufacturer's written requirements for application coverage, thickness, and curing prior to application of ignition barrier coatings.

1.12.4 Temporary Ventilation

Provide temporary ventilation for work of this section in accordance with manufacturer's written instructions and with OSHA requirements for this type of application.

1.13 FOAM SPRAY EQUIPMENT

1.13.1 Applicator

Use an air purge foam spray gun.

1.13.2 Equipment Calibration

Fully calibrate the foam metering equipment to monitor each liquid component to within 2 percent of the SPF manufacturer's required metering ratio. Calibrate spray equipment each day at the start of operations, after each restart if spraying operations have been terminated for more than one hour, whenever there is a change in fan pattern or pressure, whenever slow curing areas are noticed, whenever a change is made in hose length or working height, and after changeover between materials. Calibration consists of demonstrating that the equipment is adjusted to deliver components in proper mix and proportion. Conduct calibration tests on cardboard or plywood on a wall adjacent to the area to be sprayed.

1.13.3 Metering Equipment Requirements

Use foam metering equipment capable of developing and maintaining the SPF manufacturer's required liquid component pressures and temperatures. Foam metering equipment must have gages for visual monitoring. Equipment must provide temperature control of foam components to within the temperature ranges recommended by the foam manufacturer's printed instructions.

1.13.4 Moisture Protection

Protect surfaces of supply containers and tanks used to feed foam metering equipment from moisture.

1.13.5 Compressed Air

Supply compressed air that is in contact with SPF during mixing or atomization through moisture traps that are continuously bled.

1.13.6 Dispense Excess Materials

Do not deposit materials used for cleaning of equipment or materials dispensed for calibration purposes and establishment of spray gun pattern onto the ground. Dispense such materials into scrap containers or onto plastic film, or cardboard, and dispose of in accordance with safety requirements and jobsite regulations.

PART 2 PRODUCTS

2.1 SPRAY FOAM AIR BARRIER

2.1.1 General

Provide a closed cell sprayed in place, SPF that forms a continuous air /vapor/thermal barrier at the building enclosure. Provide in accordance

with ASTM C1029, with the requirements of UFC 3-600-01, ICC IBC Chapter 26, ICC-ES AC377, and NFPA 285. In the event of a conflict, the most stringent requirement applies. Provide all system components necessary for a complete, code compliant installation, whether indicated or not, including material support components, expansion and contraction joints, thermal barrier materials, and accessories.

Provide insulation installed within the building interior with VOC emissions certified in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method.

2.1.2 Physical Properties

Provide a closed cell product with the following characteristics:

a. Density (ASTM D1622): 2.0 lb per cf, nominal

b. Thermal Resistance (ASTM C518)

(1) Initial R-value per inch thickness: 6.7 sf·degrees F h per Btu

(2) Aged R-value per inch thickness (180 days at 76 degrees F): 6.6 sf·degrees F·h per Btu

c. Air Permeance (ASTM E2178): In accordance with Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEMLess than 0.0003 CFM per sf at 1.57 psf.

d. Air Leakage (ASTM E2357, ASTM E283): In accordance with Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM less than 0.005 CFM per sf at 1.57 psf at one inch.

e. Compressive Strength (ASTM D1621): Minimum 26 psi

f. Tensile Strength (ASTM D1623)

(1) Medium density: 62.4 psi

g. Water Vapor Permeance (ASTM E96/E96M, water method): less than 1.39 US Perms at one inch thickness

h. Vapor Retarder (ICC IBC, ICC IECC) Class III

i. Surface Burning Characteristics (ASTM E84) 3 inch thickness:

(1) Flame Spread (FS) Index Rating less than 25.

(2) Smoke Developed (SD) Index Rating less than SPF with an SD rating greater than 150 but less than 450 may be used when fully encapsulated. .

j. Closed Cell Content (ASTM D6226): 98 percent

k. Dimensional Stability (Humid Aging) (ASTM D2126): 15 percent at 28 days at 158 degrees F with 97 percent relative humidity.

l. Water Absorption (ASTM D2842): Maximum 1.0 per volume

m. Fungi Resistance (ASTM C1338): Pass, with no growth

n. Recycled Content: Minimum 9 percent (pre- and post-consumer). Provide data identifying percentage of recycled content for closed cell spray foam air barrier.

2.1.3 Accessories

Provide a thermal ignition barrier product with a thickness as listed by the manufacturer that has been tested and approved as a 15-minute thermal barrier over foam plastics in accordance with the Temperature Transmission Fire Test and Integrity Fire Test of NFPA 275.

Lath: open weave, glass fiber self-furring lath to span across all substrate and planar changes to resist foam shrinkage and loss of adhesion pending successful mockup installation.

Fasteners for Lath: 1/4 inch diameter stainless steel drive pin and mushroom head with length to provide a minimum of 1-1/4 inch embedment.

2.1.4 Expansion and Contraction

Provide an assembly that allows for relative movement due to temperature, moisture, and air pressure changes. Provide expansion and contraction measures as required by the manufacturer's written recommendations.

2.1.5 Fire-ratings, Flame Spread and Smoke Developed Index Ratings

Where fire-rated materials are indicated, provide products with the appropriate markings of a qualified testing agency. Submit fire-rating test reports. Submit flame spread (FS) and smoke developed (SD) index data. Where FS and SD values of foam products do not meet requirements, provide corresponding ignition barrier products or assemblies and verify complete encapsulation of the spray foam air barrier through product data or on shop drawings. Submit for approval in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

2.1.6 Prohibited Materials

Products that contain hexabromocyclododecane (HBCD) flame retardants are prohibited. Products that contain hydrochlorofluorocarbons (HCFCs), chlorofluorocarbons (CFCs), or other high ozone depleting blowing agents, are prohibited. For a list of acceptable substitute foam blowing agents see https://www.epa.gov/snap/foam-blowing-agents. Provide validation of indoor air quality for spray foam air barrier that no prohibited materials are used.

2.1.7 Thermal Barrier

Provide a thermal barrier in locations where SPF is exposed to the interior of the building, including attics and plenum spaces. Provide thermal barriers in accordance with ICC IBC Chapter 26 "Plastics," with ICC-ES AC377, ASTM E736, and NFPA 275. Choose one or more of the following methods of separation:

a. Building interior, other than fire-rated enclosures: Separate the SPF from the occupied interior of a building by a continuous thermal barrier of 1/2 inch glass mat gypsum wallboard (GWB) in accordance with ICC IBC Chapter 26 requirements.. Provide in accordance with NFPA 275.

b. Building interior, fire-rated enclosures: At walls, ceilings and floors that are required to be fire-rated, separate the SPF from the occupied interior of a building with an ignition barrier consisting of 5/8 inch, Type X, fire-rated GWB in the number of layers corresponding to required ratings. Include all accessories as necessary for complete fire-rated assemblies.

c. Unoccupied attics, crawl spaces: Where fire-rated enclosures are not required, and where entry is made only for service of utilities, separate the SPF from the attic or crawl space with a continuous ignition barrier in accordance with ICC IBC Chapter 26 requirements, and as approved by the Contracting Officer's Representative. Provide one of the following:

(1) 1-1/2 inch thick mineral fiber insulation

(2) 1-1/2 inch thick cellulose insulation

2.2 TRANSITION MEMBRANE

Provide as specified in Section 07 27 19.01 SELF-ADHERING AIR BARRIERS.

2.3 PRIMERS, ADHESIVES, AND MASTICS

Provide primers, adhesives, mastics and other accessory materials as recommended by spray foam manufacturer's printed literature.

Provide primers, adhesives, and mastics applied within the building interior with VOC emissions certified in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method and VOC content in compliance with limits of SCAQMD Rule 1168.

2.4 FLASHING

As specified in Section 07 60 00 FLASHING AND SHEET METAL.

2.5 JOINT SEALANTS

As specified in Section 07 92 00 JOINT SEALANTS. Verify compatibility with other system products.

PART 3 EXECUTION

3.1 EXAMINATION

Before installing the spray foam air barrier and with the installer present, examine substrates, areas, and conditions under which SPF will be applied, for compliance with requirements. Ensure that surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants. Ensure that concrete surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions. Correct defects that adversely affect the spray foam application or performance. Verify that work by other trades is in place and complete prior to application of spray foam.

3.2 PREPARATION

3.2.1 Substrate Preparation

Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for spray foam application.

a. Prepare surfaces by brushing, scrubbing, scraping, or grinding to remove loose mortar, dust, oil, grease, oxidation, mill scale and other contaminants which will affect adhesion of the SPF.

b. Wipe down metal surfaces to remove release agents or other non-compatible coatings, using clean sponges or rags soaked in a solvent compatible with the SPF.

3.2.2 Protection

Protect adjacent areas and surfaces from spray applied materials in accordance with the following:

a. Mask and cover adjacent areas to protect from over spray.

b. Ensure required foam stops and back up materials are in place to achieve a complete seal.

c. Seal off ventilation equipment. Install temporary ducting and fans to provide required exhaust of spray fumes. Provide make-up air as required.

d. Erect barriers, isolate area, and post warning signs to notify non-protected personnel of the requirement to avoid the spray area.

3.2.3 Blocking Around Heat Producing Devices

Install non-combustible blocking around heat producing devices to provide the following clearances:

a. Recessed light fixtures, including wiring compartments, ballasts, and other heat producing devices, unless certified for installation surrounded by insulation: Minimum of 3 inches from outside face of fixtures and devices and in accordance with NFPA 70 and, if insulation is to be placed above fixture or device, 24 inches above fixture.

b. Masonry chimneys or masonry enclosing a flue: a minimum of 2 inches from outside face of masonry. Masonry chimneys for medium and high heat operating appliances: Minimum clearances in accordance with NFPA 211.

c. Vents and vent connectors used for venting products of combustion, flues, and chimneys other than masonry chimneys: Minimum clearances in accordance with NFPA 211.

d. Gas Fired Appliances: Clearances in accordance with NFPA 54.

e. Oil Fired Appliances: Clearances in accordance with NFPA 31. Blocking is not required if chimneys or flues are certified by the manufacturer for use in contact with insulating materials.

3.2.4 Fire and Explosion Hazards

Prohibit open flames, sparks, welding, and smoking in the application area. Provide and maintain fire extinguishers of appropriate type, size and distance, as required by NFPA, in the application area. Mix batches in small enough quantities to avoid spontaneous combustion from exothermic heat build-up of SPF components during curing.

3.2.5 Warning Signs

Post warning signs at ground level adjacent to the work area and a minimum of 150 feet from the application area stating the area is off limits to unauthorized persons and warning of potential hazards. Place clearly visible and legible warning sign at entrance to primary road leading to the project facility warning of presence of flammable materials, irritating fumes, and potential of overspray damage.

3.2.6 Prime Substrate

Provide as recommended by the manufacturer for each substrate to be primed. Use primers at full strength. Do not dilute primers unless required and as recommended in writing by the manufacturer. Do not use cleaning solvents for thinning primers or other materials. Ensure that diluted primer(s) meet VOC requirements.

3.3 INSTALLATION

3.3.1 Sequencing and Coordination

Sequence the work so as to prevent access to the work area by other trades during foam application and curing. Limit access of non-essential workers during application. Notify the Contracting Officer 24 hours in advance of spraying operations. Sequence spray foam work with other trades to permit continuous self-flashing of the spray foam air barrier. Ensure expansion and control joints are provided as detailed on the manufacturer's shop drawings to accommodate the expansion of each layer of the air/vapor /thermal envelope. Provide temporary fire protection of uncured foam, and isolate the work area, until foam application is isolated with a permanent thermal barrier.

3.3.2 Installation of Transition Membrane

Install transition membrane materials in accordance with the details on the drawings, Section 07 27 19.01 SELF-ADHERING AIR BARRIERS, and the following:

a. Install transition membrane at all required locations prior to installation of the fluid-applied membrane air barrier.

b. Verify transition membrane is fully adhered to substrate and that its surface is clean, dry and wrinkle free prior to installation of the fluid-applied membrane air barrier.

c. Verify transition membrane completely covers all transition areas and will provide continuity of the finished SPF air barrier without gaps or cracks.

3.3.3 Installation of Spray Foam Air Barrier

Install materials in accordance with paragraph SAFETY PROVISIONS, in accordance with manufacturer's recommendations, ULC S705.2 Installation Standard, and in accordance with the following:

a. Use spray equipment that complies with foam manufacturer's recommendations for the specific type of application, and as specified herein. Record equipment settings on the Daily Work Record. Each proportioned unit can supply only one spray gun.

b. Apply only when surfaces and environmental conditions are within limits prescribed by the material manufacturer.

c. Continuously connect the spray foam air barrier between walls, roof, floor, and below grade assemblies to form a continuous integrated air barrier system around the entire building enclosure. Extend the spray foam air barrier into rough openings such as doors, windows, louvers, and other exterior penetrations. Use self-adhering air barrier transition strips if necessary to achieve full extension and continuity of the barrier at these locations. Seal edges of barrier at junctures with rough openings.

d. Install within manufacturer's tolerances, but not more than minus 1/4 inch or plus 1/2 inch.

e. Sequence work so as to completely seal all penetrations resulting from pipes, vents, wires, conduit, electrical fixtures, structural members, or other construction. If penetrations through the spray foam air barrier are made after the initial SPF application, reapply in accordance with manufacturer's written instructions for such remedial work.

f. Do not install SPF within 3 inches of heat emitting devices such as light fixtures and chimneys.

g. Finished surface of SPF must be free of voids and embedded foreign objects.

h. Remove masking materials and over spray from adjacent areas immediately after foam surface has hardened. Ensure cleaning methods do not damage work performed by other sections.

i. Trim, as required, any excess thickness that would interfere with the application of cladding and covering system by other trades.

j. Clean and restore surfaces soiled or damaged by work of other trades. Before cleaning and restoring damaged work, consult with other trades for appropriate and approved methods for cleaning and restoration to prevent further damage.

k. Complete connections to other components and repair any gaps, holes or other damage using material approved by the manufacturer.

l. Provide expansion joints in the SPF application aligned with expansion joints in the building enclosure, where substrate materials change, and in accordance with manufacturer's recommendations.

m. Provide a continuous fire watch in accordance with paragraph SAFETY

PROVISIONS.

3.4 FIELD QUALITY CONTROL

3.4.1 General Site Inspections and Testing

Provide site inspections and testing in accordance with ABAA protocol to verify conformance with the manufacturer's instructions, the ABAA QAP Quality Assurance Program (https://www.airbarrier.org/qap/), Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM and this section.

a. Conduct inspections and testing at 5, 50, and 95 percent of completion of this scope of work. Forward written inspection reports to the Contracting Officer within 5 working days of the inspection and test being performed.

b. If inspections reveal any defects, promptly remove and replace defective work at no additional expense to the Government.

3.4.2 Manufacturer Site Inspections

Manufacturer's technical representative must visit the site during the installation process to ensure the SPF and accessories are being applied in compliance with requirements. At a minimum, manufacturer's technical representative must be present at work startup and perform field inspection of the first day's completed application and at substantial completion, prior to demobilization. After each inspection, submit an inspection report signed by the manufacturer's technical representative, to the Contracting Officer within five working days. The inspection report must note overall quality of work, deficiencies, and recommended corrective actions in detail. Notify the Contracting Officer a minimum of two working days prior to site visits by manufacturer's technical representative.

3.4.3 Contractor's Site Inspections

Establish and maintain an inspection procedure to ensure compliance of the foam installation with contract requirements. Conduct inspections and testing at 5, 50, and 95 percent completion of application. Forward written inspection reports to the Contracting Officer within five working days of the inspection and test being performed. Work not in compliance must be promptly removed and replaced or corrected, in an approved manner, at no additional cost to the Government. Quality control must include, but is not limited to, the following:

a. Observation of environmental conditions; number and skill level of insulation workers.

b. Verification of certification, listing, or label.

c. Verification of proper storage and handling of materials before, during, and after installation.

d. Inspection of SPF, support structure, primer, expansion joints, thermal barrier, and accessories.

3.4.4 Field Peel Adhesion Test

Conduct in accordance with test protocol indicated in Part 1 paragraph

FIELD PEEL ADHENSION TEST.

3.4.5 Visual Inspection and Thermal Scanning

Following completion of installation, inspect the SPF surface or cavity using infrared (IR) scanning as specified in ASTM C1060. Where the IR inspection indicates construction inconsistencies including wet insulation, remove inconsistent portions of the assembly and replace insulation to correct thermal anomalies. Reinspect and document corrections to the satisfaction of the Contracting Officer.

3.4.5.1 Thermographic Test Report

Include thermographs in color and a color temperature scale to define the temperature indicated by the various colors. Identify the high temperature reading, the outdoor air temperature, the building indoor air temperature, and the wind speed and direction. Note areas of compromise in the building enclosure, and note actions required and taken to correct those areas. Final thermography test report must demonstrate that the problem areas have been corrected. Submit the complete test and analysis.

3.5 CORRECTION OF DEFICIENCIES

Upon completion of inspection, testing, or sample taking, repair damaged construction, restore substrates and finishes, and protect repaired construction. Deficiencies found during inspection must be corrected within 5 working days following notification.

3.6 CLEANUP OF SPILLS

Conduct cleanup of uncured product spillage in accordance with paragraph SAFETY PROVISIONS and the manufacturer's written safe handling instructions. In the event of a conflict, the most stringent requirement governs.

3.7 PROTECTION AND CLEANING

3.7.1 Protection of Installed Work

Protect SPF installation from damage during application and remainder of construction period in accordance with manufacturer's written instructions. Repair damaged areas to new condition.

3.7.2 Cleaning of Adjacent Surfaces

Clean overspray from adjacent construction using cleaning agents and procedures as recommended in writing by the manufacturer of each type of affected construction and as acceptable to same.

-- End of Section --

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SECTION 07 52 00

MODIFIED BITUMINOUS MEMBRANE ROOFING
05/12

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7	(2017) Minimum Design Loads for Buildings and Other Structures

AMERICAN SOCIETY OF SAFETY PROFESSIONALS (ASSP)

ASSP A10.24	(2014) Roofing - Safety Requirements of Low-Sloped Roofs
ASSP A1264.1	(2017) Safety Requirements for Workplace Walking/Working Surfaces and Their Access; Workplace, Floor, Wall and Roof Openings; Stairs and Guardrail/Handrail Systems
ASSP Z359	(2013) Fall Protection Code
ASSP Z359.2	(2017) Minimum Requirements for a Comprehensive Managed Fall Protection Program
ASSP Z359.6	(2016) Specifications and Design Requirements for Active Fall Protection Systems

ASPHALT ROOFING MANUFACTURER'S ASSOCIATION (ARMA)

ARMA 410BUR88	(2001) Manual of Roof Maintenance and Repair
ARMA PMBRG98	(1998) Quality Control Guideline for the Application of Polymer Modified Bitumen Roofing

ASTM INTERNATIONAL (ASTM)

ASTM C208	(2012; R 2017; E 2017; E 2019) Standard Specification for Cellulosic Fiber Insulating Board
ASTM C578	(2019) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C728	(2017a) Standard Specification for Perlite Thermal Insulation Board

ASTM C1153	(2010) Standard Practice for Location of Wet Insulation in Roofing Systems Using Infrared Imaging
ASTM C1289	(2019) Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
ASTM D41/D41M	(2011; R 2016) Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
ASTM D4073/D4073M	(2006; E 2019; R 2019) Standard Test Method for Tensile-Tear Strength of Bituminous Roofing Membranes
ASTM D4263	(1983; R 2018) Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
ASTM D4586/D4586M	(2007; E 2012; R 2012) Asphalt Roof Cement, Asbestos-Free
ASTM D5147/D5147M	(2014) Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material
ASTM D5957	(1998; R 2013) Standard Guide for Flood Testing Horizontal Waterproofing Installations
ASTM D6162/D6162M	(2016) Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements
ASTM D6163/D6163M	(2016) Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements
ASTM D6164/D6164M	(2016) Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements
ASTM D6298	(2016) Standard Specification for Fiberglass Reinforced Styrene-Butadiene-Styrene (SBS) Modified Bituminous Sheet with a Factory Applied Metal Surface
ASTM E108	(2020a) Standard Test Methods for Fire Tests of Roof Coverings

FM GLOBAL (FM)

FM 4470	(2016) Single-Ply, Polymer-Modified Bitumen Sheet, Built-up Roof (BUR), and Liquid Applied Roof Assemblies for Use in Class 1 and Noncombustible Roof Deck Construction
FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

NRCA C3701	(1997) Repair Manual for Low Slope Membrane Roof Systems
NRCA CONDET	(2014) Construction Details Manual
NRCA RoofMan	(2020) The NRCA Roofing Manual

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1793	(2012) Architectural Sheet Metal Manual, 7th Edition

SINGLE PLY ROOFING INDUSTRY (SPRI)

ANSI/SPRI/FM 4435/ES-1	(2017) Test Standard for Edge Systems Used with Low Slope Roofing Systems

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

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

29 CFR 1910	Occupational Safety and Health Standards

UNDERWRITERS LABORATORIES (UL)

UL 790	(2022) Standard Test Methods for Fire Tests of Roof Coverings
UL RMSD	(2012) Roofing Materials and Systems Directory

1.2 DESCRIPTION OF ROOF MEMBRANE SYSTEM

Minimum three-ply SBS modified bitumen roof membrane consisting of two modified bitumen base sheets and cap sheet. Modified bitumen roof membrane must be set in cold-applied adhesive.

All work must follow the NRCA RoofMan guidelines and standards stated

within this Section.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Roof Plan; G drawing depicting wind loads and boundaries of enhanced perimeter and corner attachments of roof system components, as applicable

Field Inspection and Existing Conditions Report

Identify all fire safety issues including exposed or concealed combustible materials, which may require additional protection during roof installation.

SD-03 Product Data

Modified Bitumen Sheets; G

Solar Reflectance Index (SRI) for Heat Island Reduction; S

Cold-Applied Membrane Adhesive; G

Primer; G

Modified Bitumen Roof Cement; G

Pre-Manufactured Accessories

Fasteners And Plates; G

Sample Warranty certificate; G

Submit all data required by Section 07 22 00 ROOF AND DECK INSULATION, together with requirements of this section. Include in data written acceptance by the roof membrane manufacturer of the products and accessories provided. Provide products as listed in the applicable wind uplift and fire rating classification listings, unless approved otherwise by the Contracting Officer.

SD-05 Design Data

Wind Uplift Calculations; G

Provide Engineering calculations, signed, sealed, and dated by a qualified Engineer validating the wind resistance per ASCE 7, ASTM D4073/D4073M, and ANSI/SPRI/FM 4435/ES-1 of roof system.

SD-07 Certificates

Provide evidence that products used within this specification are manufactured in the United States.

Qualification of Manufacturer

Certify that the manufacturer of the modified bitumen membrane meets requirements specified under paragraph QUALIFICATION OF MANUFACTURER.

Qualification of Applicator

Certify that the applicator meets requirements specified under paragraph QUALIFICATION OF APPLICATOR.

Qualification of Engineer of Record

Certify that the Engineer of Record is fully qualified, competent, and currently licensed to practice in the project jurisdiction.

Wind Uplift Resistance; G classification, as applicable

Fire Resistance classification; G

Submit the roof system assembly wind uplift and fire rating classification listings.

SD-08 Manufacturer's Instructions

Modified Bitumen Membrane Application; G

Flashing; G

Cold Adhesive Applied Modified Bitumen Membrane; G

Base Sheet attachment, including pattern and frequency of mechanical attachments required in field of roof, corners, and perimeters to provide for the specified wind resistance.

Primer

Fasteners

Cold Weather Installation; G

Include detailed application instructions and standard manufacturer drawings altered as required by these specifications. Explicitly identify in writing, differences between manufacturer's instructions and the specified requirements.

SD-11 Closeout Submittals

Warranty

Information Card

Instructions To Government Personnel

Include copies of Safety Data Sheets for maintenance/repair

materials.

Submit 20 year "No-Dollar-Limit" warranty for labor and materials.

Submit Installer Warranty

Submit General Contractor Warranty

1.3.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment for membrane roofing, if available; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for membrane roofing, if available, that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

1.4 QUALITY ASSURANCE

1.4.1 Qualification of Manufacturer

Modified bitumen sheet roofing system manufacturer must have a minimum of 5 years experience in manufacturing modified bitumen roofing products.

1.4.2 Qualification of Applicator

Roofing system applicator must be approved, authorized, or licensed in writing by the modified bitumen sheet roofing system manufacturer and have a minimum of five years experience as an approved, authorized, or licensed applicator with that manufacturer and be approved at a level capable of providing the specified warranty. The applicator must supply the names, locations and client contact information of five projects of similar size and scope that the applicator has constructed using the manufacturer's roofing products submitted for this project within the previous three years.

1.4.3 Qualification of Engineer of Record

Engineer of Record must be approved, authorized, and currently licensed by the state of New York, and have a minimum of five years experience as an approved Engineer for manufacturers of similar roof systems. Engineer of Record must supply the names and locations of five projects of similar size and scope for which he has provided engineering calculations using the manufacturer's products submitted for this project within the previous three years. Engineer of Record must provide certified engineering calculations for:

Wind uplift requirementsin accordance with Local and State codes

ASCE 7,in accordance with International Building Code.

Seismic requirements per local and state building codes

Seismic requirements per ICC IBC Chapter 16, Section 1608.3

Snow load requirements per ICC IBC Chapter 16 Section 1608.3 and Section 7 of ASCE 7

1.4.4 Fire Resistance

Complete roof covering assembly must:

a. Be Class A rated in accordance with ASTM E108, FM 4470, or UL 790; and

b. Be listed as part of Fire-Classified roof deck construction in UL RMSD, or Class I roof deck construction in FM APP GUIDE.

FM or UL approved components of the roof covering assembly must bear the appropriate FM or UL label.

1.4.5 Wind Uplift Resistance

Provide a complete roof system assembly that is rated and installed to resist wind loads calculated in accordance with ASCE 7 and validated by uplift resistance testing in accordance with Factory Mutual (FM) test procedures. Do not install non-rated systems, except as approved by the Contracting Officer. Submit licensed engineer's Wind uplift calculations and substantiating data to validate any non-rated roof system. Base wind uplift measurements on a design wind speed as indicated on the drawings and in accordance with ASCE 7 and other applicable building code requirements.

1.4.6 Preroofing Conference

After approval of submittals and before performing roofing and insulation system installation work, hold a preroofing conference to review the following:

a. Drawings, including Roof Plan, specifications and submittals related to the roof work

b. Roof system components installation

c. Procedure for the roof manufacturer's technical representative's onsite inspection and acceptance of the roof structure, and roofing substrate, the name of the manufacturer's technical representatives, the frequency of the onsite visits, distribution of copies of the inspection reports from the manufacturer's technical representatives to roof manufacturer

d. Contractor's plan for coordination of the work of the various trades involved in providing the roofing system and other components secured to the roofing

e. Quality control, (ARMA PMBRG98) plan for the roof system installation

f. Field inspection and existing conditions report identifying all fire safety issues including exposed or concealed combustible materials, which may require additional protection during roof installation

g. Safety requirements

Coordinate preroofing conference scheduling with the Contracting Officer. The conference must be attended by the Contractor, the Contracting Officer's designated personnel, and personnel directly responsible for the installation of roofing and insulation, flashing and sheet metal work, mechanical and electrical work, other trades interfacing with the roof work, designated safety personnel trained to enforce and comply with ASSP A10.24, and a representative of the roofing materials manufacturer. Before beginning roofing work, provide a copy of meeting notes and action items to all attending parties. Note action items requiring resolution prior to start of roof work.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery

Deliver materials in manufacturers' original unopened containers and rolls with labels intact and legible. Mark and remove wet or damaged materials from the site. Where materials are covered by a referenced specification, the container must bear the specification number, type, and class, as applicable. Deliver materials in sufficient quantity to allow work to proceed without interruption.

1.5.2 Storage

Protect materials against moisture absorption and contamination or other damage. Avoid crushing or crinkling of roll materials. Store roll materials on end on clean raised platforms or pallets one level high in dry locations with adequate ventilation, such as an enclosed building or closed trailer. Do not store roll materials in buildings under construction until concrete, mortar, and plaster work is finished and dry. Maintain roll materials at temperatures above 50 degrees F for 24 hours immediately before application. Do not store materials outdoors unless approved by the Contracting Officer. Completely cover felts stored outdoors, on and off roof, with waterproof canvas protective covering. Do not use polyethylene sheet as a covering. Tie covering securely to pallets to make completely weatherproof. Provide sufficient ventilation to prevent condensation. Do not store more materials on roof than can be installed the same day and remove unused materials at end of each days work. Distribute materials temporarily stored on roof to stay within live load limits of the roof construction.

Maintain a minimum distance of 35 foot for all stored flammable materials, including materials covered with shrink wraps, craft paper or tarps from all torch/welding applications.

Immediately remove wet, contaminated or otherwise damaged or unsuitable materials from the site. Damaged materials may be marked by the Contracting Officer.

1.5.3 Handling

Prevent damage to edges and ends of roll materials. Do not install damaged materials in the work. Select and operate material handling equipment to prevent damage to materials or applied roofing.

1.6 ENVIRONMENTAL REQUIREMENTS

Do not install roofing system when air temperature is below 40 degrees F, during any form of precipitation, including fog, or when there is ice, frost, moisture, or any other visible dampness on the roof deck. Follow manufacturer's printed instructions for Cold Weather Installation.

1.7 SEQUENCING

Coordinate the work with other trades to ensure that components which are to be secured to or stripped into the roofing system are available and that permanent flashing and counter flashing, per NRCA CONDET, and are installed as the work progresses. Ensure temporary protection measures are in place to preclude moisture intrusion or damage to installed materials. Apply roofing immediately following application of insulation as a continuous operation. Coordinate roofing operations with insulation work so that all roof insulation applied each day is covered with roof membrane installation the same day.

1.8 WARRANTY

Provide roof system material and workmanship warranties meeting specified requirements. Provide revision or amendment to standard membrane manufacturer warranty as required to comply with the specified requirements. Provide a manufacturer's warranty that has no dollar limit, covers full system water-tightness, and has a minimum duration of 20 years.

1.8.1 Roof Membrane Manufacturer Warranty

Furnish the roof membrane manufacturer's 20-year no dollar limit roof system materials and installation workmanship warranty, including flashing, insulation in compliance with ASTM C1289, and accessories necessary for a watertight roof system construction. Provide warranty directly to the Government and commence warranty effective date at time of Government's acceptance of the roof work. The warranty must state that:

a. If within the warranty period the roof system, as installed for its intended use in the normal climatic and environmental conditions of the facility, becomes non-watertight, shows evidence of moisture intrusion within the assembly, blisters, splits, tears, delaminates, separates at the seams, or shows evidence of excessive weathering due to defective materials or installation workmanship, the repair or replacement of the defective and damaged materials of the roof system assembly and correction of defective workmanship are the responsibility of the roof membrane manufacturer. All costs associated with the repair or replacement work are the responsibility of the roof membrane manufacturer.

b. When the manufacturer or his approved applicator fail to perform the repairs within 72 hours of notification, emergency temporary repairs performed by others does not void the warranty.

c. Upon completion of installation, and acceptance by the Contracting Officer, Construction Manager and Roofing System Engineer of Record, the manufacturer must supply the appropriate warranty to the Owner.

d. Installer must submit a minimum two year warranty to the membrane manufacturer from the date of acceptance, with a copy to the Contracting Officer , Construction Manager and Roofing System Engineer

of Record.

1.8.2 Roofing System Installer Warranty

The roof system installer must warrant for a period of two years that the roof system, as installed, is free from defects in installation workmanship, to include the roof membrane, flashing, insulation, accessories, attachments, and sheet metal installation integral to a complete watertight roof system assembly. Write the warranty directly to the Government. The roof system installer is responsible for correction of defective workmanship and replacement of damaged or affected materials. The roof system installer is responsible for all costs associated with the repair or replacement work.

1.8.3 General Contractor Warranty

Provide warranty for 5 years that the roofing system, as installed, is free from defects in workmanship. When repairs due to defective workmanship are required during the Contractor's warranty period, the Contractor must make such repairs within 72 hours of notification. When repairs are not performed within the specified time, emergency repairs performed by others will not void the warranty.

1.8.4 Continuance of Warranty

Repair or replacement work, ARMA 410BUR88, NRCA C3701 that becomes necessary within the warranty period and accomplished in a manner so as to restore the integrity of the roof system assembly and validity of the roof membrane manufacturer warranty for the remainder of the manufacturer warranty period.

1.9 CONFORMANCE AND COMPATIBILITY

Provide the entire roofing and flashing system in accordance with specified and indicated requirements, including fire and wind resistance (ANSI/SPRI/FM 4435/ES-1) requirements. Work not specifically addressed and any deviation from specified requirements must be in general accordance with recommendations of the NRCA Roofing and Waterproofing Manual, membrane manufacturer published recommendations and details, and compatible with surrounding components and construction. Submit any deviation from specified or indicated requirements to the Contracting Officer for approval prior to installation.

1.10 ELIMINATION, PREVENTION OF FALL HAZARDS

1.10.1 Fall Protection

Provide fall protection for employees per OSHA requirements.

PART 2 PRODUCTS

2.1 MATERIALS

Coordinate with other specification sections related to the roof work. Furnish a combination of specified materials that comprise a roof system acceptable to the roof membrane manufacturer and meeting specified requirements. Protect materials provided from defects and make suitable for the service and climatic conditions of the installation.

Building Product Declarations: Provide membrane roofing with EPD and Material Ingredient Report, if available.

2.1.1 Energy and Cool Roof Performance

Install a roof system that meets an overall performance as specified on the drawings or by insulation specified in other sections. The roofing system will need to include a top surface finish that meets the criteria for Cool Roof Products. Provide emittance and reflectance percentages and solar reflectance index values, to meet sustainable third party certification requirements for Heat Island Reduction.

a. Initial Solar Reflectance Index (SRI) for low-sloped roof: Minimum 82 SRI.

2.2 MODIFIED BITUMEN SHEETS MATERIALS

Furnish a combination of specified materials that comprise the modified bitumen manufacturer's standard system of the number and type of plies specified. Provide materials suitable for the service and climatic conditions of the installation. Modified bitumen sheets must be watertight and visually free of pinholes, particles of foreign matter, non-dispersed raw material, factory splices, or other conditions that might affect serviceability. Polymer modifier must comply with ARMA PMBRG98 and be uniformly dispersed throughout the sheet. Edges of sheet must be straight and flat.

a. SBS Base Sheet: ASTM D6162/D6162M or ASTM D6164/D6164M or ASTM D6163/D6163M, Type I or II, Grade S, minimum 80 mils thick.

b. SBS Interply Sheet: ASTM D6162/D6162M or ASTM D6164/D6164M or ASTM D6163/D6163M, Type I or II, Grade S, minimum 80 mils thick.

c. SBS Cap Sheet: ASTM D6162/D6162M or ASTM D6164/D6164M or ASTM D6163/D6163M; Type II or III, Grade G or S, minimum 145 mils thick, and as required to provide specified fire safety rating.

2.3 BASE FLASHING MEMBRANE

Membrane manufacturer's standard, minimum two-ply modified bitumen membrane flashing system compatible with the roof membrane specified and as recommended in membrane manufacturer's published literature. Provide flashing membranes that meet or exceed the properties of the material standards specified for the modified bitumen base, interply and cap sheet, except that flashing membrane thickness must be as recommended by the membrane manufacturer. Provide metal clad flashing membrane that complies with ASTM D6298.

2.4 COLD-APPLIED MEMBRANE ADHESIVE

Membrane manufacturer's recommended low volatile organic compound (VOC) cold process adhesive for application of the membrane plies.

2.5 MEMBRANE SURFACING

Provide modified bitumen roof membrane cap sheet with factory-applied granule surfacing of light color as selected from membrane manufacturer's standard colors.

2.6 PRIMER

ASTM D41/D41M, or other primer compatible with the application and as approved in writing by the modified bitumen membrane manufacturer.

2.7 MODIFIED BITUMEN ROOF CEMENT

ASTM D4586/D4586M, Type II for vertical surfaces, Type I for horizontal surfaces, compatible with the modified bitumen roof membrane and as recommended by the modified bitumen membrane manufacturer.

2.8 CANT AND TAPERED EDGE STRIPS

Provide standard cants and tapered edge strips of perlite conforming to ASTM C728, the same material as the roof insulation or when roof insulation material is not available, provide pressure preservative treated wood, wood fiberboard, or rigid perlite board cants and edge strips as recommended by the manufacturer, or wood fiber conforming to ASTM C208 treated with bituminous impregnation, sizing, or waxing and fabricated to provide maximum 45 degree change in direction of membrane. Cant strips must be minimum 1-1/2 inch thick and provide for minimum 5 inch face and 3-1/2 inch vertical height when installed at 45 degree face angle, except where clearance restricts height to lesser dimension. Taper edge strips at a rate of one to 1-1/2 inch per foot to a minimum of 1/8 inch of thickness. Provide kiln-dried preservative-treated wood cants, in compliance with requirements of Section 06 10 00 ROUGH CARPENTRY at base of wood nailers set on edge and wood curbing and where otherwise indicated.

2.9 FASTENERS AND PLATES

Provide coated, corrosion-resistant fasteners as recommended by the modified bitumen sheet manufacturer's printed instructions and meeting the requirements of FM 4470 and FM APP GUIDE for Class I roof deck construction and the wind uplift resistance specified. For fastening of membrane or felts to wood materials, provide fasteners driven through 1 inch diameter metal discs, or one piece composite fasteners with heads not less than 1 inch in diameter or 1 inch square with rounded or 45 degree tapered corners.

2.9.1 Masonry or Concrete Walls and Vertical Surfaces

Use hardened steel nails or screws with flat heads, diamond shaped points, and mechanically deformed shanks not less than 1 inch long for securing felts, modified bitumen sheets, metal items, and accessories to masonry or concrete walls and vertical surfaces. Use power-driven fastenersonly when approved in writing by the Contracting Officer.

2.9.2 Metal Plates

Provide flat corrosion-resistant round stress plates as recommended by the modified bitumen sheet manufacturer's printed instructions and meeting the requirements of FM 4470; not less than 2 inch in diameter. Form discs to prevent dishing or cupping.

2.10 PRE-MANUFACTURED ACCESSORIES

Pre-manufactured accessories must be manufacturer's standard for intended purpose, comply with applicable specification section, compatible with the membrane roof system and approved for use by the modified bitumen membrane

manufacturer.

2.10.1 Pre-fabricated Curbs

Provide G90 galvanized curbs with minimum 4 inch flange for attachment to roof nailers. Curbs must be minimum height of 10 inches above the finished roof membrane surface.

2.10.2 Horizontal Lifeline Fall Protection System

Provide a complete roof top fall protection system as required by OSHA 1910.140 fall protection regulations and selecting equipment that complies with ASSP Z359 Standards, and state regulations and standards. Follow manufacturer's installation procedures and standards.

Materials used in fall protection equipment shall be Type 316 stainless steel and shall comply with the provisions and requirements of American National Standards Institute, ASSP Z359 Fall Protection Code, ASSP A1264.1 Standard and DOL - 29 CFR 1910, Subpart D.3 and Subpart 1.

Performance Requirements:

a. The Fall Protection System shall be designed to allow users to walk the entire length of the system without having to disconnect from the system to pass through intermediate support points. The system shall be designed to support required number of users in case of a fall and to prevent the users from free falling more than 6 feet. All components shall be designed by the fall protection system supplier and shall meet the applicable requirements of ANSI and applicable OSHA regulations

b. Structural Performance:

1. Structural supporting Horizontal Lifeline (HLL) system must be capable of with standing design loads as required by governing regulations and codes. Where component design loads are specified herein, they represent design minimum requirements.

2. All horizontal lifelines shall be designed with a minimum 2:1 safety factor.

c. General Requirements:

1. Horizontal lifelines shall be designed and installed, under the supervision of a Qualified Person, as part of a complete personal Fall Protection system.

2. The horizontal lifeline must be level (less than a 5% grade).

3. Engineers shall, at a minimum determine the performance of the system when a fall occurs on the shortest span (largest forces) and the longest span (largest total fall distance) in the system.

4. The HLL (s) constant force energy absorbers shall not be used to limit the maximum arrest force of the worker. The HLL (s) constant force energy absorbers shall be used only to control or reduce the maximum load on the structure.

5. Anchorages for horizontal lifelines systems shall be verified and

designed, prior to use, by a Qualified Person with experience and training is designing and using horizontal lifelines systems.

6. HLL(s) shall satisfy the seismic conditions for nonstructural components as described by ASCE 7 and the most current edition of the IBC. No exceptions can be taken if the system is required to function for life-safety purposes after an earthquake.

7. The fall arrest system shall consist of a stainless steel safety cable attached to the structure. The cable shall be continuous or shall have swaged splices, which allow the user to pass without disconnecting from the system.

8. Brackets and supports shall be attached to the structure with appropriate anchors of proper size to adequately support the intended load.

9. The HLL(s) shall comply with manufacturer's design requirements.

d. Restraint HLL(s) shall be designed per ASSP Z359.2 and ASSP Z359.6:

1. The HLL(s) shall prevent workers from reaching and falling into any open hole or off the edge of a working surface.

2. The horizontal lifeline shall comply with the requirements for fall arrest horizontal lifelines as indicated in this document.

3. Where a worker is using a full body harness the force on the worker's body shall not exceed 400 lbs.

4. HLL constant force energy absorbers may be used to travel restraint systems; provided that the engineer has determined that the restraint forces will not cause the HLL constant force energy absorbers to deploy and ensures that the deflection of the wire rope in combination with other deformations of the restraint system will not permit the worker(s) to reach the fall hazard.

5. The use of fall restraint systems shall be limited to surfaces at or less than a slope of 4:12 from the horizontal. This is so a fall will not result in dynamic loading on the fall restraint system or where the authorized person could end up being suspended vertically from the system.

e. Fall Arrest HLL(s) shall be designed per ASSP Z359.2 and ASSP Z359.6

1. The selection, design, and installation of the fall arrest horizontal lifelines shall be performed under the supervision of a Qualified Person.

2. Fall arrest horizontal lifelines shall have the strength capable of sustaining static loads applied to the wire rope of at least two times the maximum arresting force.

3. When more than one user is attached to a horizontal lifeline, the load of the lifeline can be determined using either lumped mass or sequential fall as described in ASSP Z359.6 (6.3.6).

4. The swing fall shall comply with ASSP Z359.6 (5.).

5. The clearance safety margin shall comply with ASSP Z359.6.

2.11 WALKPADS

Provide roof walkpads that are polyester reinforced, granule-surfaced modified bitumen membrane material, minimum 197 mils thick, compatible with the modified bitumen sheet roofing and as recommended by the modified bitumen sheet roofing manufacturer. Panels must not exceed 4 foot in length. Other walkpad materials require approval of the Contracting Officer prior to installation.

2.12 ROOF INSULATION BELOW MODIFIED BITUMEN MEMBRANE SYSTEM

Provide insulation compatible with the roof membrane, approved by the membrane manufacturer and meeting all the requirements of ASTM C578 as specified in Section 07 22 00 ROOF AND DECK INSULATION.

2.13 COMBINED AIR BARRIER & VAPOR RETARDER

a. At metal deck roofs without concrete fill provide a combined air barrier and vapor retarder Class III with a moisture vapor permeability of 5 perms or greater, refer to specification section 07 27 10.00 10 - BUILDING AIR BARRIER SYSTEM.

b. At existing concrete roof decks provide a combined air barrier and vapor retarder Class I with a moisture vapor permeability of 0.1 or less, refer to specification section 07 27 10.00 10 - BUILDING AIR BARRIER SYSTEM.

PART 3 EXECUTION

3.1 EXAMINATION

Ensure that the following conditions exist prior to application of the roofing materials:

a. Do not install items that show visual evidence of biological growth.

b. Drains, curbs, cants, control joints, expansion joints, perimeter walls, roof penetrating components, and equipment supports are in place.

c. Surfaces are rigid, clean, dry, smooth, and free from cracks, holes, and sharp changes in elevation. Joints in the substrate are sealed to prevent dripping of bitumen into building or down exterior walls.

d. The plane of the substrate does not vary more than 1/4 inchwithin an area 10 by 10 foot when checked with a10 foot straight edge placed anywhere on the substrate.

e. Substrate is sloped as indicated to provide positive drainage.

f. Walls and vertical surfaces are constructed to receive counter flashing, and will permit mechanical fastening of the base flashing materials.

g. Treated wood nailers are in place on non-nailable surfaces, to permit

nailing of base flashing at minimum height of 8 inch above finished roofing surface.

h. Treated wood nailers are fastened in place at eaves, gable ends, openings, and intersections with vertical surfaces for securing of membrane, edging strips, attachment flanges of sheet metal, and roof fixtures. Embedded nailers are flush with deck surfaces.

i. Cants are securely fastened in place in the angles formed by walls and other vertical surfaces. The angle of the cant is 45 degrees and the height of the vertical leg is not less than 3-1/2 inch.

j. Insulation boards are installed smoothly and evenly, and are not broken, cracked, or curled. There are no gaps in insulation board joints exceeding 1/4 inch in width. Insulation is being roofed over on the same day the insulation is installed.

k. Cast-in-place substrates have been allowed to cure and the surface dryness requirements specified under paragraph FIELD QUALITY CONTROL have been met.

l. Roof deck and framing are sloped as indicated to provide positive drainage.

3.2 PREPARATION

3.2.1 Protection of Property

3.2.1.1 Protective Coverings

Install protective coverings at paving and building walls adjacent to hoists prior to starting the work. Lap protective coverings not less than 6 inch, secure against wind, and vent to prevent collection of moisture on covered surfaces. Keep protective coverings in place for the duration of the roofing work.

3.2.2 Equipment

3.2.2.1 Mechanical Application Devices

Mount mechanical application devices on pneumatic-tired wheels. Use devices designed and maintained to operate without damaging the insulation, roofing membrane, or structural components.

3.2.2.2 Electric-Heated Equipment

Provide adequate electrical service as required by manufacturer of electrical equipment to ensure against damage to equipment and property and to ensure proper application of roofing materials.

3.2.3 Priming of Surfaces

Prime all surfaces to be in contact with adhered membrane materials. Apply primer at the rate of 0.75 gallon per 100 sq. ft. or as recommended by modified bitumen sheet manufacturer's printed instructions to promote adhesion of membrane materials. Allow primer to dry prior to application of membrane materials to primed surface.

3.2.3.1 Priming of Concrete and Masonry Surfaces

After surface dryness requirements have been met, coat concrete and masonry surfaces which are to receive membrane materials uniformly with primer.

3.2.3.2 Priming of Metal Surfaces

Prime flanges of metal components to be embedded into the roof system prior to setting in bituminous materials or stripping into roofing system.

3.2.4 Membrane Preparation

Unroll modified bitumen membrane materials and allow to relax a minimum of 30 minutes prior to installation. In cold weather, adhere to membrane manufacturer's additional recommendations for pre-installation membrane handling and preparation. Inspect for damage, pinholes, particles of foreign matter, non-dispersed raw material, factory splices, or other conditions that might affect serviceability. Edges of seams must be straight and flat so that they may be seamed to one another without forming fish mouths or wrinkles. Discard damaged or defective materials.

3.2.5 Substrate Preparation

Apply membrane to clean, dry surfaces only. Do not apply membrane to surfaces that have been wet by rain or frozen precipitation within the previous 12 hours. Provide cleaning and artificial drying with heated blowers or torches as necessary to ensure clean, dry surface prior to membrane application. Torches may not be used to ensure clean, dry surfaces prior to membrane applications if the roof deck or materials used in the installation of the roofing system are combustible.

3.3 APPLICATION

Apply roofing materials as specified herein unless approved otherwise by the Contracting Officer. Keep roofing materials dry before and during application. Complete application of roofing in a continuous operation. Begin and apply only as much roofing in one day as can be completed that same day. Maintain specified temperatures for asphalt. Provide temporary roofing and flashing as specified herein prior to application of permanent roofing system.

3.3.1 Phased Membrane Construction

Phased application of membrane plies is prohibited unless otherwise approved by the Contracting Officer and supported by the membrane manufacturer's written application instructions. If cap sheet installation is delayed, thoroughly clean the applied membrane material surface and dry immediately prior to cap sheet installation. Priming of the applied membrane surface may be required at the discretion of the Contracting Officer prior to cap sheet installation.

3.3.2 Temporary Roofing and Flashing

Provide watertight temporary roofing and flashing where considerable work by other trades, such as installing pipes, ducts, and equipment is to be performed on the roof or where construction scheduling or weather conditions require protection of the building's interior before permanent roofing system can be installed. Do not install temporary roofing over

permanently installed insulation. Provide rigid pads for traffic over temporary roofing.

3.3.2.1 Removal

Completely remove temporary roofing and flashing before continuing with application of the permanent roofing system.

3.3.3 Application Method

3.3.3.1 Cold Adhesive Applied Modified Bitumen Membrane

Apply cold adhesive with airless sprayer or 1/4 inch saw-toothed rubber squeegee to prepared surfaces in accordance with membrane manufacturer's application instructions. Fully cover substrate with adhesive. Roll or lay membrane in adhesive in accordance with manufacturer's recommendations and within the time limitations of adhesive application. Broom the membrane to ensure full contact with adhesive. Seal laps with adhesive or by heat fusing with hot air welder as required by membrane manufacturer. Minimize traffic on installed membrane during the adhesive cure and set time.

3.3.4 Modified Bitumen Base Sheet

Fully adhere base sheets in accordance with membrane manufacturer's printed instructions. Apply cold adhesive with airless sprayer or a 1/4 inch saw-toothed rubber squeegee and at application rate recommended by the membrane manufacturer. Fully cover substrate with cold adhesive. Ensure laps areas of base sheet are fully sealed. Roll and broom in the base sheet to ensure full contact with the adhesive application. On nailable substrates, mechanically fasten base sheet in conformance with specified wind resistance requirements and membrane manufacturer's printed instructions, and to include increased fastening frequency in corner and perimeter areas. Drive fasteners flush with no dishing or cupping of fastener plate. Where applicable, mechanically fasten base sheet in conjunction with insulation to the substrate, in accordance with membrane manufacturers printed instructions. Apply sheets in a continuous operation. Apply sheets with side laps at a minimum of 2 inch unless greater side lap is recommended by the manufacturer's standard written application instructions. Provide end laps of not less than 6 inch and staggered a minimum of 36 inch. Apply sheets at right angles to the roof slope so that the direction of water flow is over and not against the laps . Extend base sheets approximately 2 inch above the top of cant strips at vertical surfaces and to the top of cant strips elsewhere. Trim base sheet to a neat fit around vent pipes, roof drains, and other projections through the roof. Application must be free of ridges, wrinkles, and buckles.

3.3.5 Modified Bitumen Membrane Application

Ensure proper sheet alignment prior to installation. Apply membrane layers perpendicular to slope of roof in shingle fashion to shed water, including application on areas of tapered insulation that change slope direction. Bucking or backwater laps are prohibited. Fully adhere membrane sheets to underlying substrate materials. Provide minimum 3 inch side laps and minimum 6 inch end laps and as otherwise required by membrane manufacturer. Stagger end laps minimum 36 inch. Offset side laps between membrane layers a minimum of 12 inch. Offset end laps between membrane layers a minimum of 36 inch. Install all membrane layers

the same workday, unless supported otherwise by roof membrane manufacturer application instructions and approved by the Contracting Officer. Provide tight smooth laminations of each membrane layer without wrinkles, ridges, buckles, kinks, fishmouths, or voids. Ensure full membrane adhesion and full lap seals. Rework to seal any open laps prior to application of subsequent membrane layers. The completed membrane application must be free of surface abrasions, air pockets, blisters, ridges, wrinkles, buckles, kinks, fishmouths, voids, or open seams.

3.3.5.1 Cap Sheet Installation

Underlying applied membrane must be inspected and repaired free of damage, holes, puncture, gouges, abrasions, and any other defects, and free of moisture, loose materials, debris, sediments, dust, and any other conditions required by the membrane manufacturer prior to cap sheet installation. Do not apply cap sheet if rain or frozen precipitation has occurred within the previous 24 hours. Align cap membrane and apply by the specified method with the proper side and end lap widths. Cut at a 45 degree angle across selvage edge of cap membrane to be overlapped in end lap areas prior to applying overlapping cap membrane. Apply matching granules in any areas of adhesive bleed out while the adhesive is still tacky. Minimize traffic on newly installed cap sheet membrane.

3.3.6 Membrane Flashing

Apply two-ply modified bitumen strip flashing and sheet flashing in the angles formed where the roof deck abuts walls, curbs, ventilators, pipes, and other vertical surfaces, and where necessary to make the work watertight. Apply membrane flashing in accordance with the roof membrane manufacturers printed instructions and as specified. Cut at a 45 degree angle across terminating end lap area of cap membrane prior to applying adjacent overlapping cap membrane. Press flashing into place to ensure full adhesion and avoid bridging. Ensure full lap seal in all lap areas. Mechanically fasten top edge of modified bituminous base flashing 150 mm (6 inches) on center through minimum 1 inch diameter tin caps with fasteners of sufficient length to embed minimum one inch into attachment substrate. Apply matching granules in any areas of adhesive bleed out while the adhesive is still tacky. Apply membrane liner over top of exposed nailers and blocking and to overlap top edge of base flashing installation at curbs, parapet walls, expansion joints and as otherwise indicated to serve as waterproof lining under sheet metal flashing components. Metal flashing per SMACNA 1793 guidelines and standards is specified under Section 07 60 00 FLASHING AND SHEET METAL. Do not set metal flashing in hot asphalt.

3.3.6.1 Membrane Strip Flashing

Set primed flanges of metal flashing in full bed of modified bituminous cement material and securely fasten through to attachment substrate. Strip-in with membrane flashing so that strip extends not less than 4 inch beyond outer edge of flange. Where multiple membrane stripping plies are installed, extend each additional stripping ply minimum 4 inch beyond edge of previous ply.

3.3.6.2 Membrane Flashing at Roof Drain

Roof drains are specified in Section 22 00 00 PLUMBING, GENERAL PURPOSE. Flashing for roof drains, is specified in Section 07 60 00 FLASHING AND SHEET METAL. Extend membrane sheets to edge of drain bowl opening at the

roof drain deck flange in accordance with membrane manufacturer's printed application instructions. Securely clamp membrane sheets and metal roof drain flashing and strip flashing in the flashing clamping ring. Secure clamps so that sheets and metal flashing are free from wrinkles and folds. Trim stripping must be flush with inside of clamping ring.

3.3.6.3 Pre-fabricated Curbs

Securely anchor prefabricated curbs to nailer or other base substrate and flash with modified bitumen membrane.

3.3.6.4 Set-On Accessories

Where pipe or conduit blocking, supports and similar roof accessories are set on the membrane, adhere walkpad material to bottom of accessories prior to setting on roofing membrane. Install set-on accessories to permit normal movement due to expansion, contraction, vibration, and similar occurrences without damaging roofing membrane. Do not mechanically secure set-on accessories through roofing membrane into roof deck substrate.

3.3.6.5 Lightning Protection

Flash and attach lightning protection system components to the roof membrane in a manner acceptable to the roof membrane manufacturer.

3.3.7 Roof Walkpads

Install walkpads at roof access points and where otherwise indicated for traffic areas and for access to mechanical equipment, in accordance with the modified bitumen sheet roofing manufacturer's printed instructions. Provide minimum 6 inch separation between adjacent walkpads to accommodate drainage.

3.3.8 Clean Up

Remove debris, scraps, containers and other rubbish and trash resulting from installation of the roofing system from job site each day.

3.4 CORRECTION OF DEFICIENCIES

Where any form of deficiency is found, take additional measures as deemed necessary by the Contracting Officer to determine the extent of the deficiency and perform corrective actions as directed by the Contracting Officer.

3.5 PROTECTION OF APPLIED ROOFING

At the end of the day's work and when precipitation is imminent, protect applied modified bitumen roofing system from water intrusion.

3.5.1 Water Cutoffs

Straighten insulation line using loose-laid cut insulation sheets and seal the terminated edge of modified bitumen roofing system in an effective manner. Seal off flutes in metal decking along the cutoff edge. Remove the water cut-offs to expose the insulation when resuming work, and remove the insulation sheets used for fill-in.

3.5.2 Temporary Flashing for Permanent Roofing

Provide temporary flashing at drains, curbs, walls and other penetrations and terminations of roofing sheets until permanent flashing can be applied. Remove temporary flashing before applying permanent flashing.

3.5.3 Temporary Walkways, Runways, and Platforms

Do not permit storing, walking, wheeling, and trucking directly on applied roofing materials. Provide temporary walkways, runways, and platforms of smooth clean boards, mats or planks as necessary to avoid damage to applied roofing materials, and to distribute weight to conform to live load limits of roof construction. Use rubber-tired equipment for roofing work.

3.6 FIELD QUALITY CONTROL

Perform field tests in the presence of the Contracting Officer. Notify the Contracting Officer one day before performing tests.

3.6.1 Test for Surface Dryness

Before application of membrane sheets and starting work on the area to be roofed, perform test for surface dryness in accordance with the following:

a. Prior to installing any roof system on a concrete deck, conduct a test per ASTM D4263. The deck is acceptable for roof system application when there is no visible moisture on underside of plastic sheet after 24 hours.

3.6.2 Construction Monitoring

During progress of the roof work, make visual inspections as necessary to ensure compliance with specified parameters. Additionally, verify the following:

a. Materials comply with the specified requirements.

b. Materials are not installed in adverse weather conditions.

All materials are properly stored, handled and protected from moisture or other damages.

c. Equipment is in working order. Metering devices are accurate.

d. Substrates are in acceptable condition, in compliance with specification, prior to application of subsequent materials.

(1) Nailers and blocking are provided where and as needed.

Insulation substrate is smooth, properly secured to its substrate, and without excessive gaps prior to membrane application.

(2) The proper number, type, and spacing of fasteners are installed.

Membrane adhesive application is provided uniformly and as necessary to ensure full adhesion of roll materials.

The proper number and types of plies are installed, with the specified overlaps.

Applied membrane surface is inspected, cleaned, dry, and repaired as necessary prior to cap sheet installation.

(3) Lap areas of all plies are completely sealed.

Membrane is fully adhered without ridges, wrinkles, kinks, fishmouths, or other voids or delaminations.

Installer adheres to specified and detailed application parameters.

Associated flashing and sheet metal are installed in a timely manner in accord with the specified requirements.

Temporary protection measures are in place at the end of each work shift.

3.6.2.1 Manufacturer's Inspection

Manufacturer's technical representative must visit the site a minimum of three times during the installation for purposes of reviewing materials installation practices and adequacy of work in place.

Inspections must occur during the first 20 squares of membrane installation, at mid-point of the installation, and at substantial completion, at a minimum. Additional inspections must not exceed one for each 100 squares of total roof area with the exception that follow-up inspections of previously noted deficiencies or application errors must be performed as requested by the Contracting Officer. After each inspection, submit a report, signed by the manufacturer's technical representative to the Contracting Officer within 3 working days. Note in the report overall quality of work, deficiencies and any other concerns, and recommended corrective action.

3.6.3 Samples of Roofing

Take samples per ASTM D5147/D5147M, sized 4-inch by 40-inch cut across width of modified bitumen sheets as directed by the Contracting Officer. Cut samples will be examined by the Contracting Officer for specified number of plies, proper lap width, complete lap seal, full uniform adhesive compound application and adhesion, full bond between plies, harmful foreign materials, presence of moisture, and wet insulation. Where cuts are not retained by the Contracting Officer or disposed, set cut strip back in cut area in bed of modified bitumen cement. Repair area of cut with new minimum two-ply modified bitumen membrane patch.

3.6.4 Roof Flood Test

After completing roofing, but prior to Government acceptance, perform the following test for watertight integrity.

a. Provide a flood test according to ASTM D5957 on the main roof in and area of +/- 20'-0" x 46'-0" (width of roof). Confirm location with Contracting Officer. Perform ASTM C1153 inspection after floor test.

b. Perform modified limited ASTM D5957 at six roof drains. Locations to be selected by the Contracting Officer. Each temporary containment area to be 4 square feet minimum. Plug roof drains and fill with water, 2

inch depth minimum at the containment perimeter. Measure water at beginning and end of the test period. When precipitation occurs during test period, repeat test. When water level falls, remove water, thoroughly dry, and inspect installation; repair or replace roofing at drain to provide for a properly installed watertight flashing seal. Repeat test until there is no water leakage. Perform ASTM C1153 inspection after floor test.

c. Ensure roof deck at the underside of test areas are visible. Test reports to include photos at the start and end of testing.

3.6.5 Field Testing

Engage a qualified testing agency to perform roof testing in accordance with section 01 91 00.15 and refer to Section 07 27 10.00 10 for related air leakage testing.

3.7 INSTRUCTIONS TO GOVERNMENT PERSONNEL

Furnish written and verbal instructions on proper maintenance procedures to designated Government personnel. Furnish instructions by a competent representative of the modified bitumen membrane manufacturer and include a minimum of 4 hours on maintenance and emergency repair of the membrane. Include a demonstration of membrane repair, and give sources of required special tools. Furnish information on safety requirements during maintenance and emergency repair operations.

3.8 INFORMATION CARD

For each roof, furnish a typewritten information card for facility Records and a card laminated in plastic and framed for interior display at roof access point, or a photoengraved 0.039 inch thick aluminum card for exterior display. Card must be 8 1/2 by 11 inch minimum, identifying facility name and number; location; contract number; approximate roof area; detailed roof system description, including deck type, membrane, number of plies, method of application, manufacturer, insulation and cover board system and thickness; presence of tapered insulation for primary drainage, presence of vapor retarder; date of completion; installing contractor identification and contact information; membrane manufacturer warranty expiration, warranty reference number, and contact information. Install card at roof top or access location as directed by the Contracting Officer and provide a paper copy to the Contracting Officer.

-- End of Section --

SECTION 07 56 00

FLUID-APPLIED ROOFING
10/12

PART 1 GENERAL

1.1 SUMMARY

Provide Mesh Reinforced Elastomeric Coating (MREC) roofing system complete as specified over existing modified bitumen roof membrane surface after patching and repairs of existing roof and replacement of roof have been completed and accepted by the Government.

Polyurethane-methacrylate (PUMA) coatings containing or modified with polymers incorporating non-acrylic monomers such as (but not limited to) styrene, vinyl or other ingredients are not allowed. Only 100 percent acrylic polymers shall be used. Materials such as cementitious, ceramic-filled or asphalt modified coatings, moisture-cured urethanes, Kraton-based rubbers, Hypalons and butyls are not considered acceptable substitutes for materials specified herein.

Coatings found to contain banned ingredients shall be removed from the property or shall be resurfaced with a complete roof system that meets the roofing specifications.

1.2 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM B 117	(2009) Standing Practice for Operating Salt Spray (Fog) Apparatus
ASTM D 117	(2002) Standard Guide for Sampling, Test Methods, Specifications and Guide for Electrical Insulating Oils of Petroleum Origin
ASTM D 1777	(1996; R 2007) Thickness of Textile Materials
ASTM D 3787	(2007) Bursting Strength of Textiles - Constant-Rate-of-Traverse (CRT), Ball Burst Test
ASTM D 412	(2006ae2) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D 5034	(2009) Breaking Strength and Elongation of Textile Fabrics (Grab Test)
ASTM D 6083	(05e1) Standard Specifications for Liquid

	Applied Acrylic Coating Used in Roofing
ASTM D 638	(2010) Standard Test Method for Tensile Properties of Plastics
ASTM D 7281	(2007) Standard Test Method for Determining Water Migration Resistance Through Roof Membranes
ASTM E 108	(2010a) Fire Tests of Roof Coverings
ASTM E 96/E 96M	(2005) Standard Test Methods for Water Vapor Transmission of Materials
ASTM G 26	(1996) Operating Light-Exposure Apparatus (Xenon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials
ASTM G 29	(2010) Standard Practice for determining Algal Resistance of Plastic Films
FM GLOBAL (FM)	
FM 4470	(2016) Single-Ply, Polymer-Modified Bitumen Sheet, Built-up Roof (BUR), and Liquid Applied Roof Assemblies for Use in Class 1 and Noncombustible Roof Deck Construction
INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)	
ISO 9001	(2000; R 2008; Corr 1 2009) Quality Management Systems- Requirements
ISO 14001	(2004) Environmental Management

1.3 SEQUENCING AND SCHEDULING

Specification subparagraph text.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Construction Grade Caulk
Basecoat and Intermediate Coatings
Finish Coat
Reinforcing Fabric
Cant Strips
Corrosion Resistant Primer
Traffic Coat
Biodegradable Cleaner

SD-07 Certificates

Manufacturer Qualifications
Installer Qualifications
Qualification of Inspector

SD-08 Manufacturer's Instructions

Manufacturer's written instructions

SD-09 Manufacturer's Field Reports

field tests
Manufacturer's Inspection report

SD-11 Closeout Submittals

Information Card

1.5 QUALITY ASSURANCE

1.5.1 Manufacturer Qualifications

Manufacturer must be ISO 9001 and ISO 14001 certified.

Manufacturer of the MREC system shall have a proven 15-year track record of successful installations using polyurethane-methacrylate (PUMA) elastomeric technology in the roofing industry.

Manufacturer's written instructions for installation, including details, shall be provided.

1.5.2 Installer Qualifications

Installer shall be approved by the coatings manufacturer, and shall have a minimum of five years experience in the application of polyurethane-methacrylate (PUMA) elastomeric roof coatings.

Proof of this qualification shall be provided in written form from the manufacturer of the roofing system. A signed certificate from the Manufacturer stating that the Contractor is an approved installer of the manufacturer's complete polyurethane-methacrylate (PUMA) elastomeric roofing system and that each member of the installation crew has been trained in the system's proper installation and is certified by the Manufacturer's Technical Representative. The names of the certified installers shall be submitted to Contracting Officer and only employees that are certified installers shall be allowed on the project.

Contractor shall provide a list of five project references, including contact name and telephone numbers.

An Approved Applicator (as designated by manufacturer) shall be on site during all applications of any manufacturer's products.

Contractor shall be responsible to protect all substrates, insulation, recovery board and coating from pollutants that may act as a bond-breaker between the various applications of coating. These pollutants include (but not limited to) foot traffic residue, metal shavings, tire tracks, markings caused by hoses and electrical cords, insulation adhesive, sealants, and cementitious materials. All pollutants shall be removed

prior to the application of any coatings.

1.5.3 Product Standards

The polyurethane-methacrylate (PUMA) system shall be approved and listed by Factory Mutual as an acceptable Class I-4470 Roofing System over existing roof substrates.

Container labels shall include this information or the container shall be rejected at the jobsite. Manufacturer's name, product name, type and class of material. Factory Mutual logo, batch or lot number, mixing and application instructions, and precautions.

1.5.4 Codes and Standards

The Contractor shall be thoroughly familiar with all codes, regulations, and standards governing the specified work. Any contradiction between the manufacturer's requirements and these specifications shall be brought to the attention of the manufacturer and the Contracting Officer.

1.5.5 Deviations

There shall not be any deviations from these specifications unless the deviation is submitted in writing per the General Conditions. The request for deviation shall have a letter from the roofing manufacturer technical department approving the details of the deviation.

1.5.6 Manufacturer's Technical Representative

An employee of the roofing material manufacturer shall be on site at least once every 7-calendar days during the on-site Work. Upon request, the technical representative shall provide a written inspection report during each site visit and submit the reports to the Contracting Officer. The manufacturer's Representative shall approve the application process at specific stages before the Contractor may continue including: Pre-bid inspection, start-up inspection, at the completion of the foundation coat and fabric components; and completed finish coat inspection.

1.5.7 Qualification of Inspector

Contractor shall hire full-time third-party Roofing Inspectors for the life of this Contract who will be on site daily during roofing operations to perform Inspection Duties required for proper repair of roof. Inspectors shall supply names, locations, and client contract information of 5 projects of similar size and scope that the Inspectors have witnessed using the roofing products specified. Qualifications for Inspectors shall include one of the following:

a. Roofing Inspector shall be approved, authorized or licensed in writing by the Roofing Consultants Institute as either a Registered Roofing Consultant, Certified Roofing Observer, or Registered Roofing Observer. Inspector shall have a minimum 10 years experience.

b. Roofing Inspector must be licensed professional architect or engineer demonstrating 10 years continuous specialized experience in design, investigation, testing, and consulting services related to roofing, waterproofing, and building envelope systems for new and existing structures.

Inspectors shall have a thorough knowledge of roofing details, flashing and systems employing roofing system of existing roof. Roofing inspection shall be a full-time occupation Roofing Inspector. If testing is required, Roof Consultant shall be appropriately trained, certified, and licensed in the testing procedure specified.

1.6 DELIVERY, STORAGE, AND HANDLING

1.6.1 Delivery of Materials

Materials shall be delivered to the jobsite in manufacturer's original, sealed containers with labels legible and intact.

a. Deliver materials bearing the following information:

1) Name of manufacturer.
2) Name of contents and products code.
3) Net volume of contents.
4) Lot or batch number.
5) VOC content.
6) Storage temperature limits.
7) Shelf life expiration date.
8) Mixing instructions and proportions of contents.
9) Safety information and instructions.

1.6.2 Storage of Materials

Materials shall be stored in an area specifically designated for that purpose and indicated on Drawings, in accordance with manufacturer's recommendations, where temperatures shall not be less than 50 degree F or higher than 100 degree F.

1.6.3 Material Handling

Materials shall be handled, stored and installed per manufacturer's instructions and all applicable safety regulatory requirements.

1.6.4 Damaged Materials

Contaminated, damaged or unsealed materials, or materials not conforming to the specifications, shall be rejected. Rejected materials shall be immediately removed from the jobsite and replaced at no additional cost to the Government.

Materials that have been installed and damaged prior to issuance of warranty shall be rejected and removed from the jobsite. This includes materials not protected from unprotected foot traffic, materials that were unprotected and used as a staging platform or storage area, materials that have been polluted with dirt, debris, metal shavings and other roofing materials, and or materials damaged by water intrusion.

1.7 PROJECT CONDITIONS

Install all materials in strict accordance with manufacturer's published safety requirements and weather precautions.

Do not apply materials over dirt, oil, grease, or other pollutants (this includes foot traffic or markings caused hoses, electrical cords, flexible conduits on roof, or tires). All dirt or markings shall be removed prior

to the installation of the various applications of coating used to produce the liquid applied roof system.

Do not apply mesh reinforced elastomeric coating (MREC) system components when the Ambient temperature is below 50 degree F or above 110 Degree F, if any surface moisture is present, when the dew point is within 5 degree F of the surface temperature or when there is a possibility of temperatures falling below 32 degree F within a 24 hour period.

Do not apply MREC system components if weather conditions will not permit complete cure before rain, dew, fog or freezing temperatures occur.

Do not spray-apply if the wind velocity exceeds 10 mph without taking precautions to eliminate warranty.

Take all measures necessary to protect unrelated surfaces from coating overspray or spillage.

Contractor is responsible for any adverse conditions, which may result from applying coatings while the weather is rising during the morning hours, which might result in moisture being pulled upwards from the deck, which can result in vapor pockets forming.

1.8 WARRANTY

Contractor shall furnish to the Contracting Officer, the following:

a. Written warranty on the Mesh Reinforced Elastomeric Coating (MREC) Fluid Applied Roofing System for a 2-year period after Project Acceptance Date by the Government. This shall be a non-warranty for the roofing system and shall provide the following at no additional cost to the Government:

1) Repair of roofing flashing, pitch pockets, drains, curbs, etc., as necessary to seal and repair all leaks which are attributable to faulty materials and/or workmanship.

2) Repair or replacement of damage to the building and/or its finishes, equipment and/or furnishings, when occasioned by such leaks; and

3) Inspection of the roofing by the Contractor and the roofing manufacturer's technical representative together with the COTR and/or a COTR representative, of the roofing and flashing, on or about the first and second anniversaries of the Project Acceptance Date, and repair or replacement of roofing as necessary to correct any deficiencies in workmanship or materials, such as by eliminating blisters exceeding six inch in any dimension or re-adhering open seams. Such correction work shall be done in a manner, which will preserve the integrity of the complete roofing system.

b. The liquid applied roofing system manufacturer shall submit to the contracting officer, via the Contractor, made out to the Government a 15-Year Leak Free, Material and Labor, Roofing System Warranty. The warranty shall cover both material and workmanship and shall provide that in the event of failure due to normal weathering and wind conditions during the remainder of the warranty period (the third

through thirtieth years after project acceptance) the liquid applied roofing system manufacturer will make repairs as necessary to maintain the roof in a watertight condition at no cost to the Government. The warranty shall contain a certification by the manufacturer that the complete roofing system has been installed in accordance with the manufacturer's instructions and that the Government has been provided maintenance instructions for the roof. The warranty shall contain no exclusions for materials furnished by the manufacturer. The warranty shall include all waterproofing details incorporated on the parapet walls and other areas, flashings, and sealants. The Surety shall not be held liable beyond two years from the Project Acceptance Date.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Over existing and new Modified Bitumen Roofing: A seamless, total system of 45-mil minimum (not minimum average - dry) liquid-applied polyurethane-methacrylate (PUMA) two-part, chemical-curing PUMA coating used as an elastomeric, waterproofing membrane designed for application over existing and new Modified Bitumen Roofing meeting FM 4470 Approval.

Latent Characteristics Include:

a. Roofing system shall have good resistance to ponding water.

b. Roofing system shall contain no plasticizers.

c. Roofing system shall contain no migrating fire retardants.

d. Roofing system shall have a Class A fire rating.

2.2 COMPONENTS

2.2.1 Construction Grade Caulk

Single package polyurethane sealant, as approved by roofing coating manufacturer for use in filling cracks, splits or voids, and for sealing reglet counter flashings.

2.2.2 Basecoat and Intermediate Coatings

Water-based, high solids elastomeric polyurethane-methacrylate (PUMA) base coat shall be internally plasticized to provide a permanently flexible, weather-resistant base coat and intermediate. It shall be tested as part of a FM 4470 roof assembly.

a. Color: As selected by the COR from the Manufacturer's full selection.

2.2.3 Finish Coat

Water-based, high solids elastomeric elastomeric polyurethane-methacrylate (PUMA) shall be internally plasticized to provide a permanently flexible, weather-resistant base coat and intermediate. It shall be tested as part of a FM 4470 roof assembly.

a. Color: The base application(s) of finish coat shall be tan and the top application(s) shall be white, or color approved by Contracting Officer.

2.2.4 Roof System's Material Properties

Minimal dry mil thickness of 45 mil with polyester fabric:

Property	Test	Result
Leakage Resistance	ASTM D 7281	Passed 7-day submersion under water with pressure cycling
Tensile Strength (cured)	ASTM D 412	1680 psi
Elongation	ASTM D 638 or ASTM D 412	Greater than 300%; 50% with reinforcing fabric
Algae Resistance	ASTM G 29	No growth supported
Weathering	ASTM G 26	No effect after 3000 hours
Salt Spray Test	ASTM B 117	No effect
Moisture Vapor	ASTM E 96/E 96M	.03 Perms
Fire Rating	ASTM E 108 and FM 4470	Class A
Fluid applied polyurethane-methacrylate (PUMA)	ASTM D 6083	Approved
Windstorm Pull Test	FM 4470	Class I-735 lightweight concrete
Hail (severe impact) Resistance	FM 4470	Passed over rigid foam
Foot Traffic Resistance	FM 4470	Passed
Susceptibility to Leakage	FM 4470	Passed 7-day test and pressure cycle test
Solids by Volume		Min 53 percent
Solids by Weight		Min 66 percent

2.2.5 Reinforcing Fabric

This material shall be non-woven 100 percent polyester, stitch bonded, and heat set fabric. The fabric shall bear the Factory Mutual label (FM) printed on the fabric surface. The fabric shall meet these following characteristics:

a. Weight: 3 oz/sq. yd.

b. Tensile Strength Warp 74 lbs per ASTM D 5034.

c. Tensile Strength Fill 45 lbs.

d. Elongation at Break Warp 21.3 percent per ASTM D 5034.

e. Elongation at Break Fill 51.3 percent.

f. Ball Burst 111 lbs per ASTM D 3787.

g. Trapezoid Warp 13.5 lbs per ASTM D 117.

h. Trapezoid Fill 24.2 lbs.

i. Thickness 0.018 inches per ASTM D 1777.

2.2.6 Roof Penetrations

Protective Cement Surface around Kitchen Vents and Grease Traps (where applicable): Provide Reinforced cement and polymer acrylic bonding agent slurry.

a. The slurry consist of one part polymer acrylic bonding agent, one part water, three parts Type I/II Portland Cement.

b. Slurry and polyester fabric is applied to the surface of the liquid applied roof system on all identified areas.

2.2.7 Cant Strips

Cant strips, where applicable, can be made from EPS, polyisocyanurate, or perlite.

2.2.8 Corrosion Resistant Primer

Single component, premium quality exterior polyurethane-methacrylate (PUMA) primer, as approved by the manufacture. Example of the primer is Hydro-Stable Rust Primer. For corrosion protection, flash rust resistance and enhanced adhesion over all metal surfaces metal surfaces.

2.2.9 Biodegradable Cleaner

All cleaners shall be biodegradable and shall be mixed at rate of one part cleaner to nine parts water. Example of the cleaner agent is Hydro-Stop UCC Cleaner.

Material Properties:

a. Biodegradable: Allows proper cleaning of substrates where washing with hazardous cleaning products would not be permitted prior to (re)coating.

b. Open Dry Time: Removes dirt, pollutants and other contamination build-up even if the product dries prior to rinsing.

c. Environmentally Safe: Will not harm ground vegetation, water collection ponds, septic tanks or treatment plants even in its concentrated form, nor will accidental ingestion by animal life cause adverse side effects.

d. Agency Approvals: Meets all the requirements of U.S.D.A. and FDA standards, and is also OSHA compliant.

PART 3 EXECUTION

3.1 EXAMINATION

Do not begin installation until substrates have been properly prepared.

Verify substrate surfaces are durable, free of frozen matter, dampness, loose particles, cracks, pits, projections, or foreign matter detrimental to adhesion or application of waterproofing system.

Verify that substrate surfaces are smooth and not detrimental to full contact bond of waterproofing materials.

Verify items that penetrate surfaces to receive waterproofing are securely installed.

Verify that substrate areas are adequately supported and firmly fastened in place.

Verify that roof deck has a minimum slope of 0.25 inch/foot.

Verify that roof does not have ponding water areas.

Verify that all attached vertical walls are properly waterproofed.

3.2 PREPARATION

All surfaces shall be clean and dry, and free of any dirt, dust, gravel, oil, surface chemicals or other contaminants that may interfere with optimum adhesion.

All metal to be covered with insulation that has any sign of rust shall be wire brushed and then coated with Stable Rust primer (5.0 mils dry).

All metal to be directly encapsulated with the liquid applied roof system shall be coated with Stable Rust primer (5.0 mils dry).

Any damaged or structurally unsound metal, lumber or concrete shall be repaired or replaced.

Surface Primer as a basis of design provide Uni-Base primer or equivalent required by system manufacturer for all surfaces to receive Mesh Reinforced Elastomeric Coating.

Remove all paint and loose material from the vertical wall surface to the minimum height shown on the drawings.

Protect adjacent surfaces not designated to receive waterproofing. As a minimum, clean and prepare surfaces to receive waterproofing by removing all loose and flaking particles, grease and laitance with the use of a stiff bristle push broom and or washing. Take care not to inject water into the substrate during washing. In some cases additional drying time may be required after the cleaning process. Please consult the roofing manufactures technical representative for additional advice on

cleaning various roofing substrates.

Make all necessary repairs to existing substrate. Contact manufacturer's technical representative for assistance.

Do not apply waterproofing to surfaces unacceptable to manufacturer.

3.3 INSTALLATION

3.3.1 Foundation and Intermediate Coat and Fabric Components

Consists of one coat of foundation coat applied to the substrate, one ply of the polyester fabric (sizes vary) laid into the wet foundation coat, and finally a second coat of foundation (intermediate) coat saturating the fabric from above. Care shall be given to ensure that adjacent runs of fabric are overlapped a minimum of 4 inches. Foundation and intermediate coats are applied over a smooth surface at a total rate of 2.5 gallons per 100 square feet of fabric (this application rate is over a smooth and non-porous substrate, coverage rate will very depending on surface texture and porosity). Foundation coat shall only be applied with the use of approved roof brushes. Rolling and spraying of the foundation and intermediate coat is forbidden. The dry mil thickness of membrane produced with the foundation and intermediate coat and polyester fabric shall be a minimum thickness of 30 mils (dry).

3.3.2 Protection of Foundation Coat and Polyester Fabric Membrane

It is the Contractor's responsibility to protect the membrane produced by the foundation and intermediate coat and polyester fabric from damages. All membranes that are damaged shall be rejected and removed from the job site. Damages shall include, but not limited to, coatings being marked with pollutants that may act as a bond-breaker between the various applications of coating. These pollutants include (but not limited to) foot traffic residue, metal shavings, tire tracks, markings caused by hoses and electrical chords, insulation adhesive, sealants, and cementitious materials. All pollutants shall be removed prior to the application of any coatings. Walking on the coating while the coating and fabric is wet is forbidden. Walking on the membrane with shoes that are not covered with protective shoes coverings (example: painter's booties) is forbidden. Using the membrane as a staging platform without laying plywood on the surface to protect the membrane is forbidden. Allowing pools of water to sit on the coating during the first seven days (pools of water must be brushed off each morning).

3.3.3 Encapsulation of Roof Perimeter

Using 12-inch fabric and the foundation components (described above), waterproof entire roof perimeter. Continue waterproofing up vertical surfaces and onto deck a minimum of 6 inches in each direction.

3.3.4 Encapsulation of Roof Penetrations

Using 12 inch fabric and the foundation components seal items projecting through waterproofing material watertight. Waterproof up penetrations a minimum of 6 inch.

3.3.5 Encapsulation of Roof Field

Using 40 inch (1. m) fabric and the foundation components (as described

above) seal the entire roof field. Overlap adjacent runs of fabric 4 inches minimum.

3.3.6 Encapsulation of Walls and Curbs

Using 40 inch or 20 inch fabric and the foundation components (as described above) seal all identified wall areas and all curbs (vertical and horizontal surfaces). Overlap adjacent runs of fabric 4 inches minimum.

3.4 INSTALLATION OF FINISH COAT

3.4.1 Finish Coat Component

Apply the finish coat. Each application must be applied at a wet mil thickness of 12 mils. Each application shall be applied at rate of 1.5 gallon per 200 square feet per application. The total application rate shall be 1.5 gallons per 50 square feet. The total dry mil thickness shall be 15 mils. The color of the finish coat shall be tan followed by white or as approved by the COTR. Allow the first application to dry for eight hours prior to the application of the second application. The total finish coat dry thickness shall be a minimum of 15 mils dry (.015 inches). Monitor these two coats for 5 days, sweeping off birdbaths to allow for full cure.

3.4.2 Protection of Finish Coat

It is the Contractor's responsibility to protect the finish coat from damages. All finish coat that is damaged shall be rejected and removed from the job site. Damages shall include (but not limited to) coatings being marked with pollutants that may act as a bond-breaker between the various applications of coating. These pollutants include (but not limited to) foot traffic residue, metal shavings, tire tracks, markings caused by hoses and electrical chords, insulation adhesive, sealants, and cementitious materials. All pollutants shall be removed prior to the application of any coatings. Furthermore, walking on the coating while the coating is wet is forbidden. Walking on the coating with shoes that are not covered with protective coverings (example: painter's booties) is forbidden. Using the coating or the coating membrane system as a staging platform without laying plywood on the surface to protect the membrane is forbidden. Allowing pools of water to sit on the coating during the first seven days (pools of water must be brushed off each morning).

3.5 ROOF SYSTEM MIL THICKNESS

Roof System shall be installed to a minimum 45 mil total, cured thickness.

Dry mil thickness test: The coating manufacturer's representative, Contracting Officer and Contractor shall make a final inspection to determine the dry film thickness of the liquid-applied polyurethane-methacrylate (PUMA) membrane and to verify that the system meets the manufacturer's requirements for warranty. The Contractor shall notify all interested parties in advance of scheduled inspection. The Government shall require three dry mil sample cuts of 2-inch by 1-inch and the Government shall select the three areas where the samples shall be removed. Contractor shall immediately repair the sample areas with the complete Liquid Applied Roof System using a 6-inch by 6-inch polyester fabric. The samples shall be cut in half and the Government shall be given half of each sample. The samples shall be measured with a

micrometer to determine that the mil thickness of the roof system shall be a minimum of -45 mils. If the mil thickness is not correct, the Contractor shall apply additional finish coating.

3.6 INSTALLATION OF PROTECTIVE CEMENT SURFACE

Install protective Cement Surface Systems at areas applicable, or where grease and oil may occur. These areas are most common around vents. Also install protective Cement Surface Systems to correct areas of ponding water.

Apply painter's tape to the surface of the roof system around all kitchen vents and grease trap areas when applicable. The tape shall be set a minimum of three feet from the curbs supporting the vents.

Remove all pollutants from the surface of the roof system. Protect the roof surface while mixing the cement slurry.

Mix the three gallons of Portland cement, one gallon of water and one gallon of Barrier Guard (polyurethane-methacrylate (PUMA) bonding agent). Mix the slurry and apply the slurry to roof surface and immediately brush in the polyester fabric. Once the fabric is brushed into the slurry, immediately apply a second application of the slurry.

Wait three to six hours and apply a third application of cement slurry. Remove painter's tape.

3.7 INSTALLATION OF PROTECTIVE TRAFFIC COAT

Provide protective Traffic Coat at areas where daily foot traffic occurs and at the top and bottom of all access ladders, hatches, and stairs.

Apply painter's tape to the surface of the roof system to designate walkways. The tape shall be set a minimum of three feet apart so as to produce a three-foot wide footpath.

Remove all pollutants from the surface of the roof system. Protect the roof surface while mixing the Traffic Coat. Mix the Traffic Coat with an electric drill for a minimum of three minutes. Apply one coat of Traffic Coat at a rate of 100 square feet per gallon. Wait three to six hours and apply a second application of Traffic Coat. Remove painter's tape.

3.8 CLEAN UP

Maintain work and work areas in a clean, safe condition at all times during coating installation. Remove excess materials, trash and debris from the jobsite daily.

At the completion of the project, clean area of any spills and containers, and clean up all roofing debris, leaving jobsite in a clean and orderly condition.

As a condition of the project's completion and acceptance, deliver to the Government a copy of the full executed, specified warranty from the coating manufacturer, following individual warranty guidelines.

3.9 PROTECTION

Protect installed products until completion of project. Touch-up, repair or replace damaged products before Substantial Completion.

3.10 FIELD QUALITY CONTROL

Perform field tests in the presence of the Roof Inspector and Contracting Officer. Notify the Contracting Officer one day before performing tests.

3.10.1 Construction Monitoring

During progress of the roof work, Contractor must make visual inspections as necessary to ensure compliance with specified parameters. Additionally, verify the following:

a. Materials comply with the specified requirements.

b. Materials are not installed in adverse weather conditions.

All materials are properly stored, handled and protected from moisture or other damages.

c. Equipment is in working order. Metering devices are accurate.

d. Substrates are in acceptable condition, in compliance with specification, prior to application of subsequent materials.

3.10.1.1 Manufacturer's Inspection

Manufacturer's technical representative must visit the site a minimum of once every 10 to 15 working days during the installation for purposes of reviewing materials installation practices and adequacy of work in place. Inspections must occur during the first 20 squares of membrane installation, at mid-point of the installation, and at substantial completion, at a minimum. Additional inspections must not exceed one for each 100 squares of total roof area with the exception that follow-up inspections of previously noted deficiencies or application errors must be performed as requested by the Contracting Officer. After each inspection, submit a report, signed by the manufacturer's technical representative to the Contracting Officer within 3 working days. Note in the report overall quality of work, deficiencies and any other concerns, and recommended corrective action.

3.11 INFORMATION CARD

Furnish a typewritten information card for facility Records and a card laminated in plastic and framed for interior display at roof access point, or a photoengraved 0.039 inch thick aluminum card for exterior display. Card must be 8 1/2 by 11 inch minimum. Information card must identify facility name and number; location; contract number; approximate roof area; detailed roof system description, including deck type, membrane, number of plies, method of application, manufacturer, insulation and cover board system and thickness; presence of tapered insulation for primary drainage, presence of vapor retarder; date of completion; installing contractor identification and contact information; membrane manufacturer

warranty expiration, warranty reference number, and contact information. The card must be a minimum size of 8 1/2 by 11 inch. Install card at roof top or access location as directed by the Contracting Officer and provide a paper copy to the Contracting Officer.

-- End of Section --

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SECTION 07 60 00

FLASHING AND SHEET METAL
05/17

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 189.1	(2014) Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings

AMERICAN WELDING SOCIETY (AWS)

AWS D1.2/D1.2M	(2014; Errata 1 2014; Errata 2 2020) Structural Welding Code - Aluminum

ASTM INTERNATIONAL (ASTM)

ASTM A480/A480M	(2020a) Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
ASTM B32	(2008; R 2014) Standard Specification for Solder Metal
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B370	(2012; R 2019) Standard Specification for Copper Sheet and Strip for Building Construction
ASTM D41/D41M	(2011; R 2016) Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
ASTM D226/D226M	(2017) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D1784	(2020) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D4586/D4586M	(2007; E 2012; R 2012) Asphalt Roof Cement, Asbestos-Free

ASTM E1918	(2016) Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field
ASTM E1980	(2011) Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1793	(2012) Architectural Sheet Metal Manual, 7th Edition

SINGLE PLY ROOFING INDUSTRY (SPRI)

ANSI/SPRI RD-1	(2014) Performance Standard for Retrofit Drains

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

1.2 GENERAL REQUIREMENTS

Finished sheet metal assemblies must form a weathertight enclosure without waves, warps, buckles, fastening stresses or distortion, while allowing for expansion and contraction without damage to the system. The sheet metal installer is responsible for cutting, fitting, drilling, and other operations in connection with sheet metal modifications required to accommodate the work of other trades. Coordinate installation of sheet metal items used in conjunction with roofing with roofing work to permit continuous, uninterrupted roofing operations.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Exposed Sheet Metal Coverings; G

Gravel Stops and fascia; G

Splash Pans; G

Flashing for Roof Drains; G

Base Flashing; G

Counterflashing; G

Flashing at Roof Penetrations and Equipment Supports; G

Reglets; G

Scuppers; G

Copings; G

Recycled Content; S

SD-03 Product Data

Cool Roof Data; G

SD-04 Samples

Finish Samples; G

SD-08 Manufacturer's Instructions

Instructions for Installation; G

Quality Control Plan; G

SD-10 Operation and Maintenance Data

Cleaning and Maintenance; G

1.3.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment, if available; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.4 MISCELLANEOUS REQUIREMENTS

1.4.1 Product Data

Indicate thicknesses, dimensions, fastenings, anchoring methods, and other provisions necessary for thermal expansion and contraction. Scaled manufacturer's catalog data may be submitted for factory fabricated items.

1.4.2 Finish Samples

Submit two color charts and two finish sample chips from manufacturer's standard color and finish options for each type of finish indicated.

1.4.3 Operation and Maintenance Data

Submit detailed instructions for installation and quality control during installation, cleaning and maintenance, for each type of assembly indicated.

1.5 DELIVERY, HANDLING, AND STORAGE

Package and protect materials during shipment. Uncrate and inspect materials for damage, dampness, and wet-storage stains upon delivery to the job site. Remove from the site and replace damaged materials that cannot be restored to like-new condition. Handle sheet metal items to avoid damage to surfaces, edges, and ends. Store materials in dry, weather-tight, ventilated areas until installation.

PART 2 PRODUCTS

2.1 RECYCLED CONTENT

Provide products with recycled content. Provide data for each product with recycled content, identifying percentage of recycled content.

2.2 MATERIALS

Do not use lead, lead-coated metal, or galvanized steel. Use any metal listed by SMACNA 1793 for a particular item, unless otherwise indicated. Provide materials, thicknesses, and configurations in accordance with SMACNA 1793 for each material. Different items need not be of the same metal, except that if copper is selected for any exposed item, all exposed items must be copper, and that contact between dissimilar metals must be avoided.

Furnish sheet metal items in 8 to 10 foot lengths. Single pieces less than 8 feet long may be used to connect to factory-fabricated inside and outside corners, and at ends of runs. Factory fabricate corner pieces with minimum 12 inch legs. Provide accessories and other items essential to complete the sheet metal installation. Provide accessories made of the same or compatible materials as the items to which they are applied. Fabricate sheet metal items of the materials specified below and to the gage, thickness, or weight shown in Table I at the end of this section. Provide sheet metal items with mill finish unless specified otherwise. Where more than one material is listed for a particular item in Table I, each is acceptable and may be used, except as follows:

2.2.1 Exposed Sheet Metal Items

Must be of the same material. Consider the following as exposed sheet metal: gutters, including hangers; downspouts; gravel stops and fascia; cap, valley, steeped, base, and related accessories.

2.2.2 Drainage

Do not use copper for an exposed item if drainage from that item will pass over exposed masonry, stonework or other metal surfaces. In addition to the metals listed in Table I, lead-coated copper may be used for such items.

2.2.3 Copper, Sheet and Strip

Provide in accordance with ASTM B370, cold-rolled temper, H 00 (standard).

2.2.4 Tin-Zinc Alloy coated copper

Tin-Zinc Alloy coated copper, 16 oz. minimum thickness.

2.2.5 Stainless Steel

Provide in accordance with ASTM A480/A480M, Type 302 or 304, 2D Finish, fully annealed, dead-soft temper.

2.2.6 Finishes

Provide exposed exterior sheet metal and aluminum with a baked on, factory applied color coating of polyvinylidene fluoride (PVF2) or approved equal fluorocarbon coating. Dry film thickness of coatings must be 0.8 to 1.3 mils. Color to be selected from manufacturer's full range of color choices. Field applications of color coatings are prohibited and will be rejected.

2.2.7 Cool Roof Finishes

Provide cool roof finish coatings and colors in accordance with one of the following methods of analysis:

2.2.7.1 ASHRAE 189.1 Compliance

Provide roof finishes having a minimum initial Solar Reflectance Index of 82 for low slope roofs with a 2:12 pitch or less when tested in accordance with ASTM E1918 and ASTM E1980, to comply with ASHRAE 189.1.

2.2.8 Aluminum Alloy, Extruded Bars, Rods, Shapes, and Tubes

ASTM B221.

2.2.9 Solder

Provide in accordance with ASTM B32, 95-5 tin-antimony.

2.2.10 Reglets

2.2.10.1 Polyvinyl Chloride Reglets

Provide in accordance with ASTM D1784, Type II, Grade 1, Class 14333-D, 0.075 inch minimum thickness.

2.2.10.2 Metal Reglets

Provide factory fabricated caulked type or friction type reglets with a minimum opening of 1/4 inch and a depth of 1-1/4 inch, as approved.

2.2.10.2.1 Caulked Reglets

Provide with rounded edges, temporary reinforcing cores, and accessories as required for securing to adjacent construction. Provide built-up mitered corner pieces for inside and outside corners.

2.2.10.2.2 Friction Reglets

Provide with flashing receiving slots not less than 5/8 inch deep, one inch jointing tongues, and upper and lower anchoring flanges installed at 24 inch maximum snap-lock type receiver.

2.2.11 Scuppers

Line interiors of scupper openings with sheet metal. Provide a drip edge at bottom edges with returns of not less than one inch against the face of the outside wall at the top and sides. Provide the perimeter of the lining approximately 1/2 inch less than the perimeter of the scupper.

2.2.12 Splash Pans

Provide splash pans where downspouts discharge onto roof surfaces and at locations indicated. Unless otherwise indicated, provide pans not less than 24 inches long by 18 inches wide with metal ribs across bottoms of pans. Provide sides of pans with vertical baffles not less than one inch high in the front, and 4 inches high in the back.

2.2.13 Copings

Unless otherwise indicated, provide copings in copper sheets, 8 or 10 feet long, joined by a 3/4 inch locked and soldered seam.

2.2.14 Bituminous Plastic Cement

Provide in accordance with ASTM D4586/D4586M, Type I.

2.2.15 Roofing Felt

Provide in accordance with ASTM D226/D226M Type II.

2.2.16 Asphalt Primer

Provide in accordance with ASTM D41/D41M.

2.2.17 Fasteners

Use the same metal as, or a metal compatible with the item fastened. Confirm compatibility of fasteners and items to be fastened to avoid galvanic corrosion due to dissimilar materials.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Workmanship

Make lines and angles sharp and true. Free exposed surfaces from visible wave, warp, buckle, and tool marks. Fold back exposed edges neatly to form a 1/2 inch hem on the concealed side. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction.

Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections. For installation of items not shown in detail or not covered by specifications conform to the applicable requirements of SMACNA 1793, Architectural Sheet Metal Manual. Provide sheet metal flashing in the angles formed where roof decks abut walls, curbs, ventilators, pipes, or other vertical surfaces and wherever indicated and necessary to make the work watertight. Join sheet metal items together as shown in Table II.

3.1.2 Nailing

Confine nailing of sheet metal generally to sheet metal having a maximum width of 18 inches. Confine nailing of flashing to one edge only. Space nails evenly not over 3 inch on center and approximately 1/2 inch from edge unless otherwise specified or indicated. Face nailing will not be permitted. Where sheet metal is applied to other than wood surfaces, include in shop drawings, the locations for sleepers and nailing strips required to secure the work.

3.1.3 Cleats

Provide cleats for sheet metal 18 inches and over in width. Space cleats evenly not over 12 inches on center unless otherwise specified or indicated. Unless otherwise specified, provide cleats of 2 inches wide by 3 inches long and of the same material and thickness as the sheet metal being installed. Secure one end of the cleat with two nails and the cleat folded back over the nailheads. Lock the other end into the seam. Where the fastening is to be made to concrete or masonry, use screws and drive in expansion shields set in concrete or masonry. Pre-tin cleats for soldered seams.

3.1.4 Bolts, Rivets, and Screws

Install bolts, rivets, and screws where indicated or required. Provide compatible washers where required to protect surface of sheet metal and to provide a watertight connection. Provide mechanically formed joints in aluminum sheets 0.040 inches or less in thickness.

3.1.5 Seams

Straight and uniform in width and height with no solder showing on the face.

3.1.5.1 Flat-lock Seams

Finish not less than 3/4 inch wide.

3.1.5.2 Lap Seams

Finish soldered seams not less than one inch wide. Overlap seams not soldered, not less than 3 inches.

3.1.5.3 Loose-Lock Expansion Seams

Not less than 3 inches wide; provide minimum one inch movement within the joint. Completely fill the joints with the specified sealant, applied at not less than 1/8 inch thick bed.

3.1.5.4 Standing Seams

Not less than one inch high, double locked without solder.

3.1.5.5 Flat Seams

Make seams in the direction of the flow.

3.1.6 Soldering

Where soldering is specified, apply to copper, terne-coated stainless steel, zinc-coated steel, and stainless steel items. Pre-tin edges of sheet metal before soldering is begun. Seal the joints in aluminum sheets of 0.040 inch or less in thickness with specified sealants. Do not solder aluminum.

3.1.6.1 Edges

Scrape or wire-brush the edges of lead-coated material to be soldered to produce a bright surface. Flux brush the seams in before soldering. Treat with soldering acid flux the edges of stainless steel to be pre-tinned. Seal the joints in aluminum sheets of 0.040 inch or less in thickness with specified sealants. Do not solder aluminum.

3.1.7 Welding and Mechanical Fastening

Use welding for aluminum of thickness greater than 0.040 inch. Aluminum 0.040 inch or less in thickness must be butted and the space backed with formed flashing plate; or lock joined, mechanically fastened, and filled with sealant as recommended by the aluminum manufacturer.

3.1.7.1 Welding of Aluminum

Use welding of the inert gas, shield-arc type. For procedures, appearance and quality of welds, and the methods used in correcting welding work, conform to AWS D1.2/D1.2M.

3.1.7.2 Mechanical Fastening of Aluminum

Use No. 12, aluminum alloy, sheet metal screws or other suitable aluminum alloy or stainless steel fasteners. Drive fasteners in holes made with a No. 26 drill in securing side laps, end laps, and flashings. Space fasteners 12 inches maximum on center. Where end lap fasteners are required to improve closure, locate the end lap fasteners not more than 2 inches from the end of the overlapping sheet.

3.1.8 Protection from Contact with Dissimilar Materials

3.1.8.1 Copper or Copper-bearing Alloys

Paint with heavy-bodied bituminous paint surfaces in contact with dissimilar metal, or separate the surfaces by means of moistureproof building felts.

3.1.8.2 Aluminum

Do not allow aluminum surfaces in direct contact with other metals except stainless steel, zinc, or zinc coating. Where aluminum contacts another metal, paint the dissimilar metal with a primer followed by two coats of aluminum paint. Where drainage from a dissimilar metal passes over aluminum, paint the dissimilar metal with a non-lead pigmented paint.

3.1.8.3 Metal Surfaces

Paint surfaces in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.

3.1.8.4 Wood or Other Absorptive Materials

Paint surfaces that may become repeatedly wet and in contact with metal with two coats of aluminum paint or a coat of heavy-bodied bituminous paint.

3.1.9 Expansion and Contraction

Provide expansion and contraction joints at not more than 32 foot intervals for aluminum and at not more than 40 foot intervals for other metals. Provide an additional joint where the distance between the last expansion joint and the end of the continuous run is more than half the required interval. Space joints evenly. Join extruded aluminum gravel stops and fascia by expansion and contraction joints spaced not more than 12 feet apart.

3.1.10 Base Flashing

Install and fit the flashings so as to be completely weathertight. Provide factory-fabricated base flashing for interior and exterior corners. Do not use metal base flashing on built-up roofing.

3.1.11 Counterflashing

Except where indicated or specified otherwise, insert counterflashing in reglets located from 9 to 10 inches above roof decks, extend down vertical surfaces over upturned vertical leg of base flashings not less than 3 inches. Fold the exposed edges of counterflashings 1/2 inch. Where

stepped counterflashings are required, they may be installed in short lengths a minimum 8 inches by 8 inches or may be of the preformed single piece type. Provide end laps in counterflashings not less than 3 inches and make it weathertight with plastic cement. Do not make lengths of metal counterflashings exceed 10 feet. Form flashings to the required shapes before installation. Factory form corners not less than 12 inches from the angle. Secure the flashings in the reglets with lead wedges and space not more than 18 inches apart; on elevator towers short runs, place wedges closer together. Fill caulked-type reglets or raked joints which receive counterflashing with caulking compound. Turn up the concealed edge of counterflashings built into masonry or concrete walls not less than 1/4 inch and extend not less than 2 inches into the walls. Install counterflashing to provide a spring action against base flashing. Where bituminous base flashings are provided, extend down the counter flashing as close as practicable to the top of the cant strip. Factory form counter flashing to provide spring action against the base flashing.

3.1.12 Metal Reglets

Keep temporary cores in place during installation. Ensure factory fabricated caulked type or friction type, reglets have a minimum opening of 1/4 inch and a minimum depth of 1-1/4 inch, when installed.

3.1.12.1 Caulked Reglets

Wedge flashing in reglets with lead wedges every 18 inches, caulked full and solid with an approved compound.

3.1.12.2 Friction Reglets

Install flashing snap lock receivers at 24 inches on center maximum. When flashing has been inserted the full depth of the slot, caulk the slot, lock with wedges, and fill with sealant.

3.1.13 Polyvinyl Chloride Reglets for Temporary Construction

Rigid polyvinyl chloride reglets may be provided in lieu of metal reglets for temporary construction.

3.1.14 Gravel Stops and fascia

Prefabricate in the shapes and sizes indicated and in lengths not less than 8 feet. Extend flange at least 4 inches onto roofing. Provide prefabricated, mitered corners internal and external corners. Install gravel stops and fascia after all plies of the roofing membrane have been applied, but before the flood coat of bitumen is applied. Prime roof flange of gravel stops and fascia on both sides with an asphalt primer. After primer has dried, set flange on roofing membrane and strip-in. Nail flange securely to wood nailer with large-head, barbed-shank roofing nails 1.5 inch long spaced not more than 3 inches on center, in two staggered rows.

3.1.14.1 Edge Strip

Hook the lower edge of fascia at least 3/4 inch over a continuous strip of the same material bent outward at an angle not more than 45 degrees to form a drip. Nail hook strip to a wood nailer at 6 inches maximum on center. Where fastening is made to concrete or masonry, use screws spaced 12 inches on center driven in expansion shields set in the concrete or

masonry. Where horizontal wood nailers are slotted to provide for insulation venting, install strips to prevent obstruction of vent slots. Where necessary, install strips over 1/16 inch thick compatible spacer or washers.

3.1.14.2 Joints

Leave open the section ends of gravel stops and fascia 1/4 inch and backed with a formed flashing plate, mechanically fastened in place and lapping each section end a minimum of 4 inches set laps in plastic cement. Face nailing will not be permitted. Install prefabricated aluminum gravel stops and fascia in accordance with the manufacturer's printed instructions and details.

3.1.15 Flashing for Roof Drains

Provide a 30 inches square sheet indicated. Taper insulation to drain from 24 inches out. Set flashing on finished felts in a full bed of asphalt roof cement, ASTM D4586/D4586M. Heavily coat the drain flashing ring with asphalt roof cement. Clamp the roof membrane, flashing sheet, and stripping felt in the drain clamping ring. Secure clamps so that felts and drain flashing are free of wrinkles and folds. Retrofit roof drains must conform to ANSI/SPRI RD-1.

3.1.16 Scuppers

Extend the scupper liner through and project outside of, the wall it penetrates to form a bottom drip edge against the face of the wall. Fold outside edges under 1/2 inch on all sides. Join the top and sides of the lining on the roof deck side to a closure flange by a locked and soldered joint. Join the bottom edge by a locked and soldered joint to the closure flange, where required, form with a ridge to act as a gravel stop around the scupper inlet. Provide surfaces to receive the scupper lining and coat with bituminous plastic cement.

3.1.17 Splash Pans

Install splash pans lapped with horizontal roof flanges not less than 4 inches wide to form a continuous surface. Bend the rear flange of the pan to contour of can't strip and extend up 6 inches under the side wall covering or to height of base flashing under counterflashing. Bed the pans and roof flanges in plastic bituminous cement and strip-flash as specified.

3.1.18 Flashing at Roof Penetrations and Equipment Supports

Provide metal flashing for all pipes, ducts, and conduits projecting through the roof surface and for equipment supports, guy wire anchors, and similar items supported by or attached to the roof deck..

3.1.19 Single Pipe Vents

See Table I, footnote (d). Set flange of sleeve in bituminous plastic cement and nail 3 inches on center. Bend the top of sleeve over and extend down into the vent pipe a minimum of 2 inches. For long runs or long rises above the deck, where it is impractical to cover the vent pipe with lead, use a two-piece formed metal housing. Set metal housing with a metal sleeve having a 4 inches roof flange in bituminous plastic cement and nailed 3 inches on center. Extend sleeve a minimum of 8 inches above

the roof deck and lapped a minimum of 3 inches by a metal hood secured to the vent pipe by a draw band. Seal the area of hood in contact with vent pipe with an approved sealant.

3.1.20 Copings

Provide coping with locked and soldered seam. Terminate outer edges in edge strips. Install with sealed lap joints as indicated.

3.2 PAINTING

Touch ups in the field may be applied only after metal substrates have been cleaned and pretreated in accordance with manufacturer's written instructions and products.

Field-paint sheet metal for separation of dissimilar materials.

3.3 CLEANING

Clean exposed sheet metal work at completion of installation. Remove grease and oil films, handling marks, contamination from steel wool, fittings and drilling debris, and scrub-clean. Free the exposed metal surfaces of dents, creases, waves, scratch marks, and solder or weld marks.

3.4 REPAIRS TO FINISH

Scratches, abrasions, and minor surface defects of finish may be repaired in accordance with the manufacturer's printed instructions and as approved. Repair damaged surfaces caused by scratches, blemishes, and variations of color and surface texture. Replace items which cannot be repaired.

3.5 FIELD QUALITY CONTROL

Establish and maintain a Quality Control Plan for sheet metal used in conjunction with roofing to assure compliance of the installed sheet metalwork with the contract requirements. Remove work that is not in compliance with the contract and replace or correct. Include quality control, but not be limited to, the following:

a. Observation of environmental conditions; number and skill level of sheet metal workers; condition of substrate.

b. Verification that specified material is provided and installed.

c. Inspection of sheet metalwork, for proper size(s) and thickness(es), fastening and joining, and proper installation.

3.5.1 Procedure

Submit for approval prior to start of roofing work. Include a checklist of points to be observed. Document the actual quality control observations and inspections. Furnish a copy of the documentation to the Contracting Officer at the end of each day.

TABLE I. SHEET METAL WEIGHTS, THICKNESSES, AND GAGES			
Sheet Metal Items	Copper kilograms per square foot	Aluminum, inch	Stainless Steel, inch
Scupper lining	20	.032	.015
Strainers, wire diameter or gage	No. 9 gage	.144 diameter	.109 diameter
Flashings:			
Base	20	.040	.018
Cap (Counter-flashing)	16	.032	.015
Bond barrier	16	-	.015
Stepped	16	.032	.015
Roof drain	16 (b)		
Pipe vent sleave (d)			
Coping	16	-	-
Gravel stops and fascia:			
Extrusions	-	.075	-
Sheets, smooth	20	.050	.018
Edge strip	24	.050	.025
Reglets (c)	10	-	.010
Splash pans	16	.040	.018
(a) Brass.			
(b) May be lead weighing 4 pounds per square foot.			
(c) May be polyvinyl chloride.			
(d) 2.5 pound minimum lead sleeve with 4 inch flange. Where lead sleeve is impractical, refer to paragraph SINGLE PIPE VENTS for optional material.			

TABLE II. SHEET METAL JOINTS			
TYPE OF JOINT			
Item Designation	Copper, Terne-Coated Stainless Steel, Zinc-Coated Steel and Stainless Steel	Aluminum	Remarks
Joint cap for building expansion seam, cleated joint at roof	1.25 inch single lock, standing seam, cleated	1.25 inch single lock, standing	--
Flashings			
Base	One inch 3 inch lap for expansion joint	One inch flat locked, soldered; sealed; 3 inch lap for expansion joint	Aluminum manufacturer's recommended hard setting sealant for locked aluminum joints. Fill each metal expansion joint with a joint sealing compound.
Cap-in reglet	3 inch lap	3 inch lap	Seal groove with joint sealing compound.
Reglets	Butt joint	--	Seal reglet groove with joint sealing compound.
Eave	One inch flat locked, cleated. One inch loose locked, cleated.	One inch flat locked, locked, cleated one inch loose locked, cleated	Same as base flashing.
Stepped	3 inch lap	3 inch lap	--
Valley	6 inch lap cleated	6 inch lap cleated	--
Edge strip	Butt	Butt	--
Gravel stops:			

TABLE II. SHEET METAL JOINTS			
TYPE OF JOINT			
Item Designation	Copper, Terne-Coated Stainless Steel, Zinc-Coated Steel and Stainless Steel	Aluminum	Remarks
Extrusions	--	Butt with 1/2 inch space	Use sheet flashing beneath and a cover plate
Sheet, smooth	Butt with 1/4 inch space	Butt with 1/4 inch space	Use sheet flashing backup plate.
(a) Provide a 3 inch lap elastomeric flashing with manufacturer's recommended sealant.			
(b) Seal Polyvinyl chloride reglet with manufacturer's recommended sealant.			

-- End of Section --

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SECTION 07 62 13

COPPER SHEET METAL FLASHING AND TRIM
08/09

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM B32	(2008; R 2014) Standard Specification for Solder Metal
ASTM B152/B152M	(2019) Standard Specification for Copper Sheet, Strip, Plate, and Rolled Bar
ASTM B370	(2012; R 2019) Standard Specification for Copper Sheet and Strip for Building Construction
ASTM C1136	(2017a) Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
ASTM D226/D226M	(2017) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D4586/D4586M	(2007; E 2012; R 2012) Asphalt Roof Cement, Asbestos-Free
ASTM F547	(2017) Standard Terminology of Nails for Use with Wood and Wood-Base Materials

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1793	(2012) Architectural Sheet Metal Manual, 7th Edition

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-51145	(Rev D; Notice 1; Notice 2; Notice 3) Flux, Soldering, Non-Electronic, Paste and Liquid

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

1.2 SYSTEM DESCRIPTION

a. Perform sheet metalwork to accomplish weathertight construction. Install the work without waves, warps, buckles, fastening stresses or distortion, allowing for expansion and contraction. Cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades shall be performed by sheet metal mechanics. Exposed edges shall be hemmed. Bottom edges of exposed vertical surfaces shall be angled to form drips. Form flashing into a 3-dimensional configuration, at the end of a run. to direct water to the outside of the system. Weights and thicknesses of copper flashing shall be as specified in TABLE 1. Install joints as specified in TABLE 2. Provide accessories and other items, essential to complete the sheet metal installation, though not specifically indicated or specified.

b. Installation of sheet metal items used in conjunction with roofing shall be coordinated with roofing work to permit continuous roofing operations. Factory-fabricated components shall be packed in cartons marked with the manufacturer's name or trademark printed or embossed at frequent intervals to permit easy identification. Sheet metalwork pertaining to heating, ventilating, and air conditioning is specified in other sections.

c. Galvanic action between copper and iron or steel shall be avoided by the use of proper insulation. The copper shall be insulated by the following: covering the steel member with insulation; placing strips of sheet lead between the two metals; or by heavily tinning the iron.

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment, if available; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for copper flashing, if available, that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When

used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Sheet Metal

SD-03 Product Data

Contractor Quality Control

SD-04 Samples

Materials

1.4 DELIVERY, STORAGE, AND HANDLING

Materials shall be adequately packaged and protected during shipment and inspected for damage, dampness, and wet-storage stains upon delivery to the jobsite. Materials shall be clearly labeled as to type and manufacturer. Sheet metal items shall be carefully handled to avoid damage. Store materials in dry, weathertight, ventilated areas until installation.

PART 2 PRODUCTS

2.1 MATERIALS

Provide materials conforming to the requirements specified below, and those given in TABLE 1. Materials exposed to weather shall be copper. Recyclable materials (building paper, etc.) shall conform to EPA requirements in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit samples of materials proposed for use, upon request.

2.1.1 Asphalt Roof Cement

ASTM D4586/D4586M, Type I.

2.1.2 Fasteners

Fasteners shall conform to TABLE 1. Nails shall conform to ASTM F547 or be as approved. Nails and rivets shall be copper. Screws and bolts shall be bronze. Fasteners shall be the best type for the application.

2.1.3 Felt

ASTM D226/D226M, Type II.

2.1.4 Flux

CID A-A-51145, Type I.

2.1.5 Slip Sheet

Building paper meeting the requirements of ASTM C1136, Type IV, style optional.

2.1.6 Sheet Metal

Sheet metal shall conform to ASTM B152/B152M, ASTM B370, Light cold-rolled temper (H00) copper. Submit drawings showing weights, gauges, or thickness of sheet metal; type of material; joining, expansion-joint spacing, and fabrication details; and installation procedures. Materials shall not be delivered to the site until after the approved detail drawings have been returned to the Contractor.

2.1.7 Solder

ASTM B32 Sn50.

2.2 SEALANTS AND SEALING COMPOUNDS

Sealants and sealing compounds are specified in Section 07 92 00 JOINT SEALANTS.

PART 3 EXECUTION

3.1 EXISTING COPPER SHEET METAL

Existing, original, historic copper sheet metal elements that are intact and serviceable shall be salvaged and reused whenever possible. This may include, but is not limited to, gutters, hangers, downspouts, connectors, leader heads, leader straps, basket strainers, splash pans, and other architectural sheet metal elements such as finials, and decorative panels. When work involves repair and replacement of copper sheet metal elements, new elements shall match existing original elements as closely as possible.

3.2 SOLDERING AND SEAMING

3.2.1 Soldering

Edges of sheet metals, except lead coated material, shall be pretinned before soldering is begun. Soldering shall be done slowly with well heated soldering irons to thoroughly heat the seams and completely sweat the solder through the full width of the seam. Edges of lead coated material to be soldered shall be scraped or wire-brushed to produce a bright surface, and seams shall have a liberal amount of flux brushed in before soldering is begun. Soldering shall follow immediately after application of the flux. Upon completion of soldering, the acid flux residue shall be thoroughly cleaned from the sheet metal with a solution of washing soda in water and rinsed with clean water.

3.2.2 Seams

Flat-lock and soldered-lap seams shall finish not less than 1 inch wide. Unsoldered plain-lap seams shall lap not less than 3 inches unless otherwise specified. Flat seams shall be made in the direction of the flow.

3.3 COVERING ON MINOR FLAT, PITCHED, OR CURVED SURFACES

Unless otherwise indicated, minor flat, pitched, or curved surfaces, such as crickets, bulkheads, dormers, and small decks, shall be covered or flashed with 18 x 24 inch metal sheets and shall be secured with cleats.

One ply of felt covered with 1 ply of slip sheet shall be applied as underlayment on wood surfaces. Two cleats shall be placed on the long side and 1 cleat shall be placed on the short side. Seams shall be locked and soldered.

3.4 CLEATS

Provide a continuous cleat where indicated or specified to secure loose edges of the sheet metalwork. Space butt joints approximately 1/8 inch apart. Fasten the cleat to the supporting construction with nails evenly spaced not over 12 inches on centers. Where the fastening is to be made to concrete or masonry, use screws driven in expansion shields set in concrete or masonry. The cleat for fascia anchorage shall be installed to extend below the supporting construction to form a drip and to allow the flashing to be hooked over the lower edge at least 3/4 inch. The cleat shall be of sufficient width to provide adequate bearing area to ensure a rigid installation. Where horizontal nailer is vented for insulation and the cleat is placed over masonry or concrete, the cleat shall be installed over 1/16 inch thick metal washers placed at screws. Washers shall be of metal that is electrolytically compatible with the continuous cleat.

3.5 EXPANSION JOINTS

Provide expansion joints at 40 foot intervals, except that where the distance between the last expansion joint and the end of the continuous run is more than half the required interval spacing, an additional joint shall be provided. Joints shall be evenly spaced.

3.6 FLASHINGS

3.6.1 General

Install flashings at intersections of roof with vertical surfaces and at projections through roof, except that flashing for heating and plumbing, including piping, roof, and floor drains, and for electrical conduit projections through roof or walls is covered in appropriate sections for such work. Cap flashings shall be turned around exterior corners of masonry or concrete walls at least 2 inches, shall be secured into masonry joints and into concrete with expansion anchors and shall be sealed with No. 2 or 4 sealing compound. Corner units shall have mitered joints, shall be installed with 3 inch lap joint over flashings on each side. Unless otherwise indicated, through-wall flashing shall be terminated 1/2 inch inside each exposed face of the wall. Cap flashings shall be provided over base flashings. Perforations in flashings made by masonry anchors shall be covered up by an application of bituminous plastic cement at the perforation. Exposed and unfastened flashings shall have the edge of the strip turned under 1/2 inch. Flashing shall be installed on top of joint reinforcement.

3.6.2 Base Flashings

a. Extend base flashings under the uppermost row of tile the full depth of the tile or at least 4 inches over the tile immediately below the metal.

b. Turn up the vertical leg of the metal not less than 4 inches and preferably 8 inches on the abutting surface. Where a vertical surface butts against the roof slope, the base flashing shall be built into each course of tile as it is laid, turning the metal out 4 inches on

the tile and at least 8 inches above the roof.

c. Where the roof stops against a stuccoed wall, secure a wood 2 x 4 with a beveled top edge to the wall. Then turn out base flashing over the tile at least 4 inches and bend up vertically at least 3 inches on the board.

d. Turn out the base flashing 4 inches on the roof surface and from 6 to 8 inches on the vertical surface for either sloping or flat slate roofs.

e. Use base flashings where posts, flagpoles, or scuttles project through the roof. Vent pipes shall have base flashings in the form of special sleeves and/or EPDM boots.

3.6.3 Cap Flashings (Counterflashings)

Where the base flashing is not covered by vertical tile or siding, build a cap flashing into the masonry joints lapping not less than 2 inches vertically, extending down over the base flashing 4 inches, and the edge bent back and up 1/2 inch.

3.6.4 Stepped Flashing

Install stepped flashing where sloping roofs surfaced with tiles abut vertical surfaces. Place separate pieces of base flashing in alternate tile courses. Extend each piece of base flashing out onto the roof at least 4 inches and nail to the deck. Extend the stepped base flashing up along the wall not less than 4 inches and stop beneath the cap flashing or anchor beneath wood siding in frame construction. Set cap flashings in a reglet into masonry and concrete construction, and lap cap flashing over the flashing below not less than 3 inches. Lap the stepped base flashing at vertical joints between the sections not less than 3 inches.

3.6.5 Valley Flashing

Valley flashing shall be free from longitudinal seams and shall be of a width sufficient to extend not less than 6 inches under the roof covering on each side. Lap the sheets not less than 8 inches in the direction of flow and secure to roofing construction with cleats on each side. Space cleats not more than 24 inches on centers. Do not puncture the copper sheet with nails at any place.

3.6.5.1 Open Valley Flashings

a. Open valleys shall be not less than 4 inches wide. The proper width shall be determined by the following rule: Starting at the top with a width of 4 inches, increase the width 1 inch for every 8 feet of length of the valley. Flashing pieces shall be full length sheets and of sufficient width to cover the open portion of the valley and extend up under the roofing not less than 6 inch on each side.

b. Where two valleys of unequal size come together; where the areas drained by the valley are unequal; where the slope of the valley is 26 degrees or less (6 inches or less per foot;) or where the intersecting roofs are of different slopes, an inverted V-joint 1 inch high, shall be provided along the centerline of the valley, and the edge of the valley sheets shall extend 8 inches under the roof covering on each side.

3.6.5.2 Closed Valleys

a. Flashing pieces for closed valleys shall be of sufficient length to extend 2 inches above the top of the roofing piece and lap the flashing piece below 3 inches, and of sufficient width to extend up the sides of the valley far enough to make the valley 8 inches deep.

b. Place flashing with the roofing so that all pieces are separated by a course of tile. Set pieces so as to lap at least 3 inches and to be entirely concealed by the tiles. Fasten flashing by nails at the top edge only.

3.6.6 Through-Wall Flashing

Through-wall flashing includes sill, lintel, and spandrel flashing. The flashing shall be laid with a layer of mortar above and below the flashing so that the total thickness of the two layers of the mortar and flashing are the same thickness as the regular mortar joints. Flashing shall be one piece for lintels and sills.

3.6.6.1 Lintel Flashing

Extend lintel flashing the full length of lintel. Extend it through the wall one masonry course above the lintels and bend down over the top of masonry and precast concrete lintels. Underlay bedjoints of lintels at control joints with sheet metal bond breaker.

3.6.6.2 Sill Flashing

Extend sill flashing the full width of the sill and not less than 4 inches beyond ends of sill except at a control joint where the flashing is terminated at the end of the sill.

3.6.7 Eave and Rake Flashings

Place eave and rake flashings in accordance with SMACNA 1793.

3.7 REGLETS

Reglets shall be a factory fabricated product, complete with fittings and special shapes as may be required. Open-type reglets shall be filled with fiberboard or other suitable separator to prevent crushing of the slot during installation. Reglets shall be located not less than 8 inches nor more than 16 inches above roofing not having cant strips or shall be located not less than 5 inches nor more than 13 inches above cant strip. Reglet plugs shall be spaced not over 12 inches on centers and reglet grooves shall be filled with sealant. Friction or slot-type reglets shall have metal flashings inserted the full depth of slot and shall be lightly punched every 12 inches to crimp the reglet and cap flashing together.

3.8 GRAVEL STOPS AND FASCIA

Fabricate sheets without longitudinal joints except where 2-piece fasciae are used when fascia depth exceeds 7 inches. Provide provision for expansion at joints. Factory fabricated internal and external corner units with mitered joints shall be provided. Roof flange and splice plate of the gravel stop and fascia shall extend out on the roof not less than 4 inches, and shall be set in bituminous cement over the roofing felt. Roof

flange shall be secured with nails spaced not greater than 3 inches on centers located within 1 inch of the outer edge of the flange. The fascia section shall not be face nailed except as specified for 2-piece fasciae. The upper piece of two-piece fascia shall be the same as specified above except that the fascia depth shall be at least 3-1/2 inches, and shall overlap the lower fascia not less than 2 inches. The lower piece shall be hooked 1/2 inch over edge strip and splice plate and face nailed on 12 inch centers 1 inch below top of sheet. The upper fascia shall be hemmed 1/2 inch at lower edge and shall be formed to fit tight against lower fascia.

3.9 SCUPPER LININGS

Line the interior of scupper openings with sheet metal. Form the lining to return not less than 1 inch against both faces of the wall or parapet with the outside edges folded under 1/2 inch less on the top and sides. The perimeter of the lining shall be approximately 1/2 inch less than the perimeter of the scupper. Join the top and sides of scuppers on the roof-deck side to base flashing by a locked and soldered joint. Join the bottom edge by a locked and soldered joint to the base flashing and where required, form with a ridge to act as a gravel stop around the scupper inlet. Coat surfaces to receive the lining with bituminous cement.

3.10 SPLASH PANS

Install splash pans where downspouts discharge on roof surfaces and at other locations as indicated. Pans shall be of size indicated. Pans and roof flanges shall be bedded in plastic bituminous cement and strip flashed.

3.11 CONTRACTOR QUALITY CONTROL

Establish and maintain a quality control procedure for sheet metal used in conjunction with roofing to assure compliance of the installed sheet metalwork with the contract requirements. Promptly remove and replace or correct any work found not to be in compliance with the contract in an approved manner. Submit a Quality Assurance Plan, including a checklist of points to be observed, prior to start of roofing work. Quality control shall include, but not be limited to, the following:

a. Observation of environmental conditions; number and skill level of sheet metal workers; condition of substrate.

b. Verification of compliance of materials before, during, and after installation.

c. Inspection of sheet metalwork, for proper size and thickness, fastening and joining, and proper installation.

The actual quality control observations and inspections shall be documented and a copy of the documentation furnished to the Contracting Officer at the end of each day.

TABLE 1 - COPPER SHEET METAL WEIGHTS AND THICKNESSES

Item Description	Copper (oz/square foot)
Building expansion joints: Cap	16

TABLE 1 - COPPER SHEET METAL WEIGHTS AND THICKNESSES	
Item Description	Copper (oz/square foot)
Building expansion joints: Waterstop - bellows or flanged-U-type	16
Cleats (Continuous)	24
Covering on minor flat, pitched or curved surfaces	20
Downspouts, heads and leaders	16
Flashings: Base	20
Flashings: Cap, stepped or valley	16
Gravel stops and fasciae: Sheets, corrugated	16
Gutters (girth): Up to15 inches	16
Gutters (girth): 15 to 20 inches	16
Gutters (girth): 20 to 25 inches	20
Gutters (girth): 25 to 30 inches	24
Gutter brackets (girth): Up to15 inches	1/8 x 1 inch
Gutter bracket s (girth): 15 to 20 inches	1/4 x 1 inch
Gutter brackets (girth): 20 to 24 inches	1/4 x 1 1/2 inch
Gutter cleats and cover plates	16
Scupper lining	20
Strainers (wire gauge)	No. 9
Reglets (1)	10
Splash pans	16
Copings	16
Pitch pockets	16
Through-wall, flashings above roof line	16
Through-wall, below roof line, except as otherwise specified in paragraph MATERIALS	10

TABLE 2 - COPPER SHEET METAL JOINTS	
Item Designation	Type of Joint
Building expansion joint at roof	1-1/4 inch single lock standing seam, cleated
Cleats (Continuous)	Butt
Flashings: Base	1 inch flat locked, soldered 3 inch lap for expansion joint
Cap - in reglet	3 inch lap
Cap - two - piece	Receiver 3 inch lap Cap piece 3 inch lap
Stepped	3 inch lap
Through-wall spandrel flashing (metal	1-1/2 inch mechanical interlock
Valley	6 inch lap, cleated
Sheet, corrugated	Butt with 1/4 inch
Sheet, smooth	Butt with 1/4 inch space
Gutters	1-1/2 inch lap, riveted and soldered
Pitch pockets	1 inch soldered lap
Reglets	Butt joint

-- End of Section --

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SECTION 07 81 00

SPRAY-APPLIED FIREPROOFING
02/11

PART 1 GENERAL

1.1 REFERENCES

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

ASSOCIATION OF THE WALL AND CEILING INDUSTRY (AWCI)

AWCI TM 12-A	(1997; 3rd Ed) Standard Practice for the Testing and Inspection of Field Applied Sprayed Fire-Resistive Materials; An Annotated Guide

ASTM INTERNATIONAL (ASTM)

ASTM E1042	(2002; R 2014) Acoustically Absorptive Materials Applied by Trowel or Spray
ASTM E119	(2020) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E605/E605M	(1993; R 2015; E 2015) Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members
ASTM E736	(2000; R 2011) Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
ASTM E759/E759M	(1992; R 2015; E 2015) Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members
ASTM E760/E760M	(1992; R 2015; E 2015) Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members
ASTM E761/E761M	(1992; R 2015; E 2015) Standard Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials

ASTM E859/E859M	(1993; R 2015; E 2015) Standard Test Method for Air Erosion of Sprayed Fire-Resistive Materials (SFRMs) Applied to Structural Members
ASTM E937/E937M	(1993; R 2015; E 2015) Standard Test Method for Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members
ASTM G21	(2015) Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

ICC EVALUATION SERVICE, INC. (ICC-ES)

ICC-ES AC23	(2012; R 2016) Acceptance Criteria for Sprayed Fire-resistant Materials (SFRMs), Intumescent Fire-resistant Coatings and Mastic Fire-resistant Coatings Used to Protect Structural Steel Members

UNDERWRITERS LABORATORIES (UL)

UL 263	(2011; Reprint Sep 2020) UL Standard for Safety Fire Tests of Building Construction and Materials
UL Fire Resistance	(2014) Fire Resistance Directory

1.2 SYSTEM DESCRIPTION

1.2.1 General Requirements

Protect all structural steel, undersides of steel floors (if required) and steel roof decks (if required) with spray-applied fireproofing to a fire resistance hour-rating as indicated below, unless otherwise indicated.

1.2.2 Fire Resistance Rating

Fire resistance ratings shall be in accordance with the fire rated assemblies listed in UL Fire Resistance. Proposed materials not listed in UL Fire Resistance shall have fire resistance ratings at least equal to the UL Fire Resistance ratings as determined by an approved independent testing laboratory, based on tests specified in UL 263 or ASTM E119. Submit reports and test records, attesting that the fireproofing material conforms to the specified requirements. Each test report shall conform to the report requirements specified by the test method. For the underside of the decking use metal lath installed prior to the fireproofing material or Rigid Board Fireproofing Material as outlined in the UL Fire Resistance Directory Volume 1. Apply fireproofing to structural steel members, with the following hourly fire resistance rating and in accordance with the following UL design or approved equivalent. Use unrestrained fire resistance ratings, unless the architect/engineer has specified that the degree of thermal restraint of the construction meets or exceeds the degree of thermal restraint of the tested assembly. Performance tests shall be in accordance with ASTM E119.

Fire Rating Schedule		
Element	Hourly Rating	UL Design Reference
Columns supporting one floor	2	X854
Columns supporting more than one floor	2	X854
Columns supporting roof	2	X854
Floor decks	2	D798
Floor supports	2	D798
Roof decks	1	D732
Roof supports	1	D732

1.2.3 Evaluation Reports - ICC-ES Reports

Materials shall be evaluated in accordance with ICC-ES AC23. ICC-ES Reports shall be included as part of the Submittals below. The reports will identify the product as code compliant and having met the physical performance requirements outlined in paragraphs "Dry Density and Cohesion/Adhesion" through "Air Erosion".

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. "AE" is for Architect Engineer. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Fireproofing Material; G, AE

SD-04 Samples

Spray-Applied Fireproofing; G, AE

SD-06 Test Reports

Fire Resistance Rating; G, AE

Field Tests; G, AE

Evaluation Reports; G, AE

SD-07 Certificates

Installer Qualifications; G, AE

Surface Preparation Report; G, AE

Manufacturer's Inspection Report; G, AE

1.4 QUALITY ASSURANCE

1.4.1 Installer Qualifications

Engage an experienced installer that is certified, licensed, or otherwise qualified by the spray-on fireproofing manufacturer as having the necessary experience, staff, and training to install the manufacturer's products in accordance with specified requirements. Submit manufacturer's certification that each listed installer is qualified and trained to install the specified fireproofing. Show evidence that each fireproofing installer has had a minimum of 3 years experience in installing the specified type of fireproofing. Each installer of fireproofing material shall be trained, have a minimum of 3 years experience and a minimum of three installations using fireproofing of the type specified. A manufacturer's willingness to sell its products to the Contractor or installer does not infer qualification of the buyer.

1.4.2 Pre-Installation Meeting

Hold a meeting with the installer, field testing agency, the manufacturer, subcontractors (whose employees come into contact with the fireproofing), and the Contracting Officer prior to the installation of any fireproofing material to review the substrates for acceptability, method of application, applied thickness, patching, repair, inspection and testing procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver packaged material in the original unopened containers, marked to show the brand name, the manufacturer, and the UL markings. Keep fireproofing material dry until ready to be used, and store off the ground, under cover and away from damp surfaces. Damaged or opened containers will be rejected. Apply material with shelf-life prior to expiration of the shelf-life.

1.6 PROJECT/SITE CONDITIONS

1.6.1 Temperature

Maintain substrate and ambient air temperatures above 44 degrees F during application and for 24 hours before and after application. Maintain relative humidity within the limits recommended by the fireproofing manufacturer.

1.6.2 Ventilation

Provide adequate ventilation to properly dry the fireproofing after application. In enclosed areas, provide a minimum of 4 air exchanges per hour by forced air circulation.

PART 2 PRODUCTS

2.1 SPRAY-APPLIED FIREPROOFING FP-1

Provide cementitious spray-applied fireproofing material in all locations unless indicated otherwise on the drawings, including sealer, conforming to ASTM E1042, Class (a), Category A, either Type I or Type II, except that the dust removed shall not exceed 0.0025 gram per square foot of fireproofing material applied as specified in the project. Only products that have been evaluated at UL and bear and "investigated for exterior use" approval are allowed in waterfront areas where the fireproofing may be directly exposed to a natural body of water. Material shall be asbestos free, and shall resist fungus for a period of 28 days when tested in accordance with ASTM G21. Material shall have a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84. Submit one sample panel, 18 inches square, for each specified type of fireproofing. Also, a designated sample area of not less than 100 square feet shall be prepared. Sample area shall be representative of typical installation of fireproofing including metal decks, beams, columns and attachments. Equipment, materials and procedures used in the sample area shall be the same as, or representative of, that to be used in the work. The sample area shall be approved prior to proceeding with fireproofing work in any other area. The approved sample area shall be used as a reference standard for applied fireproofing material. Sample area shall remain in place and open to observation until all spray-applied fireproofing is completed and accepted, at which time it may become part of the work.

2.1.1 Dry Density and Cohesion/Adhesion

Fireproofing shall have a minimum ASTM E605/E605M dry density and ASTM E736 cohesion/adhesion properties as follows:

2.1.1.1 Concealed Structural Components

Fireproofing for structural components concealed above the ceiling, or within a wall, chase, or furred space, shall have a minimum applied dry density of 15 pounds per cubic foot and a cohesion/adhesion strength of 200 psf.

2.1.1.2 Exposed Structural Components

Fireproofing for exposed structural components, except where otherwise specified or indicated, shall have a minimum applied dry density of 22 pounds per cubic foot and a cohesion/adhesion strength of 434 psf.

2.1.1.3 Mechanical Rooms and Storage Areas

Fireproofing for structural components located in mechanical rooms and storage areas shall have a minimum applied dry density of 40 pcf and a cohesion/adhesion strength of 1,000 psf.

2.1.2 Deflection

Spray-applied fireproofing shall not crack, spall, or delaminate when backing to which it is applied is subject to downward deflection 1/120 of 10 foot clear span, when tested in accordance with ASTM E759/E759M.

2.1.3 Bond-Impact

Spray-applied fireproofing material shall not crack, spall or delaminate when tested in accordance with ASTM E760/E760M.

2.1.4 Compressive Strength

The minimum compressive strength shall be 1000 psf when tested in accordance with ASTM E761/E761M.

2.1.5 Corrosion

Spray-applied fireproofing material shall not contribute to corrosion of test panels when tested as specified in ASTM E937/E937M.

2.1.6 Air Erosion

Dust removal shall not exceed 0.025 gram per square foot when tested in accordance with ASTM E859/E859M.

2.2 SEALER

Sealer shall be the type approved by the manufacturer of the fireproofing material, shall be fungus resistant, shall have a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84, and shall be transparent-drying color.

2.3 WATER

Water used for material mixing and surface preparation shall be potable.

2.4 SPRAY-APPLIED INTUMESCENT COATING SYSTEM FP-2

Provide a factory-mixed, multicomponent system consisting of intumescent base coat and topcoat based intumescent fire protective coating that meets the following requirements and complying with indicated fire-resistance design.

a. On curing it forms a flexible and tough barrier which transforms into a ceramic-like, insulating char to provide thermal protection of the substrate in the event of a fire.

b. The coating system includes the manufacturer's required surface preparation, primer, and fire protective layer, and topcoat.

c. The coating system protects the substrate from corrosion and retain its fire protection properties under aggressive chemical environments.

d. Resistant to solvents, acids, alkalis, salts and abrasion while retaining its fire protective properties.

e. Surface-Burning Characteristics: Comply with ASTM E84; 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: 50 or less

Provide a system that exhibits the following properties:

2.4.1 Percent Solids by Weight

100 percent

2.4.2 In Service Temperature Restrictions

Up to 150 degrees F

2.4.3 Application Method

Air spray or specialized plural component airless equipment approved by the manufacture. Troweling can be used for small areas or touch-up work.

2.4.4 Drying Time

Approximately 24 hours to achieve a hardness of 45, Type D durometer, according to ASTM D2240.

2.4.5 Shelf Life

Minimum shelf life under proper storage condition is 1 Year from date of manufacture.

2.4.6 Pot Life

Approximately 40 minutes at 77 degrees F and 50 percent relative humidity. Pot life is not a factor when using specialized plural component airless spray equipment.

2.4.7 Flash Point

Greater than 212 degrees F Pensky-Martens for each component.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Thoroughly clean surfaces to be fireproofed of dirt, grease, oil, paint, primers, loose rust, rolling lubricant, mill scale or other contaminants that will interfere with the proper bonding of the sprayed fireproofing to the substrate. Test painted/primed steel substrates in accordance with ASTM E736, with specified sprayed fireproofing material, to provide the required fire-resistance rating; painted or primed steel surfaces may require a fireproofing bond test to determine if the paint formulation will impair proper adhesion. Certify the acceptability of surfaces to receive sprayed-applied fireproofing by inspection and submit a Surface Preparation Report accordingly. The statement shall list the structural members and the areas that have been inspected and certified. Overhead areas to be fireproofed shall be cleared of all obstructions interfering with the uniform application of the spray-applied fireproofing. Hardware such as support sleeves, inserts, clips, hanger attachment devices and the like shall be installed prior to the application of the fireproofing. Condition of the surfaces shall be acceptable to the manufacturer prior to application of spray-applied fireproofing. Applications listed for use on primed surfaces shall be in accordance with the manufacturer's recommendations and standards, and detailed in submittal item SD-03 Product Data.

3.2 PROTECTION

Cover surfaces not to receive spray-applied fireproofing to prevent contamination by splatter, rebound and overspray. Cover exterior openings in areas to receive spray-applied fireproofing prior to and during application of fireproofing with tarpaulins or other approved material. Clean surfaces not to receive fireproofing of fireproofing and sealer.

3.3 FIREPROOFING MATERIAL

Mix fireproofing material in accordance with the manufacturer's recommendations. Submit data identifying performance characteristics of fireproofing material. Data includes recommended application requirements and indicate thickness of fireproofing to be applied to achieve each required fire rating.

3.4 APPLICATION

3.4.1 Sequence

Prior to application of fireproofing on each floor, the manufacturer shall inspect and approve application equipment, water supply and pressure, and the application procedures. If fireproofing is required to be applied to underside of steel roof deck and steel floor assemblies, it shall be done only after respective roof or floor construction is complete. No roof or floor traffic shall be allowed during application. Fireproofing material shall be applied prior to the installation of ductwork, piping and conduits which would interfere with uniform application of the fireproofing.

3.4.2 Application Technique

Maintain water pressure and volume to manufacturer's recommendations throughout the fireproofing application. Apply fireproofing material to the thickness and density established for the specified fire resistance rating, in accordance with the procedure recommended by the manufacturer, and to a uniform density and texture. Do not tamp fireproofing material to achieve the desired density.

3.4.3 Sealer Application

If sealer is required by the product used, apply it after field testing has been conducted and after corrective measures and repairs, if required, have been completed.

3.4.4 Applied Thickness

The minimum average thickness shall be no less than 0.5 inches. Thicknesses shall not be less than required to achieve designated fire resistance ratings. If the specified thickness is greater than or equal to 1 inch, any individual measurement shall not be less than the specified thickness minus 0.25 inches. If the specified thickness is less than 1 inch, any individual measurement shall not be less than the specified thickness minus 25 percent.

3.4.5 Application of Spray-Applied Intumescent Coating System

Prepare surfaces and apply the spray-applied Intumescent coating system in

accordance with the manufacturer's written recommendations.

3.5 MANUFACTURER'S SERVICES

3.5.1 General

The manufacturer, or its representative, shall be onsite prior to, periodically during, and at completion of the application, to provide the specified inspections and certifications; and to ensure that preparations are adequate and that the material is applied according to manufacturer's recommendations and the contract requirements.

3.5.2 Manufacturer's Inspection

The manufacturer shall inspect the fireproofing work after the work is completed on each floor or area, including testing, repair and clean-up, and shall certify that the work complies with the manufacturer's criteria and recommendations. Before the sprayed material is covered, and after all of the fireproofing work is completed, including repair, testing, and clean-up; and after mechanical, electrical and other work in contact with fireproofing material has been completed, the manufacturer shall re-inspect the work and certify that the entire project complies with the manufacturer's criteria and recommendations. Obtain and submit the Manufacturer's Inspection Report and certifications of approval stating that the spray-applied fireproofing in the entire project complies with the manufacturer's criteria and recommendations.

3.6 FIELD TESTS

The applied fireproofing shall be tested by an approved independent testing laboratory to be selected by the A/E and paid for by the Contractor. Submit test reports documenting results of tests on the applied material in the project. Report shall include defects identified, repair procedures, and results of the retests when required. Perform the tests in approved locations: for density in accordance with ASTM E736, cohesion/adhesion in accordance with ASTM E736, and for thickness in accordance with ASTM E605/E605M. Determine densities in accordance with ASTM E605/E605M or Appendix A, "Alternate Method for Density Determination" of AWCI TM 12-A. Take density determinations at the flat portion of deck, beam bottom flange, beam web, column, and an equivalent area from the top of the lower beam flange. Areas showing a density less than specified will be rejected. A test sample shall be located every 10,000 square feet of floor area or two for each floor, whichever produces the greatest number of test areas. Any area showing less than minimum requirements shall be corrected. Proposed corrective measures, in writing, shall be approved before starting the corrective action. Corrected work shall be retested.

3.6.1 Structural Components

Test each structural component type at floor and roof decks, beams, columns, joists, and trusses. Minimum average thickness shall be as required by UL Fire Resistance. Density and cohesion/adhesion shall be as specified.

3.6.2 Repair

Additional fireproofing material may be added to provide proper thickness. Correct rejected areas of fireproofing to meet specified

requirements by adding fireproofing material to provide the proper thickness, or by removing defects and respraying with new fireproofing material. Use same type of fireproofing material for repairs as originally applied or use patching materials recommended by the manufacturer. Retest and reinspect repaired areas. Apply fireproofing material to voids or damaged areas by hand-trowel, or by respraying.

3.6.3 Visual Inspections

Inspections shall be made by the certified independent laboratory prior to closure of concealed areas. These inspections may be phased, but shall not occur less than 5 working days prior to the enclosure of the fireproofing. Sprayed areas shall receive a final inspection. Fireproofed surfaces shall be inspected after mechanical, electrical, and other work in contact with fireproofing material has been completed and before sprayed material is covered. Any locations missing fireproofing shall be patched in accordance with the manufacturer's requirements.

3.6.4 Patching

Patch and repair damaged fireproofing. The patching material shall be the same as that specified for that area.

3.7 CLEANUP

Thoroughly clean surfaces not indicated to receive fireproofing of sprayed material within a 24 hour period after application.

-- End of Section --

SECTION 07 84 00

FIRESTOPPING
05/10

PART 1 GENERAL

1.1 SUMMARY

Furnish and install tested and listed firestopping systems, combination of materials, or devices to form an effective barrier against the spread of flame, smoke and gases, and maintain the integrity of fire resistance rated walls, partitions, floors, and ceiling-floor assemblies, including through-penetrations and construction joints and gaps.

a. Through-penetrations include the annular space around pipes, tubes, conduit, wires, cables and vents.

b. Construction joints include those used to accommodate expansion, contraction, wind, or seismic movement; firestopping material shall not interfere with the required movement of the joint.

c. Gaps requiring firestopping include gaps between the curtain wall and the floor slab and between the top of the fire-rated walls and the roof or floor deck above and at the intersection of shaft assemblies and adjoining fire resistance rated assemblies.

1.2 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM E119	(2020) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E1399/E1399M	(1997; R 2017) Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems
ASTM E1966	(2015) Fire-Resistive Joint Systems
ASTM E2174	(2014b) Standard Practice for On-Site Inspection of Installed Fire Stops
ASTM E2307	(2015a) Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus
ASTM E2393	(2010a) Standard Practice for On-Site Inspection of Installed Fire Resistive

	Joint Systems and Perimeter Fire Barriers
ASTM E699	(2009) Standard Practice for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating of Building Components
ASTM E814	(2013a; R 2017) Standard Test Method for Fire Tests of Penetration Firestop Systems
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials

FM GLOBAL (FM)

FM 4991	(2013) Approval of Firestop Contractors
FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

UNDERWRITERS LABORATORIES (UL)

UL 1479	(2015) Fire Tests of Through-Penetration Firestops
UL 2079	(2004; Reprint Dec 2014) Tests for Fire Resistance of Building Joint Systems
UL 723	(2018) UL Standard for Safety Test for Surface Burning Characteristics of Building Materials
UL Fire Resistance	(2014) Fire Resistance Directory

1.3 SEQUENCING

Coordinate the specified work with other trades. Apply firestopping materials, at penetrations of pipes and ducts, prior to insulating, unless insulation meets requirements specified for firestopping. Apply firestopping materials. at building joints and construction gaps, prior to completion of enclosing walls or assemblies. Cast-in-place firestop devices shall be located and installed in place before concrete placement. Pipe, conduit or cable bundles shall be installed through cast-in-place device after concrete placement but before area is concealed or made inaccessible. Firestop material shall be inspected and approved prior to final completion and enclosing of any assemblies that may conceal installed firestop.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Firestopping System; G, AE

SD-03 Product Data

Firestopping Materials; G, AE

SD-06 Test Reports

Inspection; G

SD-07 Certificates

Inspector Qualifications

Firestopping Materials

Installer Qualifications; G

Indoor Air Quality of Materials; S

1.4.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for firestopping, if available, that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen

Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

2. Low-Emitting Materials - Interior sealants applied on site:

a. Meet the VOC emissions evaluation and the VOC content evaluation. The sealants product category include all interior paints and coatings applied on site. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

1. For CDPH version compliance information, refer to LEED interpretation #ID 10495 “LEM for v4 projects”: https://www.usgbc.org/leedaddenda/10495

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.5 QUALITY ASSURANCE

1.5.1 Installer

Engage an experienced Installer who is:

a. FM Research approved in accordance with FM 4991, operating as a UL Certified Firestop Contractor, or

b. Certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary staff, training, and a minimum of 3 years experience in the installation of manufacturer's products in accordance with specified requirements. Submit documentation of this experience. A manufacturer's willingness to sell its firestopping products to the Contractor or to an installer engaged by the Contractor does not in itself confer installer qualifications on the buyer. The Installer shall have been trained by a direct representative of the manufacturer (not distributor or agent) in the proper selection and installation procedures. The installer shall obtain from the manufacturer and submit written certification of training, and retain proof of certification for duration of firestop installation.

1.5.2 Inspector Qualifications

The inspector shall meet the criteria contained in ASTM E699 for agencies involved in quality assurance and shall have a minimum of 2 years experience in construction field inspections of firestopping systems, products, and assemblies. The inspector shall be completely independent of, and divested from, the installer, the manufacturer, and the supplier of any material or item being inspected. The inspector shall not be a

competitor of the installer, the contractor, the manufacturer, or supplier of any material or item being inspected. Include in the qualifications submittal a notarized statement assuring compliance with the requirements stated herein.

1.6 DELIVERY, STORAGE, AND HANDLING

Deliver materials in the original unopened packages or containers showing name of the manufacturer and the brand name. Store materials off the ground, protected from damage and exposure to elements and temperatures in accordance with manufacturer requirements. Remove damaged or deteriorated materials from the site. Use materials within their indicated shelf life.

PART 2 PRODUCTS

2.1 FIRESTOPPING SYSTEM

Submit detail drawings including manufacturer's descriptive data, typical details conforming to UL Fire Resistance or other details certified by another nationally recognized testing laboratory, installation instructions or UL listing details for a firestopping assembly in lieu of fire-test data or report. For those firestop applications for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgment, derived from similar UL system designs or other tests, shall be submitted for review and approval prior to installation. Submittal must indicate the firestopping material to be provided for each type of application. When more than a total of 5 penetrations and/or construction joints are to receive firestopping, provide drawings that indicate location, "F" "T" and "L" ratings, and type of application.

Also, submit a written report indicating locations of and types of penetrations and types of firestopping used at each location; record type by UL list printed numbers.

Submit data for low-emitting materials.

2.2 FIRESTOPPING MATERIALS

a. Sealant shall have a VOC content of 250 g/L or less as calculated by EPA method 24.

b. Sealant shall comply with 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."

Provide firestopping materials, supplied from a single domestic manufacturer, consisting of commercially manufactured, asbestos-free, nontoxic products FM APP GUIDE approved, or UL listed, for use with applicable construction and penetrating items, complying with the following minimum requirements:

2.2.1 Fire Hazard Classification

Material shall have a flame spread of 25 or less, and a smoke developed rating of 50 or less, when tested in accordance with ASTM E84 or UL 723. Material shall be an approved firestopping material as listed in UL Fire Resistance or by a nationally recognized testing laboratory.

2.2.2 Toxicity

Material shall be nontoxic and carcinogen free to humans at all stages of application or during fire conditions and shall not contain hazardous chemicals or require harmful chemicals to clean material or equipment.

2.2.3 Fire Resistance Rating

Firestop systems shall be UL Fire Resistance listed or FM APP GUIDE approved with "F" rating at least equal to fire-rating of fire wall or floor in which penetrated openings are to be protected. Where required, firestop systems shall also have "T" rating at least equal to the fire-rated floor in which the openings are to be protected.

2.2.3.1 Through-Penetrations

Firestopping materials for through-penetrations, as described in paragraph SUMMARY, shall provide "F", "T" and "L" fire resistance ratings in accordance with ASTM E814 or UL 1479. Fire resistance ratings shall be as follows:

2.2.3.1.1 Penetrations of Fire Resistance Rated Walls and Partitions

F Rating = a minimum of the hour rating of wall or partition being penetrated.

2.2.3.1.2 Penetrations of Fire Resistance Rated Floors, Floor-Ceiling Assemblies and the Ceiling Membrane of Roof-Ceiling Assemblies

F Rating = 2 hour, T Rating = 2 hour. Where the penetrating item is outside of a wall cavity the F rating must be equal to the fire resistance rating of the floor penetrated, and the T rating shall be in accordance with the requirements of ICC IBC.

2.2.3.1.3 Penetrations of Fire and Smoke Resistance Rated Walls, Floors, Floor-Ceiling Assemblies, and the ceiling membrane of Roof-Ceiling Assemblies

F Rating = 2 hour, T Rating = 2 hour and L Rating = <5 cfm/sf Where L rating is required.

2.2.3.2 Construction Joints and Gaps

Fire resistance ratings of construction joints, as described in paragraph SUMMARY, and gaps such as those between floor slabs and curtain walls shall be the same as the construction in which they occur. Construction joints and gaps shall be provided with firestopping materials and systems that have been tested in accordance with ASTM E119, ASTM E1966 or UL 2079 to meet the required fire resistance rating. Curtain wall joints shall be provided with firestopping materials and systems that have been tested in accordance with ASTM E2307 to meet the required fire resistance rating. Systems installed at construction joints shall meet the cycling requirements of ASTM E1399/E1399M or UL 2079. All joints at the intersection of the top of a fire resistance rated wall and the underside of a fire-rated floor, floor ceiling, or roof ceiling assembly shall provide a minimum class II movement capability.

2.2.4 Material Certification

Submit certificates attesting that firestopping material complies with the

specified requirements. For all intumescent firestop materials used in through penetration systems, manufacturer shall provide certification of compliance with UL 1479. Provide validation of Indoor Air Quality of Materials.

PART 3 EXECUTION

3.1 PREPARATION

Areas to receive firestopping must be free of dirt, grease, oil, or loose materials which may affect the fitting or fire resistance of the firestopping system. For cast-in-place firestop devices, formwork or metal deck to receive device prior to concrete placement must be sound and capable of supporting device. Prepare surfaces as recommended by the manufacturer.

3.2 INSTALLATION

Completely fill void spaces with firestopping material regardless of geometric configuration, subject to tolerance established by the manufacturer. Firestopping systems for filling floor voids 4 inches or more in any direction must be capable of supporting the same load as the floor is designed to support or be protected by a permanent barrier to prevent loading or traffic in the firestopped area. Install firestopping in accordance with manufacturer's written instructions. Provide tested and listed firestop systems in the following locations, except in floor slabs on grade:

a. Penetrations of duct, conduit, tubing, cable and pipe through floors and through fire-resistance rated walls, partitions, and ceiling-floor assemblies.

b. Penetrations of vertical shafts such as pipe chases, elevator shafts, and utility chutes.

c. Gaps at the intersection of floor slabs and curtain walls, including inside of hollow curtain walls at the floor slab.

d. Gaps at perimeter of fire-resistance rated walls and partitions, such as between the top of the walls and the bottom of roof decks.

e. Construction joints in floors and fire rated walls and partitions.

f. Other locations where required to maintain fire resistance rating of the construction.

3.2.1 Insulated Pipes and Ducts

Thermal insulation shall be cut and removed where pipes or ducts pass through firestopping, unless insulation meets requirements specified for firestopping. Replace thermal insulation with a material having equal thermal insulating and firestopping characteristics.

3.2.2 Fire Dampers

Install and firestop fire dampers in accordance with Section 23 30 00 HVAC AIR DISTRIBUTION. Firestop installed with fire damper must be tested and approved for use in fire damper system. Firestop installed with fire damper must be tested and approved for use in fire damper system.

3.2.3 Data and Communication Cabling

Cabling for data and communication applications shall be sealed with re-enterable firestopping products.

3.2.3.1 Re-Enterable Devices

Firestopping devices shall be pre-manufactured modular devices, containing built-in self-sealing intumescent inserts. Firestopping devices shall allow for cable moves, additions or changes without the need to remove or replace any firestop materials. Devices must be capable of maintaining the fire resistance rating of the penetrated membrane at 0 percent to 100 percent visual fill of penetrants; while maintaining "L" rating of <10 cfm/sf measured at ambient temperature and 400 degrees F at 0 percent to 100 percent visual fill.

3.2.3.2 Re-Sealable Products

Provide firestopping pre-manufactured modular products, containing self-sealing intumescent inserts. Firestopping products shall allow for cable moves, additions or changes. Devices shall be capable of maintaining the fire resistance rating of the penetrated membrane at 0 percent to 100 percent visual fill of penetrants.

3.3 INSPECTION

For all projects, the firestopped areas shall not be covered or enclosed until inspection is complete and approved by the Contracting Officer. The inspector must inspect the applications initially to ensure adequate preparations (clean surfaces suitable for application, etc.) and periodically during the work to assure that the completed work has been accomplished according to the manufacturer's written instructions and the specified requirements. Submit written reports indicating locations of and types of penetrations and types of firestopping used at each location; type shall be recorded by UL listed printed numbers.

3.3.1 Inspection Standards

Inspect all firestopping in accordance with ASTM E2393 and ASTM E2174 for firestop inspection, and document inspection results to be submitted.

3.3.2 Inspection Reports

Submit inspection report stating that firestopping work has been inspected and found to be applied according to the manufacturer's recommendations and the specified requirements.

-- End of Section --

SECTION 07 92 00

JOINT SEALANTS
08/16

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM C509	(2006; R 2015) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM C734	(2015; R 2019) Low-Temperature Flexibility of Latex Sealants After Artificial Weathering
ASTM C919	(2012; R 2017) Standard Practice for Use of Sealants in Acoustical Applications
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C1193	(2013) Standard Guide for Use of Joint Sealants
ASTM C1311	(2014) Standard Specification for Solvent Release Agents
ASTM C1521	(2013) Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints
ASTM D217	(2019b) Standard Test Methods for Cone Penetration of Lubricating Grease
ASTM D1056	(2014) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D1667	(2017) Standard Specification for Flexible Cellular Materials - Poly (Vinyl Chloride) Foam (Closed-Cell)
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor

Sources using Environmental Chambers

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168 (2017) Adhesive and Sealant Applications

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide (2013) USGBC LEED Reference Guide for Building Design and Construction, v4

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Sealants; G, AE

Primers; G, AE

Bond Breakers; G, AE

Backstops; G, AE

Expansion Joints; G, AE

SD-06 Test Reports

Field Adhesion; G, AE

Preconstruction Compatibility Testing and Adhesion Testing; G, AE

SD-07 Certificates

Indoor Air Quality For Interior Sealants; S

Indoor Air Quality For Interior Floor Joint Sealants; S

Indoor Air Quality For Interior Acoustical Sealants; S

1.2.1 Sustainable Design Submittals

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for sealants, if available, that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product

labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

4. Low-Emitting Materials - Interior adhesives and sealants applied on site (including flooring adhesive):

a. Meet the VOC emissions evaluation and meet the VOC content evaluation. The adhesives and sealants product category include all interior adhesives and sealants applied on site. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.3 PRODUCT DATA

Include storage requirements, shelf life, curing time, instructions for mixing and application, and accessories. Provide manufacturer's Safety Data Sheets (SDS) for each solvent, primer and sealant material proposed.

1.4 CERTIFICATIONS

1.4.1 Indoor Air Quality Certifications

Submit required indoor air quality certifications in one submittal package.

1.4.1.1 Adhesives and Sealants

Provide products certified to meet indoor air quality requirements to provide certification by selected program that products meet the requirements of this Section. Provide current product certification

documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

1.5 ENVIRONMENTAL CONDITIONS

Apply sealant when the ambient temperature is between 40 and 90 degrees F.

1.6 DELIVERY AND STORAGE

Deliver materials to the jobsite in unopened manufacturers' sealed shipping containers, with brand name, date of manufacture, color, and material designation clearly marked thereon. Label elastomeric sealant containers to identify type, class, grade, and use. Handle and store materials in accordance with manufacturer's printed instructions. Prevent exposure to foreign materials or subjection to sustained temperatures exceeding 90 degrees F or lower than 0 degrees F. Keep materials and containers closed and separated from absorptive materials such as wood and insulation.

1.7 QUALITY ASSURANCE

1.7.1 Compatibility with Substrate

Verify that each sealant is compatible for use with each joint substrate in accordance with sealant manufacturer's printed recommendations for each application.

1.7.2 Joint Tolerance

Provide joint tolerances in accordance with manufacturer's printed instructions.

1.7.3 Mock-Up

Provide a mock-up of each type of sealant using materials, colors, and techniques approved for use on the project. Approved mock-ups may be incorporated into the Work.

1.7.4 Adhesion

Provide in accordance with ASTM C1193 or ASTM C1521.

1.7.5 Preconstruction Testing

Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

a. Adhesion Testing: Use ASTM C794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

b. Compatibility Testing: Use ASTM C1087 to determine sealant compatibility when in contact with glazing and gasket materials.

c. Stain Testing: Use ASTM C1248 to determine stain potential of sealant when in contact with terrazzo, stone, masonry, high pressure laminate, epoxy, solid surface, and tile substrates.

d. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.

e. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.

f. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.

g. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

a. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.

b. Conduct field tests for each kind of sealant and joint substrate.

c. Notify Architect seven days in advance of dates and times when test joints will be erected.

d. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

1) Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.

a) 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.

e. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.

f. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

PART 2 PRODUCTS

2.1 SEALANTS

Provide sealant products that have been tested, found suitable, and documented as such by the manufacturer for the particular substrates to which they will be applied.

In areas with ambient temperatures that exceed 110 degrees F, do not use

polybutene, bituminous, acrylic-latex, polyvinyl acetate latex sealants, polychloroprene (neoprene), polyvinyl chloride (PVC), and polyurethane foams, and neoprene, PVC, and styrene butadiene rubber extruded seals and closure strips due to these materials having maximum recommended surface temperature ranges from 130 to 180 degrees F.

2.1.1 Interior Sealants

Provide ASTM C920, Type S or M, Grade NS, Class 12.5, Use NT. Provide sealant products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for office space type) and VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for interior sealants. Location(s) and color(s) of sealant for the following. Note, color "as selected" refers to manufacturer's full range of color options

LOCATION	COLOR
a. Small voids between walls or partitions and adjacent lockers, casework, shelving, door frames, built-in or surface mounted equipment and fixtures, and similar items.	Match darker of adjacent surface colors
b. Perimeter of frames at doors, windows, and access panels which adjoin exposed interior concrete and masonry surfaces.	Match darker of adjacent surface colors
c. Joints of interior masonry walls and partitions which adjoin columns, pilasters, concrete walls, and exterior walls unless otherwise detailed.	Match darker of adjacent surface colors
d. Joints between edge members for acoustical tile and adjoining vertical surfaces.	Match darker of adjacent surface colors
e. Interior locations, not otherwise indicated or specified, where small voids exist between materials specified to be painted.	Match darker of adjacent surface colors
f. Joints between bathtubs and ceramic tile; joints between shower receptors and ceramic tile; joints formed where non-planar tile surfaces meet.	Match color of grout
g. Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occurring where substrates change.	Match color of grout
h. Behind escutcheon plates at valve pipe penetrations.	Match darker of adjacent surface colors

2.1.2 Exterior Sealants

For joints in vertical surfaces, provide ASTM C920, Type S or M, Grade NS, Class 25, Use NT. For joints in horizontal surfaces, provide ASTM C920, Type S or M, Grade P, Class 25, Use T. Provide location(s) and color(s) of sealant as follows. Note, color "as selected" refers to manufacturer's full range of color options:

LOCATION	COLOR
a. Joints and recesses formed where frames and subsills of windows, doors, louvers, and vents adjoin masonry, concrete, or metal frames. Use sealant at both exterior and interior surfaces of exterior wall penetrations.	Match darker of adjacent surface colors
b. Joints between new and existing exterior masonry walls.	Match darker of adjacent surface colors
c. Masonry joints where shelf angles occur.	Match adjacent surface colors
d. Joints in wash surfaces of stonework.	Match adjacent grout color
e. Expansion and control joints.	Match adjacent surface colors
f. Interior face of expansion joints in exterior concrete or masonry walls where metal expansion joint covers are not required.	Match darker of adjacent surface colors
g. Voids where items pass through exterior walls.	Match adjacent surface colors
h. Metal reglets, where flashing is inserted into masonry joints, and where flashing is penetrated by coping dowels.	Match adjacent grout color
i. Metal-to-metal joints where sealant is indicated or specified.	Match adjacent surface colors
j. Joints between ends of gravel stops, fascia, copings, and adjacent walls.	Match adjacent surface colors

2.1.3 Floor Joint Sealants

ASTM C920, Type S or M, Grade P, Class 25, Use T. Provide sealant products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of

CDPH SECTION 01350 (limit requirements for office space type) and VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for interior floor joint sealants. Provide location(s) and color(s) of sealant as follows. Note, color "as selected" refers to manufacturer's full range of color options:

LOCATION	COLOR
a. Seats of metal thresholds for exterior doors.	Gray
b. Control and expansion joints in floors, slabs, ceramic tile, and walkways.	Gray, Match adjacent grout color at tile color

2.1.4 Acoustical Sealants

Rubber or polymer based acoustical sealant in accordance with ASTM C919 to have a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84. Provide non-staining acoustical sealant with a consistency of 250 to 310 when tested in accordance with ASTM D217. Acoustical sealant must remain flexible and adhesive after 500 hours of accelerated weathering as specified in ASTM C734. Provide sealant products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for office space type) and VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for interior acoustical sealants.

2.1.5 Spray-Applied Smoke and Acoustical Seal

ASTM E90, Class 12.5, provide acrylic latex sealant for use in smoke rated partitions or joints and to prevent sound transmission through unprotected openings. Application temperature must be 40 degrees F to 104 degrees F. Not for use in fire-rated applications. Color: white.

2.1.6 Preformed Sealants

Provide preformed sealants of polybutylene or isoprene-butylene based pressure sensitive weather resistant tape or bead sealants capable of sealing out moisture, air and dust when installed as recommended by the manufacturer. At temperatures from minus 30 to plus 160 degrees F, sealants must be non-bleeding and have no loss of adhesion.

2.1.6.1 Foam Strip

Provide closed cell foam strip of polyurethane foam with cross section size required for snug fit in cavity see details. Provide foam strip capable of sealing out moisture, air, and dust when installed and compressed in accordance with manufacturer's printed instructions. Service temperature must be minus 40 to plus 275 degrees F. Furnish untreated strips with adhesive to hold them in place. Do not allow adhesive to stain or bleed onto adjacent finishes. Saturate treated strips with butylene waterproofing or impregnate with asphalt.

2.2 PRIMERS

Non-staining, quick drying type and consistency as recommended by the sealant manufacturer for the particular application. Provide primers for interior applications that meet the indoor air quality requirements of the paragraph SEALANTS above.

2.3 BOND BREAKERS

Type and consistency as recommended by the sealant manufacturer to prevent adhesion of the sealant to the backing or to the bottom of the joint. Provide bond breakers for interior applications that meet the indoor air quality requirements of the paragraph SEALANTS above.

2.4 BACKSTOPS

Provide neoprene, butyl, polyurethane, or polyethylene foams free from oil or other staining elements as recommended by sealant manufacturer. Provide 25 to 33 percent oversized backing for closed cell and 40 to 50 percent oversized backing for open cell material, unless otherwise indicated. Provide backstop material that is compatible with sealant. Do not use oakum or other types of absorptive materials as backstops.

2.4.1 Rubber (Interior Use Only)

Provide in accordance with ASTM D1056, Type 2, closed cell, Class A, round cross section cellular rubber sponge backing as required.

2.4.2 PVC (Interior Use Only)

Provide in accordance with ASTM D1667, Grade VO 12, open-cell foam, round cross section for polyvinyl chloride (PVC) backing.

2.4.3 Synthetic Rubber

Provide in accordance with ASTM C509, Option I , Type I preformed rods for synthetic rubber backing.

2.4.4 Neoprene

Provide in accordance with ASTM D1056, closed cell expanded neoprene cord Type 2, Class C, Grade 2C2 open cell neoprene sponge Type 1, Class C, Grade 1C3 for neoprene backing.

2.4.5 Butyl Rubber Based (Exterior Use Only)

Provide in accordance with ASTM C1311, from a single component, with solvent release. color as selected from manufacturer's full range of color choices.

2.4.6 Silicone Rubber Base (Interior Use Only)

Provide in accordance with ASTM C920, from a single component, with solvent release, non-sag, Type S, Grade NS/SL, Class 100/50. Color as selected from manufacturer's full range of color choices.

2.5 CLEANING SOLVENTS

Provide type(s) recommended by the sealant manufacturer and in accordance

with environmental requirements herein. Protect adjacent aluminum surfaces from solvents. Provide solvents for interior applications that meet the indoor air quality requirements of the paragraph SEALANTS above.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

Perform a field adhesion test in accordance with manufacturer's instructions and ASTM C1193, Method A or ASTM C1521, Method A, Tail Procedure. Remove sealants that fail adhesion testing; clean substrates, reapply sealants, and re-test. Test sealants adjacent to failed sealants. Submit field adhesion test report indicating tests, locations, dates, results, and remedial actions taken.

3.2 SURFACE PREPARATION

Prepare surfaces according to manufacturer's printed installation instructions. Clean surfaces from dirt, frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter that would destroy or impair adhesion. Remove oil and grease with solvent; thoroughly remove solvents prior to sealant installation. Wipe surfaces dry with clean cloths. When resealing an existing joint, remove existing caulk or sealant prior to applying new sealant. For surface types not listed below, provide in accordance with sealant manufacturer's printed instructions for each specific surface.

3.2.1 Steel Surfaces

Remove loose mill scale by sandblasting or, if sandblasting is impractical or would damage finished work, scraping and wire brushing. Remove protective coatings by sandblasting or using a residue free solvent. Remove resulting debris and solvent residue prior to sealant installation.

3.2.2 Aluminum Surfaces

Remove temporary protective coatings from surfaces that will be in contact with sealant. When masking tape is used as a protective coating, remove tape and any residual adhesive prior to sealant application. For removing protective coatings and final cleaning, use non-staining solvents recommended by the manufacturer of the item(s) containing aluminum or bronze surfaces.

3.2.3 Concrete and Masonry Surfaces

Where surfaces have been treated with curing compounds, oil, or other such materials, remove materials by sandblasting or wire brushing. Remove laitance, efflorescence and loose mortar from the joint cavity. Remove resulting debris prior to sealant installation.

3.2.4 Wood Surfaces

Ensure wood surfaces that will be in contact with sealants are free of splinters, sawdust and other loose particles.

3.3 SEALANT PREPARATION

Do not add liquids, solvents, or powders to sealants. Mix multicomponent elastomeric sealants in accordance with manufacturer's printed

instructions.

3.4 APPLICATION

3.4.1 Joint Width-To-Depth Ratios

Acceptable Ratios:

JOINT WIDTH	JOINT DEPTH	
	Minimum	Maximum
For metal, glass, or other nonporous surfaces:		
1/4 inch (minimum)	1/4 inch	1/4 inch
over 1/4 inch	1/2 of width	Equal to width
For wood, concrete, masonry, or stone:		
1/4 inch (minimum)	1/4 inch	1/4 inch
over 1/4 inch to 1/2 inch	1/4 inch	Equal to width
over 1/2 inch to 1 inch	1/2 inch	5/8 inch
Over 1 inch	prohibited	

Unacceptable Ratios: Where joints of acceptable width-to-depth ratios have not been provided, clean out joints to acceptable depths and grind or cut to acceptable widths without damage to the adjoining work. Grinding is prohibited at metal surfaces.

3.4.2 Unacceptable Sealant Use

Do not install sealants in lieu of other required building enclosure weatherproofing components such as flashing, drainage components, and joint closure accessories, or to close gaps between walls, floors, roofs, windows, and doors, that exceed acceptable installation tolerances. Remove sealants that have been used in an unacceptable manner and correct building enclosure deficiencies to comply with contract documents requirements.

3.4.3 Masking Tape

Place masking tape on the finished surface on one or both sides of joint cavities to protect adjacent finished surfaces from primer or sealant smears. Remove masking tape within 10 minutes of joint filling and tooling.

3.4.4 Backstops

Provide backstops dry and free of tears or holes. Tightly pack the back or bottom of joint cavities with backstop material to provide joints in specified depths. Provide backstops where indicated and where backstops are not indicated but joint cavities exceed the acceptable maximum depths specified in JOINT WIDTH-TO-DEPTH RATIOS Table.

3.4.5 Primer

Clean out loose particles from joints immediately prior to application of. Apply primer to joints in concrete masonry units, wood, and other porous surfaces in accordance with sealant manufacturer's printed instructions. Do not apply primer to exposed finished surfaces.

3.4.6 Bond Breaker

Provide bond breakers to surfaces not intended to bond in accordance with, sealant manufacturer's printed instructions for each type of surface and sealant combination specified.

3.4.7 Sealants

Provide sealants compatible with the material(s) to which they are applied. Do not use a sealant that has exceeded its shelf life or has jelled and cannot be discharged in a continuous flow from the sealant gun. Apply sealants in accordance with the manufacturer's printed instructions with a gun having a nozzle that fits the joint width. Work sealant into joints so as to fill the joints solidly without air pockets. Tool sealant after application to ensure adhesion. Apply sealant uniformly smooth and free of wrinkles. Upon completion of sealant application, roughen partially filled or unfilled joints, apply additional sealant, and tool smooth as specified. Apply sealer over sealants in accordance with the sealant manufacturer's printed instructions.

3.5 PROTECTION AND CLEANING

3.5.1 Protection

Protect areas adjacent to joints from sealant smears. Masking tape may be used for this purpose if removed 5 to 10 minutes after the joint is filled and no residual tape marks remain.

3.5.2 Final Cleaning

Upon completion of sealant application, remove remaining smears and stains and leave the work in a clean and neat condition.

a. Masonry and Other Porous Surfaces: Immediately remove fresh sealant that has been smeared on adjacent masonry, rub clean with a solvent, and remove solvent residue, in accordance with sealant manufacturer's printed instructions. Allow excess sealant to cure for 24 hour then remove by wire brushing or sanding. Remove resulting debris.

b. Metal and Other Non-Porous Surfaces: Remove excess sealant with a solvent moistened cloth. Remove solvent residue in accordance with solvent manufacturer's printed instructions.

-- End of Section --

SECTION 08 01 52

OPERATION AND MAINTENANCE OF WOOD DOORS
08/09

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM C1184	(2014) Standard Specification for Structural Silicone Sealants

CALIFORNIA AIR RESOURCES BOARD (CARB)

CARB Regulation	Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products

GREEN SEAL (GS)

GS-11	Paints, Coatings, Stains, and Sealers

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1113	(2016) Architectural Coatings
SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

1.2 SYSTEM DESCRIPTION

Repair wood windows as indicated, and return them to proper operation and sound condition.

1.3 SUSTAINABILITY REPORTING

Materials in this technical specification may contribute towards contract compliance with sustainability requirements. See Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING for project LEED BDC Ref Guide low-emitting materials, and LEED documentation requirements.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a designation following the "G" classification identifies the office that will review the submittal for

the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings; G

SD-03 Product Data

Hardware; G
Weatherstripping; G
Qualifications; G

SD-04 Samples

Moldings

SD-07 Certificates

Indoor Air Quality For Field-Applied Paints And Coatings; S

Indoor Air Quality for Field-applied Adhesives and Sealants; S

SD-11 Closeout Submittals

LEED Documentation

1.5 QUALITY ASSURANCE

a. Provide qualified workers trained and experienced in repairing, restoring, replicating, and replacing windows in historic buildings; submit documentation of their Qualifications during 5 consecutive years of work of this type; and a list of installations made identifying when, where and for whom the installations were made.

b. Submit Shop Drawings indicating elevations of units, full-size sections, fastenings, methods of installation and anchorage, method of glazing, locations of operating hardware, mullion details, method and material for weatherstripping, insect screen, details, connections with other work and window schedules showing location of each window unit.

1.6 DELIVERY, STORAGE, AND HANDLING

Materials shall be stored out of contact with the ground and under weathertight covering.

1.7 Indoor Air Quality Certifications

Submit required indoor air quality certifications in one submittal package.

Provide adhesive and sealant applied within the building waterproofing envelope certified to meet California Department of Public Health (CDPH) Standard Method and VOC content requirements of SCAQMD Rule 1168. Submit product data for Indoor Air Quality for Field-Applied Adhesives and Sealants.

Provide paint and coating applied within the building waterproofing envelope certified to meet California Department of Public Health (CDPH) Standard Method and VOC content requirements of Green Seal GS-11, California Air Resources Board CARB Regulation Suggested Control Measure for Architectural Coatings, or SCAQMD Rule 1113. Provide certification of Indoor Air Quality for Field-Applied Paints and Coatings.

PART 2 PRODUCTS

2.1 MATERIALS

Reuse existing materials whenever possible in the repair and rehabilitation of historic wood windows. This includes all wood elements, hardware and glazing that are determined to be of historic significance. Replace window elements with new material only when originals are so deteriorated as to prohibit their useful function.

2.2 WOOD

Wood used to replace deteriorated window members shall be of the same species and grade as the original, unless otherwise noted. Finger-jointed stock may be used for interior casing and trim only where scheduled to be painted.

2.3 GLASS AND GLAZING

Reuse existing intact original glass. Any removed lights shall be reused in their original frames and positions. New glass and glazing materials shall conform to Section 08 81 00 GLAZING.

2.4 HARDWARE

Reuse existing original hardware, when it is salvageable. Replacement hardware shall match original in design, material, and finish. Submit Manufacturer's installation instructions for each type of hardware and weatherstripping; see paragraph WEATHERSTRIPPING in PART 3. Submit representative sample of each type of hardware with identifying tags.

2.5 FASTENERS

Fasteners shall be stainless steel, galvanized, or non-ferrous metal.

2.6 GLAZING COMPOUND

Provide glazing compound for single pane glass which is oil-based, non-staining and non-bleeding. Existing insulated glass units shall be reglazed with silicone sealant complying with ASTM C1184 and compatible with the unit seal on the glass unit.

2.7 GLAZING POINTS

Glazing points shall be stainless steel or galvanized steel.

2.8 EPOXY CONSOLIDANTS

2.8.1 Liquid Consolidant

Liquid wood consolidant shall consist of a two-part, low-viscosity liquid epoxy that meets the criteria of Table A.

2.8.2 Epoxy Paste

Epoxy paste shall consist of a two-part, thixotropic paste that meets the criteria of Table A.

TABLE A

	LIQUID CONSOLIDANT	EPOXY PASTE
Properties	Low-Viscosity Liquid	No-Slump, Thixotropic Paste
Toxicity	Low	Very Low
Toxicity Cured	Non-Toxic	Non-Toxic
Ratios	1:1 by Volume	1:1 by Volume
Pot Life @ Room Temp.	30 minutes minimum	50 minutes minimum
Hardening @ Room Temp.	1 hr. or longer	1 hr. or longer
Hardening @ 140 deg. F	16 min. or less	18 min. or less
Viscosity Poises @72 deg F	4.7 max.	Thixotropic paste
Solids	95% minimum	98% minimum
Tensile Strength	4000 psi	2500 psi
Elongation (percent)	50	4

PART 3 EXECUTION

3.1 EVALUATION

Perform a complete evaluation survey of the existing conditions of each wood window to determine the extent of repairs necessary. The evaluation survey may be in the form of a schedule and shall note at a minimum:

a. Window location.

b. Condition of the paint.

c. Condition of the frame and sill.

d. Condition of the interior and exterior trim.

e. Condition of the sash (including rails, stiles, and muntins).

f. Glazing problems.

g. Window hardware and operating system.

h. The overall condition of the window.

3.2 REPAIRS

3.2.1 Example Window

Prepare an existing window of each type to serve as an example of the quality of repairs to be provided for inspection and approval by the Contracting Officer.

3.2.2 Sash Removal

Remove the interior stops first, in a method so as to not scar the wood. Connecting hardware and operating mechanisms shall then be detached and the sash shall be removed from the frame. Identify removed sashes and frames as to location to assure reinstallation in their original positions. Windows with counter-weight systems shall have the sash cords detached from the sides of the sash and their ends pinned with a nail or tied in a knot to prevent them from falling into the weight pocket; the lower sash can then be removed. Remove the parting bead so as to not scar the wood. Install plastic covering or plywood to cover the window opening during repairs.

3.2.3 Paint Removal

Areas on frame, sill, sash and muntins where paint or varnish has peeled, alligatored, blistered or crazed shall have paint removed to bare wood or first sound paint layer, using non-destructive means such as a chemical stripper or heat gun. If chemical strippers are used, neutralize wood after stripping to a litmus pH of 5 to 8.5. Allow wood to dry to a moisture content of 8 to 12 percent before repainting. If heat methods are used for paint removal, protect glass from sudden temperature change to avoid breakage.

3.2.4 Wood Repair

Remove badly decayed areas (with more than 30 percent wood decayed) from wood sash, sill, frame, and trim assemblies. Moderately decayed areas (less than 30 percent decayed), weathered, or gouged wood shall be patched with approved patching compounds, and shall be sanded smooth. Intact sash rails and stiles that are loose shall be repaired with new dowels to make joints tight.

3.2.5 Epoxy Wood Repair

Apply epoxy wood repair materials in accordance with manufacturer's written instructions. Health and safety instructions shall be followed in accordance with the manufacturer's instructions. The source or cause of wood decay shall be identified and corrected prior to application of patching materials. Wet wood shall be completely dried to a moisture content of 8 to 12 percent to its full depth before patching. Wood that is to be patched shall be clean of dust, grease, and loose paint. Use clean mixing equipment to avoid contamination. Mix and proportions shall be as directed by the manufacturer. Batches shall be only large enough to complete the specific job intended. Patching materials shall be completely cured before painting or reinstallation of patched pieces.

3.2.5.1 Epoxy Liquid Wood Consolidant

Epoxy liquid wood consolidant shall be used to penetrate and impregnate

deteriorated wood sections to reinforce wood fibers that have become softened or absorbent.

3.2.5.2 Epoxy Paste

Use epoxy paste to fill areas where portions of wood are missing such as holes, cracks, gaps, gouges, and other voids. Areas to receive epoxy paste patching material shall be primed with compatible epoxy liquid wood consolidant or a primer recommended by the manufacturer.

3.2.6 Wood Replacement

Replace pieces decayed beyond repair with new pieces that match originals in all respects. Joinery shall match that of existing. Muntins shall have coped mortise and tenon joints. Molded members shall have mitered or coped joints.

3.2.7 Hardware

Reuse existing hardware, which is in good condition, unless otherwise noted. Reused existing hardware shall be stripped of paint down to bare metal. Install new hardware where original is missing, damaged, or unsuitable for new operation, in accordance with manufacturer's directions to provide a secure and smoothly operating window assembly.

3.2.8 Glazing

Reinstall lights to be reused in their original frames and positions. Rabbeted integral glazing recesses shall be brushed with boiled linseed oil prior to the application of bed glazing compound. Replace broken glass as specified in Section 08 81 00 GLAZING.

3.2.9 Operating System

Repair windows with counter-weight systems to original operating function. Reuse original sash weights (and sash chains, if applicable) wherever possible. Missing weights and sash cords or chains shall be replaced. Missing or deteriorated sash cords shall be replaced with new cotton-polypropylene cord rated for sash weight. When new weights are required, they shall match the originals in weight. Replacement weights shall be cast iron or square milled steel bar stock.

3.2.10 Weatherstripping and Moldings

Install Weatherstripping on all operable windows. Weatherstripping shall consist of brass, compression or interlocking weather strips designed for permanent sealing under bumper or wiper action. Weatherstripping shall be provided at the perimeter of each sash including meeting rails and shall be installed in accordance with manufacturer's instructions. Submit a 12 inch long sample of each type of weatherstripping required with fasteners. Weatherstripping shall be completely concealed when sash is closed. Install moldings in accordance with manufacturer's instructions. Submit a 12 inch long piece of each molding type required for each window and casing with specified finish.

3.3 PAINTING PREPARATION

Areas where paint was removed or where existing paint shows crazing, wrinkling, and intercoat peeling shall be scraped, sanded, and shall have

edges feathered. Remove paint to bare wood or first sound paint layer. All parts shall be cleaned by brush using bleach and/or trisodium phosphate (TSP) solution, and let dry. Existing finish shall be deglossed. Open joints and cracks shall be filled with epoxy repair materials. Perimeter of fixed sash shall be caulked.

3.4 PAINTING

Wood elements shall be primed and painted in accordance with Section 09 90 00 PAINTS AND COATINGS.

3.5 REASSEMBLY

After repairs are completed, reassemble the window with all parts tight, true and functioning properly. Wood surfaces shall be free of blemishes.

3.6 ADJUSTMENTS

Make final adjustment, for proper operation of ventilating unit, after reassembly. Make adjustments to operating sash or ventilators to assure smooth operation and weathertight performance when locked closed.

3.7 CLEANING

Clean windows on both exterior and interior sides.

-- End of Section --

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SECTION 08 11 13

STEEL DOORS AND FRAMES
08/20

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2020) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A653/A653M	(2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A879/A879M	(2012; R 2017) Standard Specification for Steel Sheet, zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface
ASTM A924/A924M	(2020) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM C578	(2019) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C591	(2020) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C612	(2014; R 2019) Standard Specification for Mineral Fiber Block and Board Thermal Insulation
ASTM D2863	(2019) Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
ASTM E1300	(2016) Standard Practice for Determining Load Resistance of Glass in Buildings
ASTM F2248	(2012) Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.115	(2016) Hardware Preparation in Steel Doors and Steel Frames

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80	(2019) Standard for Fire Doors and Other Opening Protectives
NFPA 105	(2019) Standard for Smoke Door Assemblies and Other Opening Protectives
NFPA 252	(2017) Standard Methods of Fire Tests of Door Assemblies
NFPA 257	(2012; ERTA 2017) Standard on Fire Test for Window and Glass Block Assemblies

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR 111	(2009) Recommended Details for Standard Steel Doors, Frames, and Accessories and Related Components
SDI/DOOR 113	(2013; R2018) Standard Practice for Determining the Steady-State Thermal Transmittance of Steel Door and Frame Assemblies
SDI/DOOR A250.4	(2018) Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors
SDI/DOOR A250.6	(2015) Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames
SDI/DOOR A250.8	(2017) Specifications for Standard Steel Doors and Frames
SDI/DOOR A250.11	(2012) Recommended Erection Instructions for Steel Frames

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

UNDERWRITERS LABORATORIES (UL)

UL 10C	(2016) UL Standard for Safety Positive

Pressure Fire Tests of Door Assemblies

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Doors; G

Include elevations of each door design and details of doors, including vertical and horizontal edge details and metal thicknesses.

Frames; G

Include details for each frame type, including dimensioned profiles and metal thicknesses. Locations of reinforcement and preparations for hardware.

Accessories

Include details of anchorages, joints, field splices, connections, moldings, removable stops, glazing, and conduit and preparations for power, signal, and control systems.

Schedule of Doors; G

Schedule of Frames; G

SD-03 Product Data

Doors; G

Recycled Content for Steel Door Product; S

Frames; G

Recycled Content for Steel Frame Product; S

Accessories

SD-04 Samples

Where colors are not indicated, submit manufacturer's standard colors and patterns for selection.

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment; refer to Division 01 33

29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports, if available, for manufacturers that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may

withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

4. Low-Emitting Materials - Wall panels: (doors and frames)

a. Meet the VOC emissions evaluation, or inherently nonemitting sources criteria, or salvaged and reused materials criteria. The wall panels product category includes all finish wall treatments (wall coverings, wall paneling, wall tile), surface wall structures such as gypsum or plaster, cubicle/curtain/partition walls, trim, doors, frames, windows, and window treatments. Removable/interchangeable fabric panels, built-in cabinetry, and vertical structural elements are excluded. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full emissions requirements.

b. Product is considered an inherently non-emitting source of VOCs if it is powder-coated metals, plated or anodized metal.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors, frames, and accessories undamaged and with protective wrappings, packaging, or crated. Do not use non-vented plastic. Provide temporary steel spreaders securely fastened to the bottom of each welded frame, tack welded to jambs and mullions. Store doors and frames on platforms under cover in clean, dry, ventilated, and accessible locations, with 1/4 inch airspace between doors. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity. Remove damp or wet packaging immediately and wipe affected surfaces dry. Replace damaged materials with new.

1.4 COORDINATION

Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Schedule delivery of these items to site in time for installation.

1.5 WARRANTY

Provide manufacturer's standard warranty to repair or replace doors that fail in materials or workmanship within specified warranty period. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 PRODUCTS

2.1 STANDARD STEEL DOORS

SDI/DOOR A250.8, except as specified otherwise. Prepare doors to receive door hardware as specified in Section 08 71 00 DOOR HARDWARE. Undercut where indicated. Provide exterior doors with top edge closed flush and sealed to prevent water intrusion. Provide doors at 1-3/4 inch thick, unless otherwise indicated. Provide door material that uses a minimum of 25 percent recycled content. Provide data indicating percentage of recycled content for steel door product. Provide exterior glazing in accordance with ASTM F2248 and ASTM E1300.

Building Product Declarations: Provide doors with EPD and Material Ingredient Report, if available.

Provide doors installed within the building interior with VOC emissions certified in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method.

2.1.1 Classification - Level, Performance, Model

2.1.1.1 Standard Duty Doors

SDI/DOOR A250.8, Level 1, physical performance Level C, Model 2, of size(s) and design(s) indicated and core construction as required by the manufacturer.

2.1.1.2 Maximum Duty Doors

SDI/DOOR A250.8, Level 4, physical performance Level A, Model 2 with core construction as required by the manufacturer for interior doors and for indicated exterior doors, of size(s) and design(s) indicated. Where vertical stiffener cores are required, the space between the stiffeners must be filled with board insulation. Provide Level 4 where indicated.

2.2 INSULATED STEEL DOOR SYSTEMS

Provide insulated steel doors and frames in accordance with SDI/DOOR 113 at entrances to dwelling units and where indicated. Meet energy requirements including Solar Heat Gain Coefficient (SHGC) and U-factor. Provide insulated steel doors with a core of polyurethane foam; face sheets, edges, and frames of galvanized steel not lighter than 23 gage, 16 gage, and 16 gage respectively; magnetic weatherstripping; nonremovable-pin hinges; thermal-break aluminum threshold; and vinyl door bottom. Provide to doors and frames a phosphate treatment, rust-inhibitive primer, and baked acrylic enamel finish. Test doors in accordance with SDI/DOOR A250.4 and meet the requirements for Level C. Prepare doors to receive specified hardware. Provide doors 1-3/4 inch thick.

2.3 ACCESSORIES

2.3.1 Astragals

For pairs of exterior steel doors which will not have aluminum astragals or removable mullions, as specified in Section 08 71 00 DOOR HARDWARE provide overlapping steel astragals with the doors.

2.3.2 Moldings

Provide moldings around glass of interior and exterior doors and louvers of interior doors. Provide nonremovable moldings on outside of exterior doors and on corridor side of interior doors. Other moldings may be stationary or removable. Secure inside moldings to stationary moldings, or provide snap-on moldings.

2.4 INSULATION CORES

Provide insulating cores at all exterior doors and other specific doors noted in the door schedule, and provide an apparent U-factor of.48 in accordance with SDI/DOOR 113 and conforming to:

a. Rigid Cellular Polyisocyanurate Foam: ASTM C591, Type I or II, foamed-in-place or in board form, with oxygen index of not less than 22 percent when tested in accordance with ASTM D2863; or

b. Rigid Polystyrene Foam Board: ASTM C578, Type I or II; or

c. Mineral board: ASTM C612, Type I.

2.5 STANDARD STEEL FRAMES

SDI/DOOR A250.8, Level 2 or 3, except as otherwise specified. Form frames to sizes and shapes indicated, with welded corners. Provide steel frames for doors, transoms, sidelights, mullions, cased openings, and interior glazed panels, unless otherwise indicated. Provide frame product that uses a minimum of 25 percent recycled content. Provide data indicating percentage of recycled content for steel frame product.

Building Product Declarations: Provide frames with EPD and Material Ingredient Report, if available.

Provide frames installed within the building interior with VOC emissions certified in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method.

2.5.1 Welded Frames

Continuously weld frame faces at corner joints. Mechanically interlock or continuously weld stops and rabbets. Grind welds smooth.

Weld frames in accordance with the recommended practice of the Structural Welding Code Sections 1 through 6, AWS D1.1/D1.1M and in accordance with the practice specified by the producer of the metal being welded.

2.5.2 Mullions and Transom Bars

Provide mullions and transom bars of closed or tubular construction with heads and jambs butt-welded together. Bottom of door mullions must have

adjustable floor anchors and spreader connections.

2.5.3 Stops and Beads

Provide form and loose stops and beads from 20 gage steel. Provide for glazed and other openings in standard steel frames. Secure beads to frames with oval-head, countersunk Phillips self-tapping sheet metal screws or concealed clips and fasteners. Space fasteners approximately 12 to 16 inch on center. Miter molded shapes at corners. Butt or miter square or rectangular beads at corners.

2.5.4 Cased Openings

Fabricate frames for cased openings of same material, gage, and assembly as specified for metal door frames, except omit door stops and preparation for hardware.

2.5.5 Anchors

Provide anchors in accordance with ASTM A653/A653M to secure the frame to adjoining construction. Provide steel anchors, zinc-coated not lighter than 18 gage.

2.5.5.1 Wall Anchors

Provide at least three anchors for each jamb. For frames which are more than 7.5 feet in height, provide one additional anchor for each jamb for each additional 2.5 feet or fraction thereof.

a. Masonry: Provide anchors of corrugated or perforated steel straps or 3/16 inch diameter steel wire, adjustable or T-shaped;

b. Stud partitions: Weld or otherwise securely fasten anchors to backs of frames. Design anchors to be fastened to closed steel studs with sheet metal screws, and to open steel studs by wiring or welding;

c. Completed openings: Secure frames to previously placed concrete or masonry with expansion bolts in accordance with SDI/DOOR 111; and

d. Solid plaster partitions: Secure anchors solidly to back of frames and tie into the lath. Provide adjustable top strut anchors on each side of frame for fastening to structural members or ceiling construction above. Provide size and type of strut anchors as recommended by the frame manufacturer.

2.5.5.2 Floor Anchors

Provide floor anchors drilled for 3/8 inch anchor bolts at bottom of each jamb member. Where floor fill occurs, terminate bottom of frames at the indicated finished floor levels and support by adjustable extension clips resting on and anchored to the structural slabs.

2.6 FIRE DOORS AND FRAMES

Provide fire doors and frames in accordance with NFPA 80 and NFPA 105 and this specification. Include insulated core materials in fire doors where indicated in the door schedule.

2.6.1 Labels

Provide fire doors and frames bearing the label of Underwriters Laboratories (UL), Factory Mutual Engineering and Research (FM), or Warnock Hersey International (WHI) attesting to the rating required. Testing must be in accordance with NFPA 252 or UL 10C. Provide labels that are metal with raised letters, bearing the name or file number of the door and frame manufacturer. Labels must be permanently affixed at the factory to frames and to the hinge edge of the door. Do not paint door and labels.

2.6.2 Oversized Doors

For fire doors and frames which exceed the size for which testing and labeling are available, furnish certificates stating that the doors and frames are identical in design, materials, and construction to a door which has been tested and meets the requirements for the class indicated.

2.6.3 Temperature-Rise Limit

Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

2.6.4 Fire-Rated, Borrowed-Light Frame Assemblies

Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

2.6.5 Pre-Submittal Conference

Conduct conference to include representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

2.6.6 Astragal on Fire Doors

On pairs of labeled fire doors, conform to NFPA 80 and UL requirements.

2.7 EXTERIOR FRAMES

Provide thermal insulation in all exterior frames. Provide frames of a minimum Level 4, with frames of a minimum thickness of 0.067 inch, 14 gage.

2.8 HARDWARE PREPARATION

Drill and tap doors and frames to receive finish hardware. Prepare doors and frames for hardware in accordance with the applicable requirements of SDI/DOOR A250.8 and SDI/DOOR A250.6. For additional requirements refer to ANSI/BHMA A156.115. Drill and tap for surface-applied hardware at the project site. Build additional reinforcing for surface-applied hardware into the door at the factory. Punch door frames, with the exception of frames that will have weatherstripping or lightproof gasketing, to receive a minimum of two rubber or vinyl door silencers on lock side of single

doors and one silencer for each leaf at heads of double doors. Set lock strikes out to provide clearance for silencers.

2.9 FINISHES

2.9.1 Factory-Primed Finish

Thoroughly clean all surfaces of doors and frames then chemically treat and factory prime with a rust inhibiting coating as specified in SDI/DOOR A250.8., or paintable A25 galvannealed steel without primer. Where coating is removed by welding, apply touchup of factory primer.

2.9.2 Hot-Dip Zinc-Coated and Factory-Primed Finish

Fabricate exterior and interior scheduled doors and frames from hot dipped zinc coated steel, alloyed type, that complies with ASTM A924/A924M and ASTM A653/A653M. The coating weight must meet or exceed the minimum requirements for coatings having 0.4 ounces per square foot, total both sides, i.e., A40. Repair damaged zinc-coated surfaces by the application of zinc dust paint. Thoroughly clean and chemically treat to insure maximum paint adhesion. Factory prime as specified in SDI/DOOR A250.8.

2.9.3 Electrolytic Zinc-Coated Anchors and Accessories

Provide electrolytically deposited zinc-coated steel in accordance with ASTM A879/A879M, Commercial Quality, Coating Class A. Phosphate treat and factory prime zinc-coated surfaces as specified in SDI/DOOR A250.8.

2.10 FABRICATION AND WORKMANSHIP

Provide finished doors and frames that are strong and rigid, neat in appearance, and free from defects, waves, scratches, cuts, dents, ridges, holes, warp, and buckle. Provide molded members that are clean cut, straight, and true, with joints coped or mitered, well formed, and in true alignment. Dress exposed welded and soldered joints smooth. Design door frame sections for use with the wall construction indicated. Corner joints must be well formed and in true alignment. Conceal fastenings where practicable. On wraparound frames for masonry partitions, provide a throat opening 1/8 inch larger than the actual masonry thickness. Design frames in exposed masonry walls or partitions to allow sufficient space between the inside back of trim and masonry to receive caulking compound.

2.11 PROVISIONS FOR GLAZING

Materials are specified in Section 08 81 00, GLAZING.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Frames

Set frames in accordance with SDI/DOOR A250.11. Plumb, align, and brace securely until permanent anchors are set. Anchor bottoms of frames with expansion bolts or powder-actuated fasteners. Build in or secure wall anchors to adjoining construction. Where frames require ceiling struts or overhead bracing, anchor frames to the struts or bracing.

3.1.2 Doors

Hang doors in accordance with clearances specified in SDI/DOOR A250.8. After erection and glazing, clean and adjust hardware.

3.1.3 Fire Doors and Frames

Install fire doors and frames, including hardware, in accordance with NFPA 80. Install fire rated smoke doors and frames in accordance with NFPA 80.

3.2 PROTECTION

Protect doors and frames from damage. Repair damaged doors and frames prior to completion and acceptance of the project or replace with new, as directed. Wire brush rusted frames until rust is removed. Clean thoroughly. Apply an all-over coat of rust-inhibitive paint of the same type used for shop coat.

3.3 CLEANING

Immediately after erection, clean exposed surfaces of doors and frames thoroughly, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint. Remove mastic smears and other unsightly marks.

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SECTION 08 11 16

ALUMINUM DOORS AND FRAMES
05/17

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 90.1 - IP	(2013) Energy Standard for Buildings Except Low-Rise Residential Buildings

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B209M	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B221M	(2013) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
ASTM E283	(2019) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E331	(2000; R 2016) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

NFRC 100	(2017) Procedure for Determining Fenestration Product U-Factors
NFRC 200	(2017) Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

1.2 PERFORMANCE REQUIREMENTS

1.2.1 Structural Calculations

Design for conventional loading in accordance with code requirements.

1.2.2 Air Infiltration

When tested in accordance with ASTM E283, air infiltration per door leaf cannot exceed 0.6 cubic feet per minute per square foot of fixed area at a test pressure of 6.24 pounds per square foot.

1.2.3 Water Penetration

When tested in accordance with ASTM E331, there can be no water penetration at a pressure of 2.86 pounds per square foot of fixed area.

1.2.4 Thermal Transmittance, Solar Heat Gain, Visible Light Transmittance

Provide products bearing NFRC Project Label Certificates for Fenestration verifying compliance with requirements for each assembly indicated. An NFRC Bid Report, or approved equal, for field assembled exterior doors may be submitted in lieu of Project Label Certificates for Fenestration if such reports are created in accordance with NFRC CAMP procedures and are provided by the manufacturer. Such alternate reports may be submitted with shop drawings, however, NFRC validated Project Label Certificates for Fenestration are required as a Closeout Submittal. Contact NFRC for information on NFRC 100 and NFRC 200 Compliance and Monitoring Program (CAMP) rating requirements: http://www.nfrc.org/industry/certification/compliance-and-monitoring-program-camp/

1.2.4.1 U-Factor

Provide exterior glazed assemblies, including aluminum entrances doors with greater than 50 percent glazed area, certified by the NFRC as having a whole window U-factor of 0.42 or less as determined in accordance with ASHRAE 90.1 - IP and as verified in accordance with NFRC 100.

1.2.4.2 Solar Heat Gain Coefficient (SHGC)

Provide exterior glazed assemblies, including aluminum entrances doors with greater than 50 percent glazed area, certified by the National Fenestration Rating Council with a whole window SHGC of 0.40 or less as determined in accordance with ASHRAE 90.1 - IP and as verified in accordance with NFRC 200.

1.2.4.3 Visible Light Transmittance (VLT)

Provide exterior glazed assemblies, including aluminum entrances doors with greater than 50 percent glazed area, certified by the NFRC with a

whole window VLT of 1.10 or greater as determined in accordance with ASHRAE 90.1 - IP and as verified in accordance with NFRC 200.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

For Each Type of Door and Frame Assembly; G

SD-03 Product Data

For Each Type of Door and Frame Assembly; G

Recycled Content of Aluminum Material; S

SD-04 Samples

Finish Samples; G

SD-05 Design Data

Structural Calculations; G

SD-06 Test Reports

Air Infiltration; G

Water Penetration; G

SD-08 Manufacturer's Instructions

Installation of Each Type of Door and Frame Assembly; G

SD-10 Operation and Maintenance Data

Adjustments, Cleaning, and Maintenance; G

SD-11 Closeout Submittals

NFRC Project Label Certificates for Fenestration; G

1.3.1 Sustainable Design Submittals

Comply with Section 01 33 29 SUSTAINABILITY REPORTING. Submit LEED Cover Sheet for each material.

1. Environmental Product Declarations (EPD) in compliance with ISO 14025, 14044, and EN 15804 or ISO 21930 with at least a cradle to gate scope.

2. Sourcing of Raw Materials: Publicly available manufacturer's product data. Include material cost.

a. Percentage pre-consumer and post-consumer recycled content.

3. Material Ingredient Report: Publicly available report demonstrating the chemical inventory of the product to at least 0.1 percent (1000 ppm).

4. Low-Emitting Materials - doors and frames installed within building interior: California Department of Public Health CDPH SECTION 01350 Standard Method version 1.2 Certificate. Include material cost value.

1.4 DELIVERY, STORAGE, AND HANDLING

Inspect materials delivered to the site for damage. Unload and store with minimum handling. Provide storage space in dry location with adequate ventilation, free from dust or water, and easily accessible for inspection and handling. Stack materials on non-absorptive strips or wood platforms. Do not cover doors and frames with tarps, polyethylene film, or similar coverings. Protect finished surfaces during shipping and handling using manufacturer's standard method. Do not apply coatings or lacquers to surfaces to which caulking and glazing compounds must adhere.

1.5 QUALITY CONTROL

1.5.1 Shop Drawing

Indicate elevations and sections for each type of door and frame assembly. Show sizes and details of each assembly, frame construction,subframe attachment, thickness and gages of metal, details of door and frame construction, proposed method(s) of anchorage, glazing details, provisions for an location of hardware, mullion details, method and materials for flashing and weatherstripping, miscellaneous trim, installation details, and other related items necessary for a complete representation of all components.

1.5.2 Finish Samples

Submit two color charts and two finish sample chips from manufacturer's standard color and finish options for each type of finish indicated.

1.5.3 Operation and Maintenance Data

Submit detailed instructions for installation, adjustments, cleaning, and maintenance of each type of assembly indicated.

PART 2 PRODUCTS

2.1 SUSTAINABLE DESIGN REQUIREMENTS

Comply with Section 01 33 29 SUSTAINABILITY REPORTING.

Building Product Declarations: Provide doors and frames with EPD and Material Ingredient Report, if available.

Recycled content in metal: Provide at least 25 percent recycled content.

Provide doors and frames installed within the building interior with VOC emissions certified in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method.

2.2 EXTERIOR ALUMINUM-FRAMED DOORS

Provide swing-type aluminum doors and frames of size, design, and location indicated. Provide doors complete with frames, framing members, subframes, transoms, adjoining side lites, trim, and accessories. Coordinate side lites, and window walls, all with Section 08 41 13 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

2.3 INTERIOR GLASS PARTITION DOORS

Provide swing-type aluminum doors and frames of size, design, and location indicated. Provide doors complete with frames, framing members, subframes, transoms, adjoining side lites, trim, and accessories. Coordinate side lites, and window walls, all with Section 08 41 13 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

2.4 INTERIOR FRAMELESS GLASS PARTITION

Provide swing-type doors of size, design, and location indicated. Provide doors complete with transoms, adjoining side lites, trim, and accessories. Coordinate side lites, and window walls, all with Section 08 41 13 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

a. Full Glazed Rail Doors

    1. Provide doors with rails as indicated. Fabricate from formed stainless steel hollow seamless tubes or from a combination of open-shaped members interlocked or welded together. Provide an adjustable mechanism of jack screws or other methods in the top rail to allow for minor clearance adjustments after installation.

b. Full Glazed Patch Fitting Doors

    1. Provide full glass doors with fittings as indicated on drawings. Fabricate from stainless steel of alloy and temper recommended by manufacturer for use intended and required for application of finish indicated, but no less than strength and durability properties specified in ASTM B 6063-T5.

2.5 MATERIALS

2.5.1 Anchors

Stainless steel .

2.5.2 Weatherstripping

Continuous wool pile, silicone treated, or type recommended by door manufacturer.

2.5.3 Aluminum Alloy for Doors and Frames

ASTM B221M, ASTM B221, Alloy 6063-T5 for extrusions. ASTM B209M, ASTM B209, alloy and temper best suited for aluminum sheets and strips. Provide aluminum materials that include a minimum of 30 percent recycled content. Provide data indicating percentage of recycled content of aluminum material.

2.5.4 Fasteners

Hard aluminum or stainless steel.

2.5.5 Structural Steel

ASTM A36/A36M.

2.5.6 Aluminum Paint

Refer to section 08 41 13 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.

2.6 FABRICATION

2.6.1 Aluminum Frames

Extruded aluminum shapes with contours approximately as indicated. Provide removable glass stops and glazing beads for frames accommodating fixed glass. Use countersunk stainless steel Phillips screws for exposed fastenings, and space not more than 12 inches on center. Mill joints in frame members to a hairline fit, reinforce, and secure mechanically.

2.6.2 Aluminum Doors

Of type, size, and design indicated and minimum 1-3/4 inch thick. minimum wall thickness, 0.125 inch, except beads and trim, 0.050 inch. Door sizes shown are nominal; include standard clearances as follows: 0.093 inch at hinge and lock stiles, 0.125 inch between meeting stiles, 0.125 inch at top rails, 0.187 inch between bottom and threshold, and 0.687 inch between bottom and floor. Provide bevel single-acting doors 0.063 or 0.125 inch at lock, hinge, and meeting stile edges. Provide double-acting doors rounded edges at hinge stile, lock stile, and meeting stile edges.

2.6.2.1 Full Glazed Stile and Rail Doors

Provide doors with medium stiles and rails as indicated. Fabricate from extruded aluminum hollow seamless tubes or from a combination of open-shaped members interlocked or welded together. Fasten top and bottom rail together by means of welding or by 3/8 or 1/2 inch diameter cadmium-plated tensioned steel tie rods. Provide an adjustable mechanism of jack screws or other methods in the top rail to allow for minor clearance adjustments after installation.

2.6.2.2 Flush Doors

Use facing sheets with a plain smooth surface. Use one of the following constructions:

a. A phenolic resin-impregnated kraft paper honeycomb core, surrounded at edges and around glass and louvered areas with extruded aluminum shapes. Provide cores with a minimum impregnation of 18 percent resin content. Provide sheet aluminum door facings minimum 0.032 inch thick laminated to a 0.10 inch thick tempered hardboard backing, with the backing bonded to the honeycomb core. Bond facing sheets to cores under heat and pressure with thermosetting adhesive and mechanically lock to extruded edge members.

b. A phenolic resin-impregnated kraft paper honeycomb core. Use aluminum facing sheets minimum 0.050 inch thick and form into two pans to

eliminate seams on faces. Bond honeycomb core to face sheets using epoxy resin or contact cement-type adhesive.

c. A solid fibrous core, surrounded at edges and around glass and louvered areas and cross braced at intermediate points with extruded aluminum shapes. Use aluminum facing sheets of minimum 0.050 inch thickness. Bond facing sheets to core under heat and pressure with a thermosetting adhesive, and mechanically lock to the extruded edge members.

d. Form from extruded tubular stiles and rails mitered at corners, reinforce, and continuously weld at miters. Provide facing sheets of minimum 0.032 inch thick sheet aluminum internally reinforced with aluminum channels or Z-bars placed horizontally not more than 16 inch apart and extending the full width of panels. Fit spaces between reinforcing with sound-deadening insulation. Weld facing sheets to reinforcing bars or channels and to stiles and rails. Finish facing sheets flush with faces of stiles and rails.

e. Form from an internal grid composed of extruded aluminum tubular sections. Provide tubular sections at all sides and perimeter of louver and glass openings. Provide three extruded aluminum tubular sections at top and bottom of each door. Provide wall thickness of tubular sections minimum 0.09 inch except at lock rails which must be minimum0.125 inch thick, hinge lock rails which must be minimum 0.125 inch thick, and hinge rail edges which must be minimum 0.19 inch thick. Fill spaces in door with mineral insulation. Provide facing sheets of aluminum minimum 0.09 inch thick.

f. Form from extruded aluminum members at top and bottom, both sides, and at perimeters of louver and glass openings. Provide wall sections of extruded aluminum members minimum 0.09 inch thick and reinforce for application of hardware. Cover framing members on both sides with aluminum facing sheets minimum 0.064 inch thick. Fill door panels with 25 pounds per square inch density polystyrene 2.5 pound per cubic foot density, chlorofluorocarbon (CFC) free, foamed urethane with a flame spread rating of no more than 25.

2.6.3 Welding and Fastening

Where possible, locate welds on unexposed surfaces. Dress welds on exposed surfaces smoothly. Select welding rods, filler wire, and flux to produce a uniform texture and color in finished work. Remove flux and spatter from surfaces immediately after welding. Exposed screws or bolts will be permitted only in inconspicuous locations, and must have countersunk heads. Weld concealed reinforcements for hardware in place.

2.6.4 Weatherstripping

Provide on stiles and rails of exterior doors. Fit into slots which are integral with doors or frames. Weatherstripping must be replaceable without special tools, and adjustable at meeting rails of pairs of doors. During installation, verify doors swing freely and close positively. Refer to paragraph AIR INFILTRATION for air leakage requirements and testing.

2.6.5 Anchors

On the backs of subframes, provide anchors of the sizes and shapes

indicated for securing subframes to adjacent construction. Anchor transom bars at ends and mullions at head and sill. Place anchors near top and bottom of each jamb and at intermediate points not more than 25 inch apart.

2.6.6 Provisions for Hardware

Coordinate with Section 08 71 00 DOOR HARDWARE. Deliver hardware templates and hardware (except field-applied hardware) to the door manufacturer for use in fabrication of aluminum doors and frames. Cut, reinforce, drill, and tap doors and frames at the factory to receive template hardware. Provide doors to receive surface-applied hardware, except push plates, kick plates, and mop plates, with reinforcing only; drill and tap in the field. Provide hardware reinforcements of stainless steel or steel with hot-dipped galvanized finish, and secure with stainless steel screws. Provide reinforcement in core of flush doors as required to receive locks, door closers, and other hardware.

2.6.7 Provisions for Glazing

Provide extruded aluminum snap-in glazing beads on interior side of doors. Provide extruded aluminum, theft-proof, snap-in glazing beads or fixed glazing beads on exterior or security side of doors. Provide glazing beads with vinyl insert glazing gaskets. Design glazing beads to receive thickness indicated for each glazed assembly. Coordinate requirements with Section 08 81 00 GLAZING.

2.6.8 Finishes

Refer to section 08 41 13 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.

PART 3 EXECUTION

3.1 INSTALLATION

Plumb, square, level, and align frames and framing members to receive doors, transoms, adjoining side lites, and, adjoining window walls. Anchor frames to adjacent construction as indicated and in accordance with manufacturer's printed instructions and the approved shop drawings. Install anchorage that complies with applicable structural requirements. Anchor bottom of each frame to rough floor construction with 3/32 inch thick minimum stainless steel angle clips secured to back of each jamb and to floor construction; use stainless steel bolts and expansion rivets for fastening clip anchors. Hang doors to produce clearances specified in paragraph ALUMINUM DOORS. After erection and glazing, adjust doors and hardware to operate properly.

3.2 PROTECTION FROM DISSIMILAR MATERIALS

3.2.1 Dissimilar Metals

Where aluminum surfaces come in contact with metals other than stainless steel, zinc, or small areas of white bronze, protect from direct contact to dissimilar metals.

3.2.1.1 Protection

Provide one of the following systems to protect surfaces in contact with dissimilar metals:

a. Paint the dissimilar metal with one coat of heavy-bodied bituminous paint.

b. Apply elastomeric sealant between aluminum and dissimilar metals in accordance with Section 07 92 00 JOINT SEALANTS.

c. Paint dissimilar metals with one coat of primer and one coat of aluminum paint.

d. Use a non-absorptive tape or gasket in permanently dry locations.

3.2.2 Drainage from Dissimilar Metals

In locations where drainage from dissimilar metals has direct contact with aluminum, provide protective paint to prevent aluminum discoloration.

3.2.3 Masonry and Concrete

Provide aluminum surfaces in contact with mortar, concrete, or other masonry materials with one coat of heavy-bodied bituminous paint.

3.2.4 Wood or Other Absorptive Materials

Provide aluminum surfaces in contact with absorptive materials subject to frequent moisture, and aluminum surfaces in contact with treated wood, with two coats of aluminum paint or one coat of heavy-bodied bituminous paint. In lieu of painting aluminum, paint the wood or other absorptive surface with two coats of aluminum paint and seal joints with elastomeric sealant.

3.3 SEALING AROUND ASSEMBLIES

Seal all penetrations of the air barrier by sealing around door openings as necessary to achieve compliance with air leakage requirements indicated in the air barrier sections of the specifications. Flash all doors with corrosion resistant flashing to prevent water intrusion.

3.4 CLEANING

Upon completion of installation, clean door and frame surfaces in accordance with door manufacturer's written recommended procedure. Do not use abrasive, caustic, or acid cleaning agents.

3.5 PROTECTION

Protect doors and frames from damage and from contamination by other materials such as cement mortar. Prior to completion and acceptance of the work, restore damaged doors and frames to original condition, or replace with new ones.

-- End of Section --

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SECTION 08 14 00

WOOD DOORS
08/16

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM E2226	(2015a) Standard Practice for Application of Hose Stream
ASTM E283	(2019) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E90	(2009; R2016) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
ASTM F2248	(2012) Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

FOREST STEWARDSHIP COUNCIL (FSC)

FSC STD 01 001	(2015) Principles and Criteria for Forest Stewardship

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 105	(2019) Standard for Smoke Door Assemblies and Other Opening Protectives
NFPA 252	(2017) Standard Methods of Fire Tests of Door Assemblies
NFPA 80	(2019) Standard for Fire Doors and Other Opening Protectives

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 4-010-01	(2018; with Change 1, 2020) DoD Minimum Antiterrorism Standards for Buildings

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

UNDERWRITERS LABORATORIES (UL)

UL 10B	(2008; Reprint May 2020) Fire Tests of Door Assemblies

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

ANSI/WDMA I.S.1A	(2013) Interior Architectural Wood Flush Doors
ANSI/WDMA I.S.6A	(2013) Interior Architectural Stile and Rail Doors

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Doors; G

Submit drawings or catalog data showing each type of door unit; include transoms and descriptive data of head and jamb weatherstripping with installation instructions. Indicate within drawings and data the door types and construction, sizes, thickness, methods of assembly, and glazing.

SD-03 Product Data

Doors; G

Recycled Content for Door Cores; S

Accessories

Water-resistant Sealer

Sample Warranty

Sound Transmission Class Rating; G

Fire Resistance Rating; G

SD-04 Samples

Doors

Prior to the delivery of wood doors, submit a sample section of each type of door which shows the stile, rail, veneer, finish, and core construction.

Door Finish Colors; G

Submit a minimum of three color selection samples, minimum 3 by 5 inches in size representing each type of wood finish for selection by the Contracting Officer.

SD-06 Test Reports

Cycle-Slam

Hinge Loading Resistance

SD-07 Certificates

Certificates of Grade

Certified Sustainably Harvested Stile and Rail Wood Doors; S

Certified Sustainably Harvested Flush Wood Doors; S

Indoor Air Quality for Particleboard and Agrifiber Door Cores: S

SD-11 Closeout Submittals

Warranty

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Permanently installed, non-recycled wood and wood-based materials should be certified in accordance with Forest Stewardship Council Guidelines. This includes wood permanently installed in the project wood products. Submit all FSC product certification information including required Chain-of-Custody certificates and invoices tracking FSC purchase. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for manufacturers that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to

https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia
for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

4. Low-Emitting Materials - Interior paints and coatings applied on site:

a. Meet the VOC emissions evaluation and the VOC content evaluation. The paints and coatings product category include all interior paints and coatings applied on site. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

1. For CDPH version compliance information, refer to LEED interpretation #ID 10495 “LEM for v4 projects”: https://www.usgbc.org/leedaddenda/10495

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

6. Low-Emitting Materials - Wall panels: (doors)

a. Meet the VOC emissions evaluation, or inherently nonemitting sources criteria, or salvaged and reused materials criteria. The wall panels product category includes all finish wall treatments (wall coverings, wall paneling, wall tile), surface wall structures such as gypsum or plaster, cubicle/curtain/partition walls, trim, doors, frames, windows, and window treatments. Removable/interchangeable fabric panels, built-in cabinetry, and vertical structural elements are excluded. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full emissions requirements.

b. Product is considered an inherently non-emitting source of VOCs if it is one of the following, and has no integral organic-based surface coatings, binders, or sealants: stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood.

c. Salvaged and reused materials: Product is more than one year old at the time of use. If finishes are applied to the product on-site, the finishes must meet the VOC emissions evaluation AND VOC content evaluation requirements.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.3 CERTIFICATIONS

1.3.1 Certified Wood Grades

Provide certificates of grade from the grading agency on , acoustical doors, and fire doors.

1.3.2 Certified Sustainably Harvested Wood

Provide wood certified as sustainably harvested by FSC STD 01 001. Provide a letter of Certification of Sustainably Harvested Wood signed by

the wood supplier. Identify certifying organization and their third party program name and indicate compliance with chain-of-custody program requirements. Submit sustainable wood certification data; identify each certified product on a line item basis. Submit copies of invoices bearing certification numbers.

1.3.3 Indoor Air Quality Certification

1.3.3.1 Low-Emitting Walls (Doors)

Provide doors and frames installed within the building interior with VOC emissions certified in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method.

1.3.3.2 Low-Emitting Paints and Coatings

Provide sealer applied within the building interior with VOC emissions in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method and VOC content not to exceed 200 g/L.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver doors to the site in an undamaged condition and protect against damage and dampness. Stack doors flat under cover. Support on blocking, a minimum of 4 inch thick, located at each end and at the midpoint of the door. Store doors in a well-ventilated building so that they will not be exposed to excessive moisture, heat, dryness, direct sunlight, or extreme changes of temperature and humidity. Do not store in a building under construction until concrete, masonry work, and plaster are dry. Replace defective or damaged doors with new ones.

1.5 WARRANTY

Warrant doors free of defects as set forth in the door manufacturer's standard door warranty.

PART 2 PRODUCTS

2.1 DOORS

Provide doors of the types, sizes, and designs indicated free of urea-formaldehyde resins.

2.1.1 Stile and Rail Doors

2.1.1.1 Exterior Doors

Provide solid wood doors with medium density overlayed hardwood sapele mahogany for exterior and white oak for interior. White oak cut to match existing wood grain in paneling at the historic lobby - with slip match. Provide wood edge bands. Door stile and rail construction to use blind mortise and tenon at upper rails and blind haunched tenons at bottom rail at the stile/rail assembly. Doweled connections between stile and rail must not be used.

See drawings for door elevations and details. Glazing see Section 08 81 00 GLAZING.

Wood Exterior Door must meet the minimum DOD standard 3-11.1 Glazing in

UFC 4-010-01. Provide a glazing frame bite in accordance with ASTM F2248.

2.1.1.2 Interior Doors

Premium stile and rail doors conforming to ANSI/WDMA I.S.6A. Provide white oak veneers with cut to match existing wood paneling in the historic lobby with slip match. Furnish laminate panels in not less that three ply thickness. Provide flat panels with a minimum finished panel thickness of 1/2 inch and 3/4 inch thickness for raised panels. Provide certified sustainably harvested stile and rail wood doors.

2.1.2 Interior Flush Doors

Provide particleboard core, Type II flush doors conforming to ANSI/WDMA I.S.1A with faces of premium grade wood. Provide Certified Sustainably Harvested Flush Wood Doors. Hardwood veneers are to be white oak, with a rift sawn cut. Hardwood stile edge bands of doors receives a natural finish, compatible with face veneer. Provide mill option for stile edge of doors scheduled to be painted. No visible finger joints will be accepted in stile edge bands. When used, locate finger-joints under hardware. Door cores must have a minimum recycled content of 45 percent. Provide data identifying percentage of recycled content for door cores. Products must contain no added urea-formaldehyde resins. Provide certification of indoor air quality for particleboard and agrifiber door cores.

2.1.3 Acoustical Doors

ANSI/WDMA I.S.1A, solid core, constructed to provide Sound Transmission Class rating of 35 when tested in accordance with ASTM E90. Provide acoustical doors at all private offices and at conference rooms and for additional doors noted in door schedule.

2.1.4 Composite-Type Fire Doors

Provide doors specified or indicated to have a fire resistance rating conforming to the requirements of UL 10B, ASTM E2226, or NFPA 252 for the class of door indicated. Affix a permanent metal label with raised or incised markings indicating testing agency's name and approved hourly fire rating to hinge edge of each door.

2.2 ACCESSORIES

2.2.1 Door Louvers

Fabricate from wood and of sizes indicated. Provide louvers with a minimum of 35 percent free air. Equip louvers with sightproof inverted vee slat type. Block hollow core doors to provide solid anchorage for the louvers. Mount louvers in the door with flush wood moldings.

2.2.2 Door Light Openings

Provide glazed openings with the manufacturer's standard wood moldings. Provide moldings for doors to receive natural finish of the same wood species and color as the wood face veneers. Provide moldings on the exterior doors with sloped surfaces.

2.2.3 Weatherstripping

Provide weatherstripping that is a standard cataloged product of a manufacturer regularly engaged in the manufacture of this specialized item. Provide weatherstripping tempered spring bronze or looped neoprene or vinyl held in an extruded non-ferrous metal housing. Install bronze weatherstripping with a minimum thickness of 0.0089 inch for sills, and a minimum thickness of 0.0063 inch elsewhere. Air leakage of weatherstripped doors not to exceed 1.25 cubic feet per minute of air per square foot of door area when tested in accordance with ASTM E283.

2.2.4 Additional Hardware Reinforcement

Provide the minimum lock blocks to secure the specified hardware. The measurement of top, bottom, and intermediate rail blocks are a minimum 125 mm 5 inch by full core width. Comply with the manufacturer's labeling requirements for reinforcement blocking, but not mineral material similar to the core.

2.3 FABRICATION

2.3.1 Marking

Stamp each door with a brand, stamp, or other identifying mark indicating quality and construction of the door.

2.3.2 Quality and Construction

Identify the standard on which the construction of the door was based , identify the standard under which preservative treatment was made, and identify doors having a Type I glue bond.

2.3.3 Preservative Treatment

Treat exterior doors with a water-repellent preservative treatment and so marketed at the manufacturer's plant.

2.3.4 Adhesives and Bonds

Use Type I bond for exterior doors. Provide a nonstaining adhesive on doors with a natural finish.

2.3.5 Prefitting

Provide factory finished factory prefitted doors for the specified hardware, door frame and door-swing indicated. Machine and size doors at the factory by the door manufacturer in accordance with the standards under which the doors are produced and manufactured. The work includes sizing, beveling edges, mortising, and drilling for hardware and providing necessary beaded openings for glass and louvers. Provide the door manufacturer with the necessary hardware samples, and frame and hardware schedules to coordinate the work.

2.3.6 Finishes

2.3.6.1 Factory Finish

2.3.6.1.1 Factory Finish for Exterior Wood Doors

Exterior face and sides - Provide a durable exterior grade finish applied per manufacturers recommendations to provide superior ultra violet protection, water resistance, salt and mildew resistance. Finish to ensure a longer term maintenance cycle that can hold up to exposed weather conditions. Acceptable products include Marine Grade Epoxy Systems (water or oil based) or Spar – Marine Varnish (oil based)Interior face - similar to exterior system but finish must closely match refurbished finish of existing lobby paneling at all exterior door locations.

2.3.6.1.2 Factory Finish for Interior Doors

Provide doors finished at the factory by the door manufacturer as follows: WDMA System TR-8 (UV cured acrylated polyester/urethane) or TR-2 (catalyzed lacquer) or TR-4 (conversion varnish) factory finish systems that utilize water-based stains and finishes with ultraviolet UV protection. The coating is NAAWS 3.1 premium, medium rubbed sheen, closed grain effect. Use stain when required to produce the finish specified for color. Seal edges, cutouts, trim, and wood accessories, and apply two coats of finish compatible with the door face finish. Touch-up finishes that are scratched or marred, or where exposed fastener holes are filled, in accordance with the door manufacturer's instructions. Match color and sheen of factory finish using materials compatible for field application.

2.3.6.2 Color

Provide door finish colors as indicated in the drawings.

2.3.7 Water-Resistant Sealer

Provide manufacturer's standard water-resistant sealer compatible with the specified finishes.

2.4 SOURCE QUALITY CONTROL

Meet or exceed the following minimum performance criteria of stiles of doors utilizing standard mortise leaf hinges:

a. Cycle-slam: Heavy Duty Doors: 500,000 cycles with no loose hinge screws or other visible signs of failure.

b. Hinge loading resistance: Averages of ten test samples not less than Heavy Duty doors: 475 pounds force when tested for direct screw withdrawal using a No. 12, 1-1/4 inch long, steel, fully threaded wood screw. Drill 5/32 inch pilot hole, use 1-1/2 inch opening around screw for bearing surface, and engage screw full, except for last 1/8 inch. Do not use a steel plate to reinforce screw area.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

Before installation, seal top and bottom edges of doors with the approved water-resistant sealer. Seal cuts made on the job immediately after cutting using approved water-resistant sealer. Fit, trim, and hang doors with a 1/16 inch minimum, 1/8 inch maximum clearance at sides and top, and a 3/16 inch minimum, 1/4 inch maximum clearance over thresholds. Provide 3/8 inch minimum. Bevel edges of doors at the rate of 1/8 inch in 2 inch. Door warp must not exceed 1/4 inch when measured in accordance with ANSI/WDMA I.S.1A.

3.1.1 Fire and Smoke Doors

Install fire doors in accordance with NFPA 80. Install smoke doors in accordance with NFPA 105. Do not paint over labels.

3.1.2 Prehung Doors

Install doors in accordance with the manufacturer's instructions and details. Provide fasteners for stops and casing trim within 3 inch of each end and spaced 11 inch on center maximum. Provide side and head jambs joined together with a dado or notch of 3/16 inch minimum depth.

3.1.3 Weatherstripping

Install doors in strict accordance with the door manufacturer's printed installation instructions and details. Weatherstrip exterior swing-type doors at sills, heads and jambs to provide weathertight installation. Apply weatherstripping at sills to bottom rails of doors and hold in place with a brass or bronze plate. Apply weatherstripping to door frames at jambs and head. Shape weatherstripping at sills to suit the threshold. Meeting stiles of exterior double-doors must be made weathertight by means of a looped vinyl or neoprene strip in an extruded nonferrous metal housing applied to the edge of one door leaf.

-- End of Section --

SECTION 08 31 00

ACCESS DOORS AND PANELS
05/17

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2020) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A653/A653M	(2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A666	(2015) Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar
ASTM A1008/A1008M	(2020) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
ASTM E90	(2009; R2016) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
ASTM E119	(2020) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E413	(2016) Classification for Rating Sound Insulation
ASTM E1332	(2016) Standard Classification for Rating Outdoor-Indoor Sound Attenuation

MASTER PAINTERS INSTITUTE (MPI)

MPI 79	(2012) Primer, Alkyd, Anti-Corrosive for Metal

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 252	(2017) Standard Methods of Fire Tests of Door Assemblies

UNDERWRITERS LABORATORIES (UL)

UL 10B	(2008; Reprint May 2020) Fire Tests of Door Assemblies
UL 263	(2011; Reprint Sep 2020) UL Standard for Safety Fire Tests of Building Construction and Materials

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Access Doors And Panels; G, AE

SD-03 Product Data

Access Doors And Panels; G, AE

Hardware Including Locks and Keys; G, AE

Accessories; G

Power Transfer Components; G

Recycled Content; S

SD-04 Samples

Finishes; G

SD-06 Test Reports

Fire-rating(s) of Assemblies; G

Acoustical Ratings of Assemblies; G

1.3 MISCELLANEOUS REQUIREMENTS

For access doors and panels provide the following:

1.3.1 Shop Drawings

For field assembled access doors and panels, provide plans, elevations, sections, and details for each type of access door and panel assembly. Indicate frame, surface and edge construction, materials, and accessories. Indicate types of finished surfaces and details for panel

edge conditions. Provide a door schedule with a unique number for each access door and panel, specific location in the project, location of hinges and hardware for each door. Indicate acoustical ratings of assemblies as sound transmission class (STC) ratings, and fire-rating(s) of assemblies andlocations and power transfer components for electrified locks and alarms.

1.3.2 Product Data

For shop assembled access doors and panels, provide literature indicating sizes, types, frame and edge construction, finishes, hardware, accessories such as gaskets, seals and weatherstripping, and location of each door and panel in the project. Indicate acoustical ratings of assemblies, fire-ratings of assemblies, and locations and power transfer components for electrified locks and alarms.. Provide details of adjoining work for each condition indicated.

1.3.3 Finish Samples

Submit two color charts from manufacturer's standard color and finish options for each type of frame and panel assembly finish indicated.

1.3.4 Test Reports

Provide test reports for acoustical assemblies when tested in accordance with ASTM E90 and classified in accordance with ASTM E413 and ASTM E1332.

1.4 PERFORMANCE REQUIREMENTS

1.4.1 Structural Requirements

Provide floor access assemblies to support live loads indicated for floors. Deflection must not exceed 1/180 of span.

1.4.2 Acoustical Requirements

Provide access panels with a minimum sound transmission class (STC) that matches the assembly it is in. Provide gasketing in accordance with manufacturer's written recommendations.

1.4.3 Fire-Rating Requirements

Provide access panels with a minimum fire-rating that matches the assembly it is in.

1.4.4 Access Panels for Wet Areas

Provide panel assemblies that will be located in wet areas with corrosion resistant finishes and hardware and water resistant gasketing.

1.5 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new items.

PART 2 PRODUCTS

2.1 RECYCLED CONTENT

Provide products with recycled content. Provide data for each product with recycled content, identifying percentage of recycled content.

2.2 MATERIALS

2.2.1 Steel Plates, Shapes, and Bars

Provide in accordance with ASTM A36/A36M.

2.2.2 Sheet Steel

Provide cold rolled steel sheet substrate in accordance with ASTM A1008/A1008M, Commercial Steel (CS), exposed.

2.2.3 Stainless Steel

Provide in accordance with ASTM A666, type 302 or 304.

2.2.4 Metallic Coated Steel Sheet

Provide in accordance with ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.2.5 Hardware

Provide automatic closing devices. Provide latch releases operable from insides of doors. Provide anchors in accordance with applicable fire test parameters.

2.2.6 Hinges

Provide concealed spring hinges, 175 degrees of opening, with non-removable hinge pins. Provide hinges of same steel as door and frame or in accordance with manufacturer's written recommendations. If providing non-continuous hinges, provide in numbers required to maintain alignment of door panel with frame. Provide coatings as necessary to permanently protect dissimilar metals from contact with one another; see Part 3 herein for more information.

2.2.7 Locks

Unless otherwise indicated, provide flush Lock cylinders are specified in Section 08 71 00 DOOR HARDWARE.

2.2.8 Accessories

Provide anchors in size, number and location on four sides to secure access door to substrate. Provide anchors in types as recommended by manufacturer's written installation instructions for each substrate indicated. Provide shims, bushings, clips, gaskets, and other devices as necessary for a complete installation.

2.3 FABRICATION

2.3.1 Thickness, Size, Edges

Fabricate frames for access doors of steel not lighter than 16 gage with welded joints and anchorage for securing to adjacent construction. Provide doors a minimum of 24 by 24 inches and of not lighter than 16 gage steel, with stiffened edges and welded attachments. Provide with eased (lightly rounded) edges, without burrs, snags or sharpness and exposed welds ground smooth.

2.3.2 Welding

Provide in accordance with AWS D1.1/D1.1M.

2.4 ACCESS ASSEMBLY TYPES

Unless indicated otherwise, provide flush-face steel access doors and panels with steel frames and flanges.

2.4.1 Recessed Doors

Provide recessed access doors with gypsum wallboard bead flanges at all drywall ceiling locations in offices, conference rooms, central stair/lobby ceilings, special meeting rooms, and other areas as indicated on the drawings. Depth of door panel recess must accommodate the installed thickness of the finish material of the wall or ceiling assembly for a flush finished condition of the wall and the access panel face. Reinforce panel and frame to prevent sagging.

2.4.2 Fire-rated Doors

2.4.2.1 Door Construction

Provide ceiling access door construction in accordance with ASTM E119 or UL 263. Provide wall access doors in accordance with NFPA 252 or UL 10B.

2.4.2.2 Labels

Provide class B opening according to UL 10B or test by another nationally recognized laboratory, approved by the Contracting Officer. Provide fire-rating as indicated herein, with a maximum temperature rise of 216 degrees F.

2.4.2.3 Door Panel and Frame

Steel sheet, with mineral fiber insulation core, insulated sandwich type construction.

2.4.3 Acoustical Doors

Manufacturer's standard assembly rated in accordance with STC requirements indicated herein. Acoustical insulating materials must have a flame spread rating of no more than 25.

2.4.4 Insulated Doors

Provide access door panels with 25 pounds per square inch density polystyrene with a flame spread rating of no more than 25.

Provide ceiling access panels for terminal air blenders as indicated. Provide pin-tumbler cylinder locks with appropriate cams in lieu of screwdriver-operated latches.

2.5 FINISHES

Provide steel frames and panel surfaces with a powder coated finish. Provide manufacturer's standard two coat finish system consisting of one coat primer and one thermoset topcoat. Provide dry film thickness in 2 mils minimum. Provide steel frame and panel surfaces with a shop applied prime coat. Field paint frames and panels to match wall and ceiling surfaces in which they occur. Provide exposed fastenings that approximately match the color and finish of the each material to which fastenings are applied.

PART 3 EXECUTION

3.1 PREPARATION

Field verify all measurements prior to fabrication. Verify access door locations and sizes provide required maintenance access to installed building services components. Protect existing construction and completed work from damage during installation.

3.2 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated, in accordance with manufacturer's written instructions. Include materials and parts as necessary for a complete installation of each item. Conceal fastenings where practicable. Poor matching of holes to fasteners is cause for rejection of the work.

3.3 ACCESS LOCATIONS

Install removable access panels directly below each valve, flow indicator, damper, air splitter or other utility requiring access that is located above ceilings, other than at acoustical panel ceilings, and that would otherwise not be accessible. Install access doors and panels permitting access to service valves, traps, dampers, cleanouts, and other mechanical, electrical and conveyor control items concealed in walls and partitions.

3.4 ACCESS LOCATIONS IN WET AREAS

When possible, avoid locating access panels in wet areas. When such locations cannot be avoided, provide moisture resistant assemblies as indicated in Part I herein.

3.5 FIELD PAINTING

Field painting primed access doors in accordance with the requirements of Section 09 90 00 PAINTS AND COATINGS.

3.6 DISSIMILAR MATERIALS

Where dissimilar metals are in contact, protect surfaces with a coating in accordance with MPI 79 to prevent galvanic or corrosive action.

3.7 ADJUSTMENT

Adjust hardware so that door panel opens freely. Adjust door when closed center door panel in frame.

3.8 ENVIRONMENTAL CONDITIONS

Do not paint surfaces when damp or exposed to weather, when surface temperature is below 45 degrees F or over 95 degrees F, unless approved by the Contracting Officer.

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SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
08/18

PART 1 GENERAL

1.1 REFERENCES

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

ALUMINUM ASSOCIATION (AA)

AA DAF45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 501	(2015) Methods of Test for Exterior Walls
AAMA 611	(2014) Voluntary Specification for Anodized Architectural Aluminum
AAMA 800	(2016) Voluntary Specifications and Test Methods for Sealants
AAMA 1503	(2009) Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections
AAMA 2605	(2020) Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7-16	(2017; Errata 2018; Supp 1 2018) Minimum Design Loads and Associated Criteria for Buildings and Other Structures

ASTM INTERNATIONAL (ASTM)

ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B221M	(2013) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
ASTM E119	(2020) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E283	(2019) Standard Test Method for

	Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E330/E330M	(2014) Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E331	(2000; R 2016) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E783	(2002; R 2018) Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
ASTM E1105	(2015) Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference
ASTM E1424	(1991; R 2016) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure and Temperature Differences Across the Specimen
ASTM F1642/F1642M	(2017) Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings
ASTM F2248	(2012) Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.4	(2013) Door Controls - Closers
ANSI/BHMA A156.10	(2017) Power Operated Pedestrian Doors

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 4-010-01	(2018; with Change 1, 2020) DoD Minimum Antiterrorism Standards for Buildings

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS TT-P-645	(Rev C) Primer, Paint, Zinc-Molybdate, Alkyd Type

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

UNDERWRITERS LABORATORIES (UL)

UL 263	(2011; Reprint Sep 2020) UL Standard for Safety Fire Tests of Building Construction and Materials
UL 325	(2017; Reprint Feb 2020) UL Standard for Safety Door, Drapery, Gate, Louver, and Window Operators and Systems

1.2 ADMINISTRATIVE REQUIREMENTS

1.2.1 Pre-Installation Meetings

Conduct a meeting before installation begins to verify the project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

Within 30 days of the Contract Award, submit the following for review and approval by the Contracting Officer:

a. List of product installations

b. Sample warranty

c. Finish and color samples

d. Manufacturer's catalog data

Concurrently submit certified test reports showing compliance with specified performance characteristics and UL 325 for the following:

a. Wind Load (Resistance) in accordance with AAMA 501

b. Deflection in accordance with ASTM F1642/F1642M

c. Condensation Resistance and Thermal Transmittance Performance Requirements in accordance with AAMA 1503

d. Water Infiltration in accordance with ASTM E331

e. Structural Requirements in accordance with ASTM F1642/F1642M

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S"

are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Sample Warranty; G

List of Product Installations; G

SD-02 Shop Drawings

Shop drawings must be signed and sealed by the manufacturer's structural engineer.

Installation Drawings; G

Fabrication Drawings; G

SD-03 Product Data

Manufacturer's Catalog Data; G

Finish; G

Recycled Content of Aluminum Material; S

SD-04 Samples

Finish and Color Samples; G

SD-06 Test Reports

Certified Test Reports; G

Deflection

Air Infiltration

Condensation Resistance and Thermal Transmittance

Water Infiltration

SD-07 Certificates

Indoor Air Quality For Adhesives And Sealants; S

SD-08 Manufacturer's Instructions

Manufacturer's Instructions

SD-11 Closeout Submittals

Manufacturer's Product Warranty

1.3.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

    1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

    2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

    3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

    1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for aluminum entrances, if available, that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

    1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

    2. Manufacturer Inventory.

    3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

5. Low-Emitting Materials - Interior adhesives and sealants applied on site (including flooring adhesive):

a. Meet the VOC emissions evaluation and meet the VOC content evaluation. The adhesives and sealants product category include all interior adhesives and sealants applied on site. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.4 QUALITY CONTROL

1.4.1 Qualifications

1.4.1.1 Installer Qualifications

Provide documentation of the installer's experience in performing the work specified in this section.

Ensure that the installers are specialized in work similar to that required for this project, and that they are acceptable to product manufacturer.

1.4.1.2 Manufacturer Qualifications

Ensure that manufacturers meet the requirements specified in this section and project drawings.

Ensure that the manufacturer is capable of providing field service representation during construction, approving acceptable installers and approving application methods.

1.4.2 Single-Source Responsibility

When aluminum entrances are part of a building enclosure system, that includes storefront framing, windows, a curtain wall system, and related

products, provide building enclosure system products from a single-source manufacturer.

Use a single source manufacturer with sole responsibility for providing design, structural engineering, and custom fabrication for door portal systems and for supplying components, materials, and products. Do not use products provided from numerous sources for assembly at the site. Ensure that the following work items and components are fabricated or supplied by a single source are:

a. Door assemblies to be installed in door portals as specified in Section 08 11 16 ALUMINUM DOORS AND FRAMES.

b. Glazed walls to be constructed around door portals as specified in this Section.

c. Door operating hardware to be installed on or within door portals as specified in Section 08 71 00 DOOR HARDWARE.

d. Glass as specified in Section 08 81 00 GLAZING.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Ordering

To avoid construction delays, comply with the manufacturer's lead-time requirements and instructions for ordering.

1.5.2 Packing, Shipping, Handling and Unloading

Deliver materials in the manufacturer's original, unopened, undamaged containers with identification labels intact.

1.5.3 Storage and Protection

Store materials in a way that protects them from exposure to harmful weather conditions. Avoid damaging the storefront material and components during handling. Protect storefront material against damage from elements, construction activities, and other hazards before, during, and after storefront installation.

Do not use adhesive papers or sprayed coatings that become firmly bonded when exposed to sunlight. Do not leave coating residue on surfaces.

1.6 PROJECT / SITE CONDITIONS

1.6.1 Field Measurements

Verify actual measurements or openings by taking field measurements before fabrication; record these measurements on shop drawings. To avoid construction delays, coordinate field measurements, and fabrication schedule with construction progress.

1.7 WARRANTY

Provide a written manufacturer's warranty, executed by a company official, warranting against defects in materials and products for 5 years from the date of shipment. Warrant that the door corner construction is for the life of the project. Provide a written installer's warranty, warranting

work to be watertight and free from defective materials, defective workmanship, and glass breakage as a result of defective design, and agreeing to replace components that fail within 5 years.

The warranty states the following:

a. Watertight and airtight system installation is completed within specified tolerances.

b. The completed installation remains free of rattles, wind whistles and noise caused by thermal movement and wind pressure.

c. System is structurally sound and free from distortion.

d. Glass and glazing gaskets will not break or "pop" from frames as a result of design, wind load pressure, movement caused by expansion or contraction, or structural loading.

e. Glazing sealants and gaskets remain free of abnormal deterioration or dislocation as a result of sunlight, weather, or oxidation.

Provide written warranty stating that the organic coating finish will not fade more than 10 percent or show chalking, yellowing, peeling, cracking, pitting, corroding or variations in color, or gloss deterioration beyond the manufacturer's descriptive standards for 20 years from the shipment date and agreeing to promptly correct defects.

1.8 CERTIFICATIONS

1.8.1 Indoor Air Quality for Adhesives and Sealants

Provide adhesives and sealants applied within the building interior with VOC emissions certified in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method and VOC content in compliance with limits of SCAQMD Rule 1168.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION 1: EXTERIOR ALUMINUM-FRAMED ENTRANCE AND STOREFRONT SYSTEM

Provide aluminum entrances, with glass and glazing, door hardware, and components.

Aluminum framed system must meet the minimum DOD standard 3-11.1 Glazing in UFC 4-010-01. Provide for glazing in exterior building elements such as storefronts, doors, windows, provide a glazing frame bite in accordance with ASTM F2248.

2.1.1 Design Requirements for Aluminum (Entrances and Components)

Provide a door portal system designed to withstand the following loads without breakage, loss, failure of seals, product deterioration, or other defects.

a. Dead and Live Loads: Determined by ASCE 7-16 and calculated in accordance with applicable codes.

b. Seismic Loads: Design and install the system to comply with the seismic requirements for the project location in accordance with Section 1613 of the International Building Code, ICC IBC.

c. Wind Loads: Design and install the system so that the effects of wind load acting inward and outward normal to the plane of the wall are in accordance with ASTM E330/E330M.

d. Thermal Loads And Movement:

(1) Ambient Temperature Range: 120 degrees F

(2) Material Surfaces Range: 180 degrees F

e. Water and Air Resistance: Provide weatherstripping, exterior gaskets, sealants, and other accessories to resist water and air penetration.

f. f. Building Product Declarations: Provide aluminum entrances with EPD and Material Ingredient Report, if available.

2.1.1.1 Material Standard

ASTM B221; 6063-T5 alloy and tempered.

Provide door stile and rail face dimensions of the entrance doors as follows:

Vertical Stile	Top Rail	Bottom Rail
5 inches	5 inches	10 inches minimum

Provide major portions of the door members at 0.125 inches nominal in thickness and glazing molding at 0.050 inches thick.

2.1.1.2 Recycled Content

Provide aluminum framed entrances and storefronts that have a minimum of 20 percent recycled content based upon the aluminum billet used in the original material. Provide data indicating percentage of recycled content of aluminum material.

2.1.1.3 Sealants

Provide either ethylene propylene diene monomer (EPDM) elastomeric extrusions or thermoplastic elastomer glazing gaskets. Structural silicone sealant is required.

Internal Sealants: Provide sealants that according to the manufacturer will remain permanently elastic, tacky, non-drying, non-migrating, and weather tight.

2.1.1.4 Thermal Barrier

Use a rigid, structural thermal barrier to separate all exterior aluminum from interior aluminum. For purposes of this specification, a structural thermal barrier is defined as a system that transfers shear during bending and, therefore, promotes composite action between the exterior and interior extrusions. Do not use a nonstructural thermal barrier. Ensure

that the thermal barrier provides a structural connection between the two sides of the door.

2.1.1.5 Full Glazed Stile and Rail Doors

Refer to Section 08 11 16 ALUMINUM DOORS AND FRAMES.

2.1.2 Finish System 1

Before fabrication, clean the units and give them a AA-M-10-C22-A31 clear (natural) anodized finish in accordance with the requirements of the AA DAF45. The finish thickness is A41, 0.4 mil or greater.

a. Organic Coating (high-performance exterior coating):

(1) Comply with requirements of AAMA 2605.

(2) Clean surfaces and pretreat them with a conversion coating before applying 0.3 mil dry-film thickness of epoxy or acrylic primer according to the recommendations of the finish coat manufacturer.

(3) Apply a finish coat of 70 percent minimum fluoropolymer resin fused to primed surfaces at the temperature recommended by the manufacturer and at a minimum dry film thickness of 1.0 mil.

(4) Use a 2-, 3-, or 4-coat system as required for the color selected.

(5) Provide finish color to match Aluminum Windows finish Antique Bronze, DL, by Graham Windows.

Glazing for System 1 must be IGU-1. Refer to section 08 81 00 GLAZING.

2.2 SYSTEM DESCRIPTION 2: INTERIOR GLASS PARTITION

Provide aluminum Interior Glass Partition Framing System, with glass and glazing, door hardware, and components. Provide heavy duty framing, sizes as indicated on the drawings.

2.2.1 Design Requirements for Aluminum (Entrances and Components)

Provide a door portal system designed to withstand the following loads without breakage, loss, failure of seals, product deterioration, or other defects.

a. Dead and Live Loads: Determined by ASCE 7-16 and calculated in accordance with applicable codes.

b. Seismic Loads: Design and install the system to comply with the seismic requirements for the project location in accordance with Section 1613 of the International Building Code, ICC IBC.

c. Wind Loads: Design and install the system so that the effects of wind load acting inward and outward normal to the plane of the wall are in accordance with ASTM E330/E330M.

d. Acoustical Rating: STC 35

2.2.1.1 Material Standard

ASTM B221; 6063-T5 alloy and tempered.

Provide door stile and rail face dimensions of the entrance doors as follows:

Vertical Stile	Top Rail	Bottom Rail
5 inches	5 inches	10 inches minimum

Provide major portions of the door members at 0.125 inches nominal in thickness and glazing molding at 0.050 inches thick.

2.2.1.2 Recycled Content

Provide aluminum framed entrances and storefronts that have a minimum of 20 percent recycled content based upon the aluminum billet used in the original material. Provide data indicating percentage of recycled content of aluminum material.

2.2.1.3 Sealants

Provide either ethylene propylene diene monomer (EPDM) elastomeric extrusions or thermoplastic elastomer glazing gaskets. Structural silicone sealant is required.

Internal Sealants: Provide sealants that according to the manufacturer will remain permanently elastic, tacky, non-drying, non-migrating, and weather tight.

2.2.2 Full Glazed Stile and Rail Doors

Refer to Section 08 11 16 ALUMINUM DOORS AND FRAMES.

2.2.3 Finish System 2

Before fabrication, clean the units and give them a AA-M-10-C22-A31 clear (natural) anodized finish in accordance with the requirements of the AA DAF45. The finish thickness is A41, 0.4 mil or greater.

b. Clear Anodized; Conforming to AA-M12C22A31 and AAMA 611.

(1) Architectural Class II

(2) Etched, medium matte

(3) Clear anodic coating, 0.4 minimum thickness

Glazing for System 2 must be GL-12a (Clear) or 12b (Opaque), 3/8" interior laminated glass. Refer to section 08 81 00 GLAZING.

2.3 SYSTEM DESCRIPTION 3: INTERIOR FIRE RATED GLASS PARTITION

Provide aluminum interior fire rated glass partition, with glass and glazing, door hardware, and components. Provide heavy duty framing, sizes as indicated on the drawings.

2.3.1 Design Requirements for Aluminum (Entrances and Components)

Provide a door portal system designed to withstand the following loads without breakage, loss, failure of seals, product deterioration, or other defects.

a. Dead and Live Loads: Determined by ASCE 7-16 and calculated in accordance with applicable codes.

b. Seismic Loads: Design and install the system to comply with the seismic requirements for the project location in accordance with Section 1613 of the International Building Code, ICC IBC.

c. Passes wall assembly test standard UL 263 / ASTM E119 for 120 minute fire ratings

d. Acoustical Rating: STC 35

2.3.1.1 Material Standard

ASTM B221; 6063-T5 alloy and tempered.

2.3.1.2 Recycled Content

Provide aluminum framed entrances and storefronts that have a minimum of 20 percent recycled content based upon the aluminum billet used in the original material. Provide data indicating percentage of recycled content of aluminum material.

2.3.1.3 Sealants

Provide either ethylene propylene diene monomer (EPDM) elastomeric extrusions or thermoplastic elastomer glazing gaskets. Structural silicone sealant is required.

Internal Sealants: Provide sealants that according to the manufacturer will remain permanently elastic, tacky, non-drying, non-migrating, and weather tight.

2.3.2 Finish System 3

Glazing for System 3 must be GL-15. Refer to section 08 81 00 GLAZING.

2.3.3 Full Glazed Stile and Rail Doors

Refer to Section 08 11 16 ALUMINUM DOORS AND FRAMES.

2.4 SYSTEM DESCRIPTION 4: INTERIOR FRAMELESS GLASS WALL SYSTEM

Frameless Glazed Interior Wall Assembly: Factory fabricated assemblies consisting of full-width and height glass panels fastened with U-channel fittings on top and bottom edge of glass wall.

a. Configuration: As indicated on drawings.

b. U-Channel Fittings: Extruded aluminum, satin anodized finish, dry glazed, and with matching end caps.

1. Top channel is 1-1/2 inch (38 mm) high by 1 inch (25.4 mm) deep.

2. Bottom channel is 1 inch (25.4 mm) high by 1 inch (25.4 mm) deep.

c. Glass Type: GL-13, Refer to section 08 81 00 GLAZING

d. Designed to withstand normal operation without damage, racking, sagging, or deflection.

e. Coordinate wall and door assembly preparation and provide hardware as necessary for fully operable installation.

f. Finished metal surfaces protected with strippable film.

g. Factory assembled to greatest extent practical; may be disassembled to accommodate shipping constraints.

2.4.1 Interior Frameless Glass Wall System

1. Storefront System Fittings:

Aluminum Components: Conforming to ASTM B221M, Alloy 6063, T5 Temper

Finish: Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils (0.018 mm) thick.

2. Fasteners and Anchoring: Types and sizes indicated in shop drawings.

a) For concrete, counter bore hole size per manufacturer's recommended anchoring device at 12 inch on center unless otherwise indicated. For steel attachment, weld as indicated on structural drawings.

3. Embedded Systems: Provide floor recess or opening wide enough to accommodate shoe and recessed steel mounting plate as indicated on the drawings. Counter bore hole size per manufacturer's recommended anchoring device at 12 inch on center, unless otherwise noted.

c. Full Glazed Stile and Rail Doors

1. Refer to Section 08 11 16 - ALUMINUM DOORS AND FRAMES.

d. Full Glazed Doors

1. Refer to Section 08 11 16 - ALUMINUM DOORS AND FRAMES.

2.4.2 Finish System 4

Glazing for System 4 must be GL-15. Refer to section 08 81 00 GLAZING.

2.5 FABRICATION

Provide the following information when submitting fabrication drawings for custom fabrications:

a. Indicate elevations, detailed design, dimensions, member profiles, joint locations, arrangement of units, and member connections.

b. Show the following items:

(1) Details of special shapes.

(2) Reinforcing.

(3) Anchorage system.

(4) Interfacing with building construction.

(5) Provisions for expansion and contraction.

(6) Thermal breaks.

c. Indicate typical glazing details, and internal sealant requirements as recommended by the sealant manufacturer.

d. Clearly indicate locations of exposed fasteners and joints.

e. Clearly show where and how the manufacturer's system deviates from Contract drawings and these specifications.

2.5.1 Entrance System Fabrication

Provide door corner construction consisting of mechanical clip fastening, SIGMA deep penetration plug welds and 1 1/8 inch long fillet welds inside and outside all four corners. Provide a hook-in type exterior glazing stop with EPDM glazing gaskets reinforced with non-stretchable cord. Provide an interior glazing stop that is mechanically fastened to the door member and that incorporates a silicone-compatible spacer used with silicone sealant.

Accurately fit and secure joints and corners. Make joints hairline in appearance. Remove burrs and smooth edges. Prepare components with internal reinforcement for door hardware. Arrange fasteners and attachments so that they are concealed from view.

Separate dissimilar metals with protective coating or pre-formed separators to prevent contact and corrosion.

2.5.2 Shop Assembly

Fabricate and assemble units with joints only at the intersection of aluminum members with hairline joints; rigidly secure these units, and seal them in accordance with the manufacturer's recommendations.

2.5.2.1 Welding

Conceal welds on aluminum members in accordance with AWS recommendations or methods recommended by the manufacturer. Members showing welding bloom or discoloration on finish or material distortion will be rejected by the Contacting Officer.

2.5.3 Fabrication Tolerance

Fabricate and assemble units with joints only at intersection of aluminum members with hairline joints; rigidly secure these units, and seal them in accordance with the manufacturer's recommendations.

Fabricate aluminum entrances in accordance with the entrance

manufacturer's prescribed tolerances.

2.5.3.1 Material Cuts

Square to 1/32 inch off square, over largest dimension; proportionate amount of 1/32 inch on the two dimensions.

2.5.3.2 Maximum Offset at Consecutive Members

1/64 inch in alignment between two consecutive members in line, end to end.

2.5.3.3 Joints

Between adjacent members in same assembly: Joints are hairline and square to the adjacent member.

2.5.3.4 Variation

In squaring diagonals for doors and fabricated assemblies: 1/16 inch.

2.5.3.5 Flatness

For doors and fabricated assemblies: plus/minus 1/16 inch of neutral plane.

2.6 MATERIALS

2.6.1 Sealants

Refer to Section 07 92 00 JOINT SEALANTS. Ensure that all sealants conform to AAMA 800.

2.6.2 Glass

Refer to Section 08 81 00 GLAZING.

2.7 ACCESSORIES

2.7.1 Fasteners

Provide stainless steel fasteners in areas where the fasteners are exposed.

Use non-corrosive and compatible fasteners with components being fastened. Do not use exposed fasteners, except where unavoidable for application of hardware.

In areas where fasteners are not exposed, use aluminum, non-magnetic stainless steel, or other materials warranted by the manufacturer.

For exposed locations, provide countersunk Phillips head screws when items with a matching finish are fastened. For concealed locations, provide the manufacturer's standard fasteners.

Provide nuts or washers that have been designed with a means to prevent disengagement; do not deform fastener threads.

2.7.2 Perimeter Anchors

When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

2.7.2.1 Inserts and Anchorage Devices

Provide manufacturer's standard formed or fabricated assemblies, steel or aluminum, of shapes, plates, bars, or tubes. Shop-coat steel assemblies after fabrication with an alkyd zinc chromate primer complying with FS TT-P-645.

2.7.3 Standard Entrance Hardware

2.7.3.1 Weatherstripping

Equip meeting stiles on pairs of doors with an adjustable astragal using wool pile with a polymeric fin.

Provide door weatherstripping on a single-acting offset pivot or butt-hung door and frame (single or pairs) consisting of a thermoplastic elastomer weatherstripping on a tubular shape with a semi-rigid polymeric backing.

Provide sill-sweep strips: Provide an EPDM blade gasket sweep strip in an aluminum extrusion applied to the interior exposed surface of the bottom rail with concealed fasteners. (Provide as necessary to meet specified performance tests.)

2.7.3.2 Threshold

Provide an extruded aluminum threshold, one piece per door opening, with ribbed surface.

2.7.3.3 Offset Pivots

Provide the manufacturer's standard top and bottom pivots with one intermediate offset pivot.

2.7.3.4 Panic Device

Provide the manufacturer's recommended standard panic hardware.

2.7.3.5 Closer

Provide a surface closer in accordance with ANSI/BHMA A156.4.

2.7.3.6 Security Lock or Dead Lock

Provide A/R MS 1850A lock with two A/R 1871 cylinder operated flush bolts.

2.7.3.7 Cylinder(s)/Thumb-turn

Provide the manufacturer's recommended standard.

2.7.3.8 Cylinder Guard

Provide the manufacturer's recommended standard.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Site Verification of Conditions

Verify that the condition of substrate previously installed under other sections is acceptable for product installation in accordance with the manufacturer's instructions.

Verify that openings are sized to receive the storefront system and that the sill plate is level in accordance with the manufacturer's acceptable tolerances.

3.2 PREPARATION

Field-verify dimensions before fabricating components for the door portal assembly.

Coordinate requirements for locations of blockouts for anchorage of door portal columns and other embedded components with Section 03 30 00 CAST-IN-PLACE CONCRETE.

Coordinate the erection of door portal with installation of surrounding glass wall and door assemblies. Ensure that the door portals can provide support and anchorage for assembly components.

Coordinate electrical requirements for electrified door hardware to ensure proper power source, conduit, wiring, and boxes.

3.2.1 Adjacent Surfaces Protection

Protect adjacent work areas and finish surfaces from damage during product installation.

3.2.2 Aluminum Surface Protection

Protect aluminum surfaces from contact with lime, mortar, cement, acids, and other harmful contaminants.

3.3 INSTALLATION

Submit installation drawings for review and approval.

Install the entrance system in accordance with the manufacturer's instructions and the AAMA storefront and entrance guide specifications manual. Attach the entrance system to the structure, allowing it to be adjusted to accommodate construction tolerances and other irregularities. Provide alignment attachments and shims to permanently fasten the system to the building structure. Align the assembly so that it is plumb and level, and free of warp and twist. Maintain assembly dimensional tolerances aligning with adjacent work.

Set thresholds in a bed of mastic and secure the thresholds. Protect aluminum members in contact with masonry, steel, concrete, or dissimilar materials using nylon pads or a bituminous coating. Shim and brace the aluminum system before anchoring the system to the structure. Verify that weep holes are open, and the metal joints are sealed in accordance with the manufacturer's installation instructions. Seal metal-to-metal joints

using a sealant recommended by the system manufacturer.

3.3.1 Tolerances

Ensure that tolerances for wall thickness and other cross-sectional dimensions of entrance members are nominal and in compliance with Aluminum Standards and Data, published by the Aluminum Association.

3.3.2 Adjusting

Adjust operating hardware for smooth operation, and as recommended by the manufacturer.

3.3.3 Related Products Installation Requirements

3.3.3.1 Sealants (Perimeter)

Refer to Section 07 92 00 JOINT SEALANTS.

3.3.3.2 Glass

Refer to Section 08 81 00 GLAZING.

3.4 FIELD QUALITY CONTROL

3.4.1 Air Infiltration

Test air infiltration in accordance with ASTM E783

Submit certified test reports showing compliance with specified performance characteristics as follows:

a. For single-acting offset pivot, butt hung, or continuous geared hinge entrances in the closed and locked position, test the specimen in accordance with ANSI/BHMA A156.10, and ASTM E283 at a pressure differential of 1.57 psf for pairs of doors; ensure that maximum infiltration for a pair of 7 foot by 8 foot entrance doors and frame is 1.2 cfm/square foot.

b. Ensure the maximum allowable infiltration for a completed storefront system does not exceed 0.06 cfm/square foot when tested in accordance with ASTM E1424 at a differential static pressure of 6.24 psf.

3.4.2 Wind Loads

Provide a completed storefront system capable of withstanding wind pressure loads, normal to the wall plane indicated, as follows:

a. Exterior Walls

(1) Positive Pressure: as indicated in the structural drawings psf

(2) Negative Pressure: as indicated in the structural drawings psf

b. Interior Walls: (pressure acting in either direction) 5 psf

3.4.3 Deflection

Submit certified test reports showing that the maximum allowable

deflection in a member when tested in accordance with ASTM E330/E330M with allowable stress is L/175 or 3/4 inches maximum.

3.4.4 Condensation Resistance and Thermal Transmittance

Submit certified test reports showing compliance with specified performance characteristics as follows:

a. U-Value Requirements:

(1) Perform test in accordance with the AAMA 1503 procedure and on the configuration specified therein.

(2) Thermal Transmittance ("U" Value) maximum 0.42 BTU/hr/sf/deg F at 15 mph exterior wind.

b. CRF Class Requirements:

(1) Perform a test in accordance with AAMA 1503.

(2) Condensation Resistance Factor Requirements (CRF) minimum 55.

3.4.5 Water Infiltration

Submit certified test reports showing that the system is designed to provide no uncontrolled water when tested in accordance with ASTM E1105 at a static pressure of 8 psf.

3.5 ADJUSTING AND CLEANING

3.5.1 Protection

Protect the installed product's finish surfaces from damage during construction. Protect the aluminum storefront system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.

3.5.2 Cleaning

Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions before acceptance remove excess mastic, mastic smears, and other foreign materials. Remove construction debris from the project site and legally dispose of this debris.

3.6 WARRANTY

Submit three signed copies of the manufacturer's product warranty for the entrance system as follows:

a. Warranty Period: Five years from Date of Substantial Completion of the project, provided that the Limited Warranty begins no later than six months from the date of shipment by the manufacturer. In addition, support welded door corner construction with a limited lifetime warranty for the life of the door under normal use.

Ensure that the Warranty's language is identical to the "As Approved" version of the sample warranty submitted to and returned from the Contracting Officer.

-- End of Section --

SECTION 08 51 13

ALUMINUM WINDOWS
05/19

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 502	Recommended Field Testing of Newly Installed Fenestration Products
AAMA 907	(2015) Voluntary Specification for Corrosion Resistant Coatings on Carbon Steel Components Used in Windows, Doors and Skylights
AAMA 1503	(2009) Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections
AAMA 2605	(2020) Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels
AAMA WSG.1	(1995) Window Selection Guide
AAMA/WDMA/CSA 101/I.S.2/A440	(2017) North American Fenestration Standard/Specification for Windows, Doors, and Skylights

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 169	(2013) Climate Data for Building Design Standards

ASTM INTERNATIONAL (ASTM)

ASTM E90	(2009; R2016) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
ASTM E413	(2016) Classification for Rating Sound Insulation
ASTM E783	(2002; R 2018) Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors

ASTM E1105	(2015) Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference
ASTM E1332	(2016) Standard Classification for Rating Outdoor-Indoor Sound Attenuation
ASTM F2248	(2012) Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass
ASTM G154	(2016) Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

NFRC 100	(2017) Procedure for Determining Fenestration Product U-Factors
NFRC 200	(2017) Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Windows; G

Fabrication Drawings

SD-03 Product Data

Windows; G

Recycled Content of Aluminum Windows; S

Hardware; G

Fasteners; G

Window Performance; G

Thermal-Barrier Windows; G

Mullions; G

Exterior Casing Cover System; G

Muntins; G

Lead Caming; G

Accessories; G

Adhesives

Thermal Performance; G

SD-04 Samples

Finish Sample

Window Sample

Window Mock-Ups; G

SD-05 Design Data

Structural Calculations for Deflection; G

Design Analysis; G

SD-06 Test Reports

Minimum Condensation Resistance Factor

Air Infiltration

Water Infiltration

SD-10 Operation and Maintenance Data

Windows, Data Package 1; G

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

Plastic Identification

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment, if available; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.3 QUALITY ASSURANCE

1.3.1 Qualification of Manufacturer

Window manufacturer must specialize in designing and manufacturing the type of aluminum windows specified in this section, and have a minimum of 10 years of documented successful experience. Manufacturer must have the facilities capable of meeting contract requirements, single-source responsibility and warranty.

1.3.2 Shop Drawing Requirements

Take field measurements prior to preparation of drawings and fabrications. Provide drawings that indicate elevations of windows, full-size sections, thickness and gages of metal, fastenings, proposed method of anchoring, size and spacing of anchors, details of construction, method of glazing, details of operating hardware, mullion details, installation details, and other related items.

1.3.3 Sample Requirements

1.3.3.1 Finish Sample Requirements

Submit color chart of standard factory color coatings when factory-finish color coating is to be provided.

1.3.3.2 Window Sample Requirements

Submit one full-size corner of each window type proposed for use. Where screens or weatherstripping is required, fit sample with such items that are to be used.

1.3.3.3 Mock-Ups

Before fabrication, full-size mock-up as indicated of aluminum window complete with glass and AAMA certification label for structural purposes and NFRC Temporary and Permanent Label for certification of thermal performance rating will be required for review of window construction and quality of hardware operation. Mock-up must be used for field testing.

1.3.4 Design Data Requirements

Submit calculations to substantiate compliance with deflection requirements. A registered Professional Engineer must provide calculations.

Submit design analysis with calculations showing that the design of each different size and type of aluminum window unit and its anchorage to the structure. Calculations verifying the structural performance of each window proposed for use, under the given loads, must be prepared and signed by a registered professional engineer. Reflect the window components and anchorage devices to the structure, as determined by the design analysis, in the shop drawings.

1.3.5 Test Report Requirements

Submit test reports for each type of window attesting that identical windows have been tested and meet the requirements specified herein for conformance to AAMA/WDMA/CSA 101/I.S.2/A440 including test size, and minimum condensation resistance factor (CRF) and glazing frame bite in accordance with ASTM F2248..

1.3.6 Certification

Each prime window unit must bear the AAMA Label warranting that the product complies with AAMA/WDMA/CSA 101/I.S.2/A440. Certified test reports attesting that the prime window units meet the requirements of AAMA/WDMA/CSA 101/I.S.2/A440, including test size, will be acceptable in lieu of product labeling.

1.4 DELIVERY AND STORAGE

Deliver windows to project site in an undamaged condition. Use care in handling and hoisting windows during transportation and at the jobsite. Store windows and components out of contact with the ground, under a weathertight covering, so as to prevent bending, warping, or otherwise damaging the windows. Repair damaged windows to an "as new" condition as approved. If windows can not be repaired, provide a new unit.

1.5 PLASTIC IDENTIFICATION

Label plastic products provided to indicate their polymeric composition according to the following list. Where products are not labeled, provide product data indicating polymeric information in Operation and Maintenance Manual.

a. Type 1: Polyethylene Terephthalate (PET, PETE).

b. Type 2: High Density Polyethylene (HDPE).

c. Type 3: Vinyl (Polyvinyl Chloride or PVC).

d. Type 4: Low Density Polyethylene (LDPE).

e. Type 5: Polypropylene (PP).

f. Type 6: Polystyrene (PS).

g. Type 7: Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.

1.6 PERFORMANCE REQUIREMENTS

1.6.1 Wind Loading Design Pressure

Design window components, including mullions, hardware, and anchors, to withstand a wind-loading design pressure as indicated in the structural drawings.

1.6.2 Tests

Test windows proposed for use in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 for the particular type and quality window specified.

Perform tests by a nationally recognized independent testing laboratory equipped and capable of performing the required tests. Submit the results of the tests as certified laboratory reports required herein.

Minimum design load for a uniform-load structural test must be 50 psf.

Test projected windows in accordance with the applicable portions of the AAMA WSG.1 for air infiltration, water resistance, uniform-load deflection, and uniform-load structural test.

Conduct field testing of mock-up for air and water infiltration per AAMA 502, ASTM E783 AND ASTM E1105. Provide a sample rate of 5 percent for air and water infiltration field testing.

1.7 DRAWINGS

Submit the Fabrication Drawings for aluminum window units showing complete window assembly including hardware, weatherstripping, and subframe assembly details.

1.8 WINDOW PERFORMANCE

Aluminum windows must meet the following performance requirements. Perform testing requirements by an independent testing laboratory or agency.

1.8.1 Structural Performance

Structural test pressures on window units must be for positive load (inward) and negative load (outward). After testing, there will be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanisms or any other damage which could cause window to be inoperable. There must be no permanent deformation of any main frame, sash or ventilator member in excess of the requirements established

by AAMA/WDMA/CSA 101/I.S.2/A440 for the window types and classification specified in this section.

1.8.2 Air Infiltration

Air infiltration must not exceed the amount established by AAMA/WDMA/CSA 101/I.S.2/A440 for each window type.

1.8.3 Water Penetration

Water penetration must not exceed the amount established by AAMA/WDMA/CSA 101/I.S.2/A440 for each window type.

1.8.4 Thermal Performance

Windows (including frames and glass) will be independently tested and certified with a Solar Heat Gain Coefficient (SHGC) determined according to NFRC 200 procedures and a whole window U-factor determined in accordance with NFRC 100 within the ranges as indicated below according to the ASHRAE 169 Climate Zone of the project location. Provide visual Transmittance (VT) of 0.5 or greater.

1.8.4.1 Northern Climate

Windows installed within Climate Zone 5 will have a U-Factor of 0.42 BTU/h·ft^2·degrees F or less and a SHGC of 0.40 or less.

1.8.5 Sound Attenuation

When tested in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 or the following below, provide a minimum Sound Transmission Class (STC) of 35 in accordance with ASTM E90 and as determined by ASTM E413 or Outside-Indoor Transmission Class (OITC) of 25 in accordance with ASTM E1332 and as determined by ASTM E413 with the window glazed with 1/2 inch air space between two pieces of 1/4 inch.

1.9 WARRANTY

Provide Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period.

PART 2 PRODUCTS

2.1 WINDOWS

Provide prime windows that comply with AAMA/WDMA/CSA 101/I.S.2/A440 and the requirements specified herein. In addition to compliance with AAMA/WDMA/CSA 101/I.S.2/A440, window framing members for each individual light of glass must not deflect to the extent that deflection perpendicular to the glass light exceeds L/175 of the glass edge length when subjected to uniform loads at specified design pressures. Provide Structural calculations for deflection to substantiate compliance with deflection requirements. Provide windows of types, performance classes, performance grades, combinations, and sizes indicated or specified. Provide aluminum window frames with a minimum recycled content of 20 percent. Provide data identifying percentage of recycled content of aluminum windows. Design windows to accommodate hardware, glass, weatherstripping, screens, and accessories to be furnished. Each window

must be a complete factory assembled unit with or without glass installed. Dimensions shown are minimum. Provide windows with insulating glass and thermal break necessary to achieve a minimum Condensation Resistance Factor (CRF) of 66 when tested in accordance with AAMA 1503. Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.

2.1.1 Casement Windows (C) at TV Studio

Type C-AW- PG-100. Ventilators must be handle operated. Provide ventilators over 65 inches high with two separate locking devices or a two-point locking device operated by rods from a single lever handle. Conceal rods where possible.

2.1.2 Horizontal Sliding Windows (HS)

Type HS-R15 R (Optional Performance Grade.

2.1.3 Fixed Windows (F)

Type F- AW-PG-100 (Optional Performance Grade).

2.1.4 Glass and Glazing

Materials are specified in Section 08 81 00 GLAZING.

2.1.5 Caulking and Sealing

Are specified in Section 07 92 00 JOINT SEALANTS.

2.2 FABRICATION

Fabrication of window units must comply with AAMA/WDMA/CSA 101/I.S.2/A440.

2.2.1 Provisions for Glazing

Design windows and rabbets suitable for glass thickness shown or specified. For minimum antiterrorism windows, attach glazing to its supporting frame using structural silicone sealant or adhesive glazing tape in accordance with ASTM F2248.

2.2.2 Fasteners

Use window manufacturer's standard for windows, trim, and accessories. Self-tapping sheet-metal screws are not acceptable for material more than 1/16 inch thick.

2.2.3 Adhesives

Provide joint sealants as specified in Section 07 92 00 JOINT SEALANTS. For interior application of joint sealants, comply with applicable regulations regarding reduced VOC's, and as specified in Section 07 92 00 JOINT SEALANTS.

2.2.4 Drips and Weep Holes

Provide continuous drips over heads of top ventilators. Where fixed windows adjoin ventilators, drips must be continuous across tops of fixed windows. Provide drips and weep holes as required to return water to the outside.

2.2.5 Combination Windows

Windows used in combination must be factory assembled of the same class and grade. Where factory assembly of individual windows into larger units is limited by transportation considerations, prefabricate, match mark, transport, and field assemble.

2.2.6 Mullions and Transom Bars

Provide mullions with a thermal break. Secure mullions and transom bars to adjoining construction and window units in such a manner as to permit expansion and contraction and to form a weathertight joint. Provide mullion covers on the interior and exterior to completely close exposed joints and recesses between window units and to present a neat appearance.

2.2.7 Casing Cover System

(Panning, Trims, Receptors, Mullions, Sills etc.)

Exterior Casing Covers (Panning, Receptors, Subsills, Sills): Provide extruded prime alloy aluminum 6063-T5 no less than nominal 0.078 inch wall thickness. Casing covers of less than 2 inches in depth from the window frame may be of 0.062 inch wall thickness. Provide aluminum sections of one piece designed to lock around the entire window frame for a weather tight connection.

a. Secure the casing cover section at the corners with stainless steel screws in integral screw ports with the joints back sealed using a compatible sealant.

b. Exposed screws, fasteners or pop rivets are not acceptable on the exterior of the casing cover system.

Exterior mullion covers: Extruded aluminum shape to provide rigidity, no less than nominal 0.062 inch wall thickness. Seal against the casing cover sections with continuous bulbous vinyl weatherstrip interlocked within the mullion cover.

Interior trim:

a. Interior Trim, Closures and Angles: As detailed, of extruded shapes no less than 0.062 inch nominal wall thickness.

b. Snap Trim: Apply in full length without splices and attach with clips spaced no more than 18 inches on center. Clips shall be no less than 3 inches long. No exposed screws will be allowed on interior trim.

2.2.8 Muntins

Provide Exterior Grids: Hollow extruded aluminum or flat bar, finish to match the window system. Bevel (Trapezoidal) profile 13/16 inches x 9/16 inches deep, or as shown on plans, with a 30 degree slope to match

perimeter sash frame. Fasten grid to perimeter vent or frame at each contact point. Two piece snap grids are not permitted as a substitute.

2.2.9 Lead Caming

Provide lead caming by window manufacturer. Provide polymer coated, self-adhesive lead profiles as indicated, finish to match window finish. Provide cross linked polyurethane paint system utilising UV stable pigments and dyes testes in compliance with ASTM G154. Thickness range: 10 - 15 microns. Provide modified acrylic adhesive, typically siliconised liner 0.08 mm thick in compliance with DIN EN 1993, peel adhesion to steel 29N/ 25mm., shear performance per DIN EN 1946L 35N/ 625 mm2.

2.2.10 Accessories

Provide windows complete with necessary hardware, fastenings, clips, fins, anchors, glazing beads, and other appurtenances necessary for complete installation and proper operation. Furnish extruded aluminum subframe receptors and subsill with each window unit.

2.2.10.1 Hardware

AAMA/WDMA/CSA 101/I.S.2/A440. The item, type, and functional characteristics must be the manufacturer's standard for the particular window type. Provide stainless steel hardware of suitable design and of sufficient strength to perform the function for which it is used. Equip all operating ventilators with a lock or latching device which can be secured from the inside.

2.2.10.2 Fasteners

Provide concealed anchors of the type recommended by the window manufacturer for the specific type of construction. Anchors and fasteners must be compatible with the window and the adjoining construction. Provide a minimum of three anchors for each jamb located approximately 6 inches from each end and at midpoint.

2.2.10.3 Window Anchors

Anchoring devices for installing windows must be made of aluminum, cadmium-plated steel, stainless steel, or zinc-plated steel conforming to AAMA/WDMA/CSA 101/I.S.2/A440.

2.2.11 Finishes

Comply with NAAMM's "Metal Finishes Manual" for applying and designating finishes. Exposed aluminum surfaces must be factory finished with an organic coating. Color must be Antique Bronze UC72688, DL, Graham Windows. All windows must have the same finish.

2.2.11.1 Organic Coating

Clean and prime exposed aluminum surfaces. Provide a high-performance finish in accordance with AAMA 2605 with total dry film thickness of not less than 1.2 mils.

2.3 THERMAL-BARRIER WINDOWS

Provide thermal-barrier windows, complete with accessories and fittings,

where indicated.

Specify material and construction except as follows:

a. Aluminum alloy must be 6063-T6.

b. Frame construction, including operable sash, must be factory-assembled and factory-sealed inner and outer aluminum completely separated from metal-to-metal contact. Join assembly by a continuous, concealed, low conductance divider housed in an interlocking extrusion of the inner frame. Metal fasteners, straps, or anchors must not bridge the connection between the inner and outer frame.

c. Operating hardware for each sash must consist of spring-loaded nylon cushion blocks and pin locks designed to lock in predetermined locations.

d. Sash must be completely separated from metal-to-metal contact by means of woven-pile weatherstripping, plastic, or elastomeric separation members.

e. Operating and storm sash must be factory-glazed with the type of glass indicated and of the quality specified in Section 08 81 00 GLAZING.

2.4 MULLIONS

Provide mullions between multiple-window units where indicated.

Provide profiles for mullions and mullion covers, reinforced as required for the specified wind loading, and securely anchored to the adjoining construction. Mullion extrusion will include serrations or pockets to receive weatherstripping, sealant, or tape at the point of contact with each window flange.

Mullion assembly must include aluminum window clamps or brackets screwed or bolted to the mullion and the mullion cover.

Mullion cover must be screw-fastened to the mullion unless otherwise indicated.

Mullion reinforcing members must be fabricated of the materials specified in AAMA/WDMA/CSA 101/I.S.2/A440 and meet the specified design loading.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Method of Installation

Install in accordance with the window manufacturer's printed instructions and details. Build in windows as the work progresses or install without forcing into prepared window openings. Set windows at proper elevation, location, and reveal; plumb, square, level, and in alignment; and brace, strut, and stay properly to prevent distortion and misalignment. Protect ventilators and operating parts against accumulation of dirt and building materials by keeping ventilators tightly closed and locked to frame. Bed screws or bolts in sill members, joints at mullions, contacts of windows with sills, built-in fins, and subframes in mastic sealant of a type recommended by the window manufacturer. Install and caulk windows in a

manner that will prevent entrance of water and wind. Fasten insect screens securely in place.

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

3.1.2 Dissimilar Materials

Where aluminum surfaces are in contact with, or fastened to masonry, concrete, wood, or dissimilar metals, except stainless steel or zinc, protect the aluminum surface from dissimilar materials as recommended in the Appendix to AAMA/WDMA/CSA 101/I.S.2/A440. Do not coat surfaces in contact with sealants after installation with any type of protective material. Do not apply coatings or lacquers to surfaces to which caulking and glazing components must adhere.

3.1.3 Anchors and Fastenings

Make provision for securing units to each other, to masonry, and to other adjoining construction. Windows installed in masonry walls must have head and jamb members designed to recess into masonry wall not less than 7/16 inch.

3.1.4 Adjustments After Installation

After installation of windows and completion of glazing and field painting, adjust all ventilators and hardware to operate smoothly and to provide weathertight sealing when ventilators are closed and locked. Lubricate hardware and operating parts as necessary. Verify that products are properly installed, connected, and adjusted.

3.2 FIELD TESTING

Conduct field testing of mock up for air and water infiltration per AAMA 502, ASTM E783 AND ASTM E1105. Provide a sample rate of 5% for air and water infiltration field testing.

3.3 CLEANING

Clean interior and exterior surfaces of window units of mortar, plaster, paint spattering spots, and other foreign matter to present a neat appearance, to prevent fouling of weathering surfaces and weather-stripping, and to prevent interference with the operation of hardware. Replace all stained, discolored, or abraded windows that cannot be restored to their original condition with new windows.

-- End of Section --

SECTION 08 71 00

DOOR HARDWARE
02/16

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM F883	(2013) Padlocks

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.1	(2016) Butts and Hinges
ANSI/BHMA A156.2	(2017) Bored and Preassembled Locks and Latches
ANSI/BHMA A156.3	(2014) Exit Devices
ANSI/BHMA A156.4	(2013) Door Controls - Closers
ANSI/BHMA A156.5	(2020) Cylinder and Input Devices for Locks
ANSI/BHMA A156.6	(2015) Architectural Door Trim
ANSI/BHMA A156.7	(2016) Template Hinge Dimensions
ANSI/BHMA A156.8	(2015) Door Controls - Overhead Stops and Holders
ANSI/BHMA A156.13	(2017) Mortise Locks & Latches Series 1000
ANSI/BHMA A156.15	(2015) Release Devices Closer Holder, Electromagnetic and Electromechanical
ANSI/BHMA A156.16	(2018) Auxiliary Hardware
ANSI/BHMA A156.18	(2016) Materials and Finishes
ANSI/BHMA A156.20	(2017) Strap and Tee Hinges, and Hasps
ANSI/BHMA A156.21	(2019) Thresholds
ANSI/BHMA A156.22	(2017) Door Gasketing and Edge Seal Systems
ANSI/BHMA A156.25	(2013) Electrified Locking Devices
ANSI/BHMA A156.26	(2012) Continuous Hinges
ANSI/BHMA A156.31	(2013) Electric Strikes and Frame Mounted

Actuators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code
NFPA 72	(2019; TIA 19-1; ERTA 1 2019) National Fire Alarm and Signaling Code
NFPA 80	(2019) Standard for Fire Doors and Other Opening Protectives
NFPA 101	(2018; ERTA 18-1; ERTA 18-2; ERTA 18-3; ERTA 18-4; TIA 18-1; TIA 18-2; TIA 18-3; TIA 18-4) Life Safety Code
NFPA 105	(2019) Standard for Smoke Door Assemblies and Other Opening Protectives
NFPA 252	(2017) Standard Methods of Fire Tests of Door Assemblies

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR A250.8	(2017) Specifications for Standard Steel Doors and Frames

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

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

36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

UNDERWRITERS LABORATORIES (UL)

UL 10C	(2016) UL Standard for Safety Positive Pressure Fire Tests of Door Assemblies
UL 1784	(2015) Standard for Air Leakage Tests of Door Assemblies and Other Opening Protectives
UL Bld Mat Dir	(updated continuously online) Building Materials Directory

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S"

are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Manufacturer's Detail Drawings; G, RO

Verification of Existing Conditions; G, RO

Hardware Schedule; G, RO

Keying System; G, RO

SD-03 Product Data

Hardware Items; G, RO

SD-08 Manufacturer's Instructions

Installation

SD-10 Operation and Maintenance Data

Hardware Schedule Items, Data Package 1; G, RO

SD-11 Closeout Submittals

Key Bitting; G, RO

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment, if available; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content, if available. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for hardware, if available that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

1.3 SHOP DRAWINGS

Submit manufacturer's detail drawings indicating all hardware assembly

components and interface with adjacent construction. Indicate power components and wiring coordination for electrified hardware. Base shop drawings on verified field measurements and include verification of existing conditions.

1.4 PRODUCT DATA

Indicate fire-ratings at applicable components. Provide documentation of ABA/ADA accessibility compliance of applicable components, as required by 36 CFR 1191 Appendix D - Technical.

1.5 HARDWARE SCHEDULE

Prepare and submit hardware schedule in the following form:

Hardware Item	Quantity	Size	Reference Publi-cation Type No.	Finish	Mfr Name and Catalog No.	Key Control Symbols	UL Mark (If fire-rated and listed)	BHMA Finish Desig-nation

In addition, submit hardware schedule data package 1 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.6 KEY BITTING CHART REQUIREMENTS

1.6.1 Requirements

Submit key bitting charts to the Contracting Officer prior to completion of the work. Include:

a. Complete listing of all keys (e.g. AA1 and AA2).

b. Complete listing of all key cuts (AA1-123456, AA2-123458).

c. Tabulation showing which key fits which door.

d. Copy of floor plan showing doors and door numbers.

e. Listing of 20 percent more key cuts than are presently required in each master system.

1.7 QUALITY ASSURANCE

1.7.1 Hardware Manufacturers and Modifications

Provide, as far as feasible, locks, hinges, and closers of one lock, hinge, or closer manufacturer's make. Modify hardware as necessary to provide features indicated or specified.

1.7.2 Key Shop Drawings Coordination Meeting

Prior to the submission of the key shop drawing, the Contracting Officer, Contractor, Door Hardware Subcontractor, using Activity and Base Locksmith must meet to discuss and coordinate key requirements for the facility.

1.8 DELIVERY, STORAGE, AND HANDLING

Deliver hardware in original individual containers, complete with necessary appurtenances including fasteners and instructions. Mark each individual container with item number as shown on hardware schedule. Deliver permanent keys and removable cores to the Contracting Officer, either directly or by certified mail. Deliver construction master keys with the locks.

1.9 PRE-INSTALLATION MEETING

Prior to commencement of installation of any doors and frames, the General Contractor shall conduct a pre installation meeting that will include qualified representatives from the door hardware supplier, hollow metal door and frame supplier, wood door supplier, access control system contractor, intrusion detection system contractor, fire alarm system contractor, and the electrical contractor. The General Contractor shall present the Shop Drawings for each door component, hardware component, and the various electronic systems that are inter-related with the door assemblies. The meeting will confirm the specifics of the hardware, electro mechanical hardware, access control devices, intrusion detection devices, and fire alarm controlled devices to be installed at each door, along with the related accessories and power requirements, and the related door and frame preparation. The General Contractor will identify items of overlapping or missing scope and resolve. The meeting will result in a mutual understanding and agreement as to the responsibility of each trade toward achieving functionality of all systems.

PART 2 PRODUCTS

2.1 TEMPLATE HARDWARE

Hardware applied to metal or to prefinished doors must be manufactured using a template. Provide templates to door and frame manufacturers in accordance with ANSI/BHMA A156.7 for template hinges. Coordinate hardware items to prevent interference with other hardware.

2.2 HARDWARE FOR FIRE DOORS AND EXIT DOORS

Provide all hardware necessary to meet the requirements of NFPA 72 for door alarms, NFPA 80 for fire doors, NFPA 101 for exit doors, NFPA 252 for fire tests of door assemblies, ABA/ADA accessibility requirements, and all other requirements indicated, even if such hardware is not specifically mentioned in paragraph HARDWARE SCHEDULE. Provide Underwriters Laboratories, Inc. labels for such hardware in accordance with UL Bld Mat Dir or equivalent labels in accordance with another testing laboratory approved in writing by the Contracting Officer.

2.3 HARDWARE ITEMS

Clearly and permanently mark with the manufacturer's name or trademark, hinges, pivots, locks, latches, exit devices, bolts and closers where the identifying mark is visible after the item is installed. For closers with covers, the name or trademark may be beneath the cover. Coordinate electrified door hardware components with corresponding components specified in Division 28 ELECTRONIC SECURITY SYSTEMS (ESS).

2.3.1 Hinges

Provide in accordance with ANSI/BHMA A156.1 with number of knuckles as specified in Door Hardware Sets. Ball bearing hinges may be provided in lieu of anti-friction bearing hinges.

2.3.1.1 Quantity

a. Three hinges: For doors with heights up to 90 inches.
b. Four hinges: For doors with heights from 91 to 120 inches.
c. Provide additional hinge at doors with width exceeding 40 inches.

2.3.1.2 Size

Size hinge width for door thickness and clearances required.

a. Widths up to 36 inches: 4-1/2 inch standard or heavy weight per Basis of Design.
b. Widths from 37 to 48 inches: 5 inch heavy weight per Basis of Design.

2.3.1.3 Options

Non-Removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin when door is closed; for all doors.

2.3.2 Continuous Hinges

Where continuous hinges are required, provide in accordance with ANSI/BHMA A156.26.

2.3.3 Locks and Latches

2.3.3.1 Mortise Locks and Latches

Provide in accordance with ANSI/BHMA A156.13, Series 1000, Operational Grade 1, Security Grade 2, certified mortise locksets furnished in the functions per the Basis of Design called out in the Door Hardware Sets. Locksets to be manufactured with a corrosion resistant, stamped 12 gauge minimum formed steel case and be field-reversible for handing without disassembly of the lock body. Lockset trim (including levers and roses) to be the product of a single manufacturer. Furnish with standard 2 3/4-inch backset, 3/4-inch throw anti-friction stainless steel latchbolt. Provide roses of mortise locks with screwless shanks and no exposed screws. Bore doors to fit cylinders where required by Basis of Design.

Meet 36 CFR 1191, NFPA 101, NFPA 80, and UL 10C positive pressure. The existing USMA System is equal to Schlage Buy American Act (BAA)/American Recovery and Reinvestment Act(ARRA) certified heavy duty commercial lever type with removable 7 pin, Type L keyway.

2.3.3.2 Lock and Latch Strikes

Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated.

2.3.4 Mechanical Exit Devices

Provide in accordance with ANSI/BHMA A156.3, Types 1 and 2, Grade 1, certified panic and fire exit hardware devices furnished in the functions required by the Basis of Design in the Door Hardware Sets. Provide adjustable strikes for rim type and vertical rod devices. Provide open back strikes for pairs of doors with vertical rod devices. Provide touch bars in lieu of conventional crossbars and arms as required by the Basis of Design in the Door Hardware Sets. Provide escutcheons not less than 7 by 2-1/4 inch.

2.3.4.1 Non-Rated Doors

At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL 325 UL 305. Provide proper fasteners as required by manufacturer including sex nuts and bolts.

2.3.4.2 Flush End Caps

Provide heavy weight impact resistant flush end caps made of architectural metal in the same finish as the devices as in the Door Hardware Sets. Plastic end caps will not be acceptable.

2.3.4.3 Rail Sizing

Provide exit device rails factory sized for proper door width application.

2.3.5 Cylinders and Cores

2.3.5.1 General

Cylinder manufacturer to have minimum (10) years' experience designing secured master key systems and have on record a published security keying system policy.

2.3.5.2 Source Limitations

Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

2.3.5.3 Cylinders

ANSI/BHMA A156.5. Original manufacturer cylinders complying with the following:

a. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
b. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
c. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes

2.3.5.4 Permanent Cores

Lock cylinders shall be Best Mortise Cylinder Key system or equal to continue the USMA Garrison's master key system. Interchangeable core locks are to be compatible with existing USMA Garrison's "Best"

manufactured locks. Provide Removable Cores with core insert removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware. Provide removable core (small format) as specified in Door Hardware Sets. Finish face to match lockset.

2.3.5.5 Construction Cores

Provide disposable temporary cores to requirements of lockset manufacturer for cylinders that will receive permanent cores by Best. Temporary cores shall be small format 7 pin type as specified in Door Hardware Sets.

2.3.6 Electrified Hardware

Comply with the requirements of NFPA 70 for wiring of electrified hardware.

2.3.6.1 Electromechanical Exit Devices

Electrified Conventional Push Rail Devices (Heavy Duty): Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as required by the Basis of Design in the Door Hardware Sets.

2.3.6.1.1 Electrified Options

As indicated by the Basis of Design in the Door Hardware Sets, provide electrified exit device options including: electric latch retraction, electric dogging, outside door trim control, touchbar monitoring and request-to-exit signaling. Unless otherwise indicated by the Basis of Design, provide electrified exit devices standard as fail secure

2.3.6.2 Electric Strikes and Frame Mounted Actuators

Provide in accordance with ANSI/BHMA A156.31, Grade 1. Provide electric strikes and actuators as required to meet operational requirements. Provide electric strikes that remain secure during power failure. Provide battery backup for continued operation during power failure. Provide strikes and actuators with a minimum opening force of 2300 pounds. Provide facility interface devices that use direct current (dc) power to energize the solenoids. Provide electric strikes and actuators that incorporate end-of-line resistors to facilitate line supervision by the system. If not incorporated into the electric strike or local controller, provide metal oxide resistors (MOVs) to protect the controller from reverse current surges.

2.3.6.2.1 Solenoid

Provide actuating solenoid for strikes and actuators that are rated for continuous duty, cannot dissipate more than 12 Watts and must operate on 12 or 24 Volts dc. Inrush current cannot exceed 1 ampere and the holding current cannot be greater than 500 milliamperes. Actuating solenoid must move from fully secure to fully open positions in less than 500 milliseconds.

2.3.6.2.2 Signal Switches

Provide strikes and actuators with signal switches to indicate to the system when the bolt is not engaged or the strike mechanism is unlocked. Signal switches must report a forced entry to the system.

2.3.6.2.3 Coordination

Provide electric strikes and actuators of a size, weight and profile compatible with each specified door frame. Field verify installation clearances prior to procurement.

2.3.6.2.4 Mounting Method

Provide electric strikes and actuators suitable for use with single and double doors, with mortise or rim type hardware specified, and for right or left hand mounting as specified. In double door installations, locate the lock in the active leaf and monitor the fixed leaf.

2.3.6.3 Electrified Mortise Locks

Provide in accordance with ANSI/BHMA A156.25, Grade 1 (Heavy Duty). Provide electrified mortise locks of type and design as indicated by the Basis of Design in the Door Hardware Sets. Provide facility interface devices that use dc power to energize solenoids. Provide solenoids, resisters, and signal switches in accordance with paragraph ELECTRIC STRIKES AND FRAME MOUNTED ACTUATORS.

2.3.6.3.1 Electrified Lock Options

As indicated by the Basis of Design in the Door Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, and request-to-exit signaling. Unless otherwise indicated, provide electrified locksets standard as fail secure.

2.3.6.4 Power Transfer Hinges

Provide power transfer hinges with each electrified lock that route power and monitoring signals from the lockset to the door frame. Coordinate power transfer hinges with door frames.

2.3.6.5 Card Readers and Keypad Access Control Hardware

Card Reader/Keypads shall be Hirsch Identive CR-SCM-CCLK so as integrate into the USMA access control system. Provide dc power, power transfer, and wiring as required for each installation. Coordinate installation with work of access control system and intrusion detection system. Coordinate access control hardware with corresponding devices and systems specified in Division 28 ELECTRONIC SECURITY SYSTEMS (ESS).

2.3.6.6 Release Devices

In accordance with ANSI/BHMA A156.15, Grade 1.

Provide wall and floor mounted Electromagnetic release devices connected to smoke detecting devices.

At Stair 3 and 4 first floor landing provide electromagnetic release devices (hold-opens) at egress gates to basement level, connected to fire alarm system.

2.3.7 Lock Trim

Provide cast, forged, or heavy wrought construction and commercial plain

design for lock trim.

2.3.7.1 Knobs and Roses

Provide in accordance with ANSI/BHMA A156.2 and ANSI/BHMA A156.13 for knobs, roses, and escutcheons. For unreinforced knobs, roses, and escutcheons, provide a 0.050 inch thickness. For reinforced knobs, roses, and escutcheons, provide an outer shell thickness of 0.035 inch and a combined total thickness of 0.070 inch, except at knob shanks. Provide knob shanks 0.060 inch thick.

2.3.7.2 Lever Handles

Provide lever handles where indicated in the Hardware Schedule. Provide in accordance with ANSI/BHMA A156.3 for mortise locks of lever handles for exit devices. Provide lever handle locks with a breakaway feature (such as a weakened spindle or a shear key) to prevent irreparable damage to the lock when force in excess of that specified in ANSI/BHMA A156.13 is applied to the lever handle. Provide lever handles return to within 1/2 inch of the door face.

2.3.7.3 Texture

Provide knurled or abrasive coated knobs or lever handles for doors which are accessible to blind persons and which lead to dangerous areas.

2.3.8 Keys

Furnish one file key, one duplicate key, and one working key for each key change and for each master and grand master keying system. Furnish one additional working key for each lock of each keyed-alike group. Furnish two additional keys for each sleeping room. Furnish a quantity of key blanks equal to 20 percent of the total number of file keys. Stamp each key with appropriate key control symbol and "U.S. property - do not duplicate." Do not place room number on keys.

2.3.8.1 Construction Keying

Provide construction master keys in quantity as required by project Contractor. Replace construction cores with permanent cores.

2.3.9 Door Bolts

Provide in accordance with ANSI/BHMA A156.16. Provide dustproof strikes for bottom bolts, except at doors having metal thresholds. Provide automatic latching flush bolts in accordance with ANSI/BHMA A156.3, Type 25.

2.3.10 Closers

2.3.10.1 General

a. Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.

b. Closers to comply with UL 10C and UBC 7-2 for Positive Pressure Fire

Test and be UL listed for use of fire rated doors.

c. Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use.

d. Provide heavy duty, forged steel closer arms unless otherwise indicated by the Basis of Design in the Door Hardware Sets.

e. Where closers are indicated to have mechanical dead-stop, provide heavy duty arms and brackets with an integral positive stop. Where closers are indicated to have mechanical hold open, provide heavy duty units with an additional built-in mechanical holder assembly designed to hold open against normal wind and traffic conditions. Holder to be manually selectable to on-off position. Where closers are indicated to have a cushion-type stop, provide heavy duty arms and brackets with spring stop mechanism to cushion door when opened to maximum degree.

f. Install closers on doors for optimum aesthetics. Avoid installation on the exterior or corridor side of doors where possible. Provide drop plates or other accessories as required for proper mounting.

2.3.10.2 Surface-Mounted Door Closers

ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units and high impact, non-corrosive plastic covers standard.

2.3.10.3 Concealed Floor Closer

Grade 1; with cement case and cast-iron closer body case and top pivot.

a. Closer Type: Center pivoted; include top pivot.

b. Door-Swing Type: Single acting.

c. Fire Rated: Listed for use in labeled fire-rated assemblies where indicated.

d. Function: Manually selected hold open.

e. Backcheck: Factory preset.

f. Closing Power Adjustment: At least 35 percent more than minimum tested value.

g. Case Depth: Regular, 4 inches.

h. Floor Plates: Provide flush cover plates matching door hardware finish unless thresholds are indicated.

1. Material: Aluminum.

2.3.10.4 Concealed Overhead Closer

Grade 1; mortised into head frame; with cast-metal body and exposed cover plate.

a. Type: Concealed arm and track, butt or pivot hung, single acting.

b. Arm: Manually selected hold open.

c. Track: Manually selected hold open.

d. Cover Plate Material: Aluminum.

e. Backcheck: Factory preset.

f. Closing Power Adjustment: At least 35 percent more than minimum tested value.

2.3.10.5 Identification Marking

Engrave each closer with manufacturer's name or trademark, date of manufacture, and manufacturer's size designation in locations that will be visible after installation w/ removal of the cover.

2.3.11 Overhead Holders

Provide in accordance with ANSI/BHMA A156.8.

2.3.12 Door Protection Plates

Provide in accordance with ANSI/BHMA A156.6.

2.3.12.1 Sizes of Mop and Kick Plates

2 inch less than door width for single doors; 1 inch less than door width for pairs of doors. Provide 10 inch kick plates for flush doors. Provide 6 inch mop plates.

2.3.13 Door Stops and Silencers

Provide in accordance with ANSI/BHMA A156.16. Silencers Type L03011. Provide three silencers for each single door, two for each pair.

2.3.14 Padlocks

Provide in accordance with ASTM F883, with 7-pin SFIC keying, key retention and weather cover..

2.3.15 Hasps

Provide in accordance with ANSI/BHMA A156.20.

2.3.16 Crash Chains

Provide in accordance with ANSI/BHMA A156.16. Extra heavy duty, solid welded, adjustable length steel twist chain with attachment plates and compression springs at each end.

2.3.17 Thresholds

Provide in accordance with ANSI/BHMA A156.21. Use J35100, with vinyl or silicone rubber insert in face of stop, for exterior doors opening out, unless specified otherwise.

2.3.18 Weatherstripping Gasketing

2.3.18.1 General

Weatherstripping, smoke seals, and other gasketing are to be of type and design as required by the Basis of Design in the Door Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners.

2.3.18.2 Smoke Seals

ANSI/BHMA A156.22. Provide products complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to USMA, at smoke controlled openings shown on drawings, based on testing according to UL 1784, Categories H and J. Provide smoke gasketing per Basis of Design in Hardware Set Schedule. Meet NFPA 252, NFPA 80, and UL 10C positive pressure.

2.3.18.3 Replaceable Seal Strips

Provide only those products where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

2.3.19 Soundproofing Gasketing

Provide in accordance with ANSI/BHMA A156.22. Provide adjustable doorstops at heads,jambs and automatic door bottoms in accordance with the hardware set, of extruded aluminum, clear (natural), surface applied, with vinyl fin seals between plunger and housing. Provide doorstops with solid neoprene tube, silicone rubber, or closed cell sponge gasket. Provide door bottoms with adjustable operating rod and silicone rubber or closed cell sponge neoprene gasket. Provide doorstops that are mitered at corners. Provide type and function designation where specified in paragraph HARDWARE SETS.

2.3.20 Rain Drips

Provide in accordance with ANSI/BHMA A156.22. Provide rain drips in type and design required by the Basis of Design in the Door Hardware Sets. Set drips in sealant and fasten with stainless steel screws.

2.3.20.1 Door Rain Drips

Approximately 1-1/2 inch high by 5/8 inch projection. Align bottom with bottom edge of door.

2.3.20.2 Overhead Rain Drips

Approximately 1-1/2 inch high by 2-1/2 inch projection. Align bottom with door frame rabbet.

2.3.21 Auxiliary Hardware (Other than locks)

Provide in accordance with ANSI/BHMA A156.16, Grade 1.

2.3.22 Special Tools

Provide special tools, such as spanner and socket wrenches and dogging keys, as required to service and adjust hardware items.

2.4 FASTENERS

Provide fasteners of type, quality, size, and quantity appropriate to the specific application. Fastener finish to match hardware. Provide stainless steel or nonferrous metal fasteners in locations exposed to weather. Verify metals in contact with one another are compatible and will avoid galvanic corrosion when exposed to weather.

2.5 FINISHES

Provide in accordance with ANSI/BHMA A156.18. Provide all hardware in Satin Brass unless otherwise noted, finishes are shown in Door Hardware Sets.

2.6 KEY CABINET AND CONTROL SYSTEM

Provide in accordance with ANSI/BHMA A156.5, Type required to yield a capacity (number of hooks) of 50 percent greater than the number of key changes used for door locks.

PART 3 EXECUTION

3.1 INSTALLATION

Provide hardware in accordance with manufacturers' printed installation instructions. Fasten hardware to wood surfaces with full-threaded wood screws or sheet metal screws. Provide machine screws set in expansion shields for fastening hardware to solid concrete and masonry surfaces. Provide toggle bolts where required for fastening to hollow core construction. Provide through bolts where necessary for satisfactory installation.

3.1.1 Weatherstripping Installation

Provide full contact, weathertight seals that allow operation of doors without binding the weatherstripping.

3.1.1.1 Spring Tension Type Weatherstripping

Provide spring tension type on heads and jambs. Provide bronze nails with bronze. Provide stainless steel nails with stainless steel. Space nails not more than 1-1/2 inch on center.

3.1.2 Soundproofing Installation

Provide as specified for stop applied weatherstripping.

3.1.3 Threshold Installation

Extend thresholds the full width of the opening and notch end for jamb

stops. Set thresholds in a full bed of sealant and anchor to floor with cadmium-plated, countersunk, stainless steel screws in expansion sleeves. For aluminum thresholds placed on top of concrete surfaces, coat the underside surfaces that are in contact with the concrete with fluid applied waterproofing as a separation measure prior to placement.

3.2 FIRE DOORS AND EXIT DOORS

Provide hardware in accordance with NFPA 72 for door alarms, NFPA 80 for fire doors, NFPA 101 for exit doors, and NFPA 252 for fire tests of door assemblies. .

3.3 HARDWARE LOCATIONS

Provide in accordance with SDI/DOOR A250.8, unless indicated or specified otherwise.

a. Kick Plates: Push side of single-acting doors. Both sides of double-acting doors.

b. Mop Plates: Bottom flush with bottom of door.

3.4 KEY CABINET AND CONTROL SYSTEM

Locate where directed by the Contracting Officer. Tag one set of file keys and one set of duplicate keys. Place other keys in appropriately marked envelopes, or tag each key. Provide complete instructions for setup and use of key control system. On tags and envelopes, indicate door and room numbers or master or grand master key.

3.5 FIELD QUALITY CONTROL

After installation, protect hardware from paint, stains, blemishes, and other damage until acceptance of work. Submit notice of testing 15 days before scheduled, so that testing can be witnessed by the Contracting Officer. Adjust hinges, locks, latches, bolts, holders, closers, and other items to operate properly. Demonstrate that permanent keys operate respective locks, and give keys to the Contracting Officer. Correct, repair, and finish, errors in cutting and fitting and damage to adjoining work.

3.6 HARDWARE SETS

The attached DOOR HARDWARE SET SCHEDULE represents the design intent of the Government. These sets are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the Contracting Officer with corrections made prior to the bidding process. Necessary items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

-- End of Section --

DOOR HARDWARE SCHEDULE

Hardware Sets

Set: 1.0

Doors: B301

1 Continuous Hinge (A31031G)		087100
1 Continuous Hinge (A31331G)		087100
1 Electric Power Transfer*	10B	087100
1 Automatic Flush Bolt (Type 27)	US10BE	087100
1 Fail Secure Lock (E01, E06)	613E	087100
1 Coordinator (Type 21A)	Black	087100
2 Surface Closer (C02021-PT4G)	690	087100
1 Threshold (J36100)		087100
2 Sweep (R3D534)		087100
1 Frame Harness		087100
1 Door Harness		087100
2 Position Switch (E08)*		087100
1 Card Reader		
1 Power Supply*		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Perimeter/meeting stile seals by frame/door supplier.
• Electronic Operation: Valid card unlocks outside lever or key retracts latchbolt. Request to exit shows authorized egress. Free egress at all times. In case of power loss, door remains locked and latched.

Set: 2.0

Doors: B307B

1 Continuous Hinge (A31031G)		087100
1 Exit Device (Type 1, 01)	613E	087100
1 Surface Closer (C02021-PT4G)	690	087100
1 Threshold (J36100)		087100
1 Rain Guard (R0Y976)		087100
1 Sweep (R3D534)		087100
1 Position Switch (E08)*		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Perimeter/meeting stile seals by frame/door supplier.

Set: 3.0

Doors: 400A

3 Hinge (A8112)		PE	087100
1 Storeroom Lock (F07)	613E	YA	087100
1 Interchangeable Core (E09241)	606	YA	087100
1 Surface Closer (C02021-PT4G)	690		087100
1 Kick Plate (J102)	US32D		087100
1 Threshold (J36100)		PE	087100
1 Rain Guard (R0Y976)		PE	087100
1 Gasketing (R3E164)		PE	087100
1 Sweep (R3D534)		PE	087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.

Set: 3.1

Doors: 400B Interior Existing Door

3 Hinge (A8112)	US10B	087100
1 Passage Latch (F01)	613E	087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Coordinate hardware to work with existing door preparations. All other existing hardware to remain

Set: 4.0

Doors: B201, 100A, 101

2 Electric Power Transfer*	EL-CEPT	10B	SU	087100
2 Floor Closer (CO6041)	27N	613	RF	087100
4 Intermediate Pivot (C07321)*	M19	613	RF	087100
1 Exit Device (Type 2, 02, E01, E04)	7170 LBR B MELR EO	613E	YA	087100
1 Exit Device (Type 2, 03, E01, E04)	7170 LBR B MELR 121NL	613E	YA	087100

	Temp Core			
2 Interchangeable Core (E09241)	A600	626	YA	087100
1 Mortise Mullion Cylinder Housing (E09251)	K660	626	YA	087100
2 Door Pull (J402)	RM5670 12" X Mtg-Type 1	US10BE	RO	087100
1 Threshold (J36100)	2549D		PE	087100
1 Gasketing (R0Y154)	S88DL		PE	087100
2 Sweep (R3D534)	345DV		PE	087100
1 Astragal (R3E734)	369DP		PE	087100
2 Frame Harness	QC-C1500P		MK	087100
2 Door Harness	QC-C___		MK	087100
2 Position Switch (E08)*	DPS-M-BK		SU	087100
1 Card Reader	BY SECURITY INTEGRATOR			
1 Power Supply*	AQDxx (TO SUIT)		SU	087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Electronic Operation: Valid card or key retracts latchbolt. Request to exit shows authorized egress. Free egress at all times. In case of power loss, door remains locked and latched.
For the new exterior wood doors BOD parts numbers are being provided – Refer to the project sole source list

Set: 5.0

Doors: R101

1 Continuous Hinge (A31031G)			PE	087100
1 Storeroom Lock (F07)		626	YA	087100
1 Interchangeable Core (E09241)		626	YA	087100
1 Surface Closer (C02021-PT4G)		689		087100
1 Kick Plate (J102)		US32D		087100
1 Threshold (J36100)			PE	087100
1 Rain Guard (R0Y976)			PE	087100
1 Gasketing (R3E164)			PE	087100
1 Sweep (R3D534)			PE	087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.

Set: 6.0

Doors: XB301

3 Hinge (A8112)	US10B	087100
1 Storeroom Lock (F07)	613E	087100
1 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02021-PT4G)	690	087100
1 Threshold (J36100)		087100
1 Gasketing (R0Y154)		087100
1 Sweep (R3B434)		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Coordination of existing hinge, lock, and strike preparations in existing openings shall occur prior to submittals of hardware schedules.
• Coordinate new hardware with existing door and/or frame.

Set: 7.0

Doors: 100B, 100C

6 Hinge (A8112)	626	087100
2 Electric Power Transfer*		087100
1 Tubular Exit Device*	630	087100
1 Tubular Exit Device*	630	087100
1 Electric Strike*		087100
2 Interchangeable Core (E09241)	626	087100
1 Mortise Mullion Cylinder Housing (E09251)	626	087100
2 Surface Closer (C02021-PT4G)	689	087100
1 Kick Plate (J102)	US32D	087100
(at door 100B only)		
2 Frame Harness		087100
2 Door Harness		087100
2 Position Switch (E08)*		087100
1 Card Reader		
1 Power Supply*		087100
1 Motion Sensor*		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Perimeter/meeting stile seals by frame/door supplier.

• Electronic Operation: Valid card or key unlocks electric strike. Request to exit shows authorized egress. Free egress at all times. In case of power loss, door remains locked and latched.

Set: 8.0

Doors: 150B

3 Hinge (A8111)	US26D	087100
1 Electric Power Transfer*		087100
1 Exit Device (Type 1, 01, E0431)	US32D	087100
1 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Door Stop (L02251 / L02121)	US26D	087100
1 Adhesive Gasketing (R0Y154)		087100
1 Door Bottom (R3G324)*		087100
1 Wiring Harness		087100
1 Frame Harness		087100
1 Door Harness		087100
1 Position Switch (E08)*		087100
1 Card Reader		
1 Power Supply*		087100

Notes: *Waiver may be required to comply with Trade Agreement Act.
• Perimeter/meeting stile seals by frame/door supplier.
• Coordinate seals with door & frame manufacturer.
• Electronic Operation: Valid card shunts alarm function; Depressing touchbar without valid card initiates alarm function while permitting immediate egress. Free egress at all times.
• Coordinate exit device manufacturer at doors 150A & 150B to ensure they are the same.

Set: 9.0

Doors: 172, 235, 346, B110, B150, B220,

3 Hinge (A8111)	US26D	087100
1 Electric Power Transfer*		087100
1 Fail Secure Lock (E01, E06)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Door Stop (L02251 / L02121)	US26D	087100
1 Frame Harness		087100
1 Door Harness		087100
1 Position Switch (E08)*		087100

1 Card Reader		
1 Power Supply*		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Perimeter/meeting stile seals by frame/door supplier.
• Electronic Operation: Valid card unlocks outside lever or key retracts latchbolt. Request to exit shows authorized egress. Free egress at all times. In case of power loss or fire alarm, door remains locked and latched.

Set: 9.1

Doors: 145, 219, 242, 325, 422, B172, B237

3 Hinge (A8111)	US26D	087100
1 Electric Power Transfer*		087100
1 Fail Secure Lock (E01, E06)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Kick Plate (J102)	US32D	087100
1 Door Stop (L02251 / L02121)	US26D	087100
3 Silencer (L03011)		087100
1 Frame Harness		087100
1 Door Harness		087100
1 Position Switch (E08)*		087100
1 Card Reader		
1 Power Supply*		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Electronic Operation: Valid card unlocks outside lever or key retracts latchbolt. Request to exit shows authorized egress. Free egress at all times. In case of power loss or fire alarm, door remains locked and latched.

Set: 10.0

Doors: 170B, 230B

3 Hinge (A8111)	US26D	087100
1 Electric Power Transfer*		087100
1 Fail Secure Exit Device w/ Delayed Egress (E06, A156.24)	630	087100
2 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Door Stop (L02251 / L02121)	US26D	087100

3 Silencer (L03011)		087100
1 Frame Harness		087100
1 Door Harness		087100
1 Position Switch (E08)*		087100
2 Card Reader		
1 Power Supply*		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Perimeter/meeting stile seals by frame/door supplier.
• Electronic Operation: Ingress side, Valid card unlocks outside lever or key retracts latchbolt. Egress side, Valid card shunts delayed egress function; Depressing touchbar for more than two seconds initiates delayed egress function. In case of power loss or fire alarm, delayed egress function drops out while ingress side of the door remains locked and latched.

Set: 11.0

Doors: 131, 132, 133, 134, 135, 141, 142, 174, 211, 212, 213, 214, 215, 216, 222, 223, 226, 234, 236, 321, 322, 323, 331, 332, 333, 350, 351, B111, B112, B113, B114, B115, B116, B131, B132, B133, B134, B141, B142, B143, B144, B151, B152, B153, B154, B155, B157, B158, B221, B222, B223, B224, B225, B226

3 Hinge (A8112)	US26D	087100
1 Office Lock (F04)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Adhesive Gasketing (R0Y154)		087100
1 Door Bottom (R3G324)*		087100
1 Door Stop (L02251 / L02121)	US26D	087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Coordinate seals with aluminum door & frame manufacturer.

Set: 12.0

Doors: 150A

3 Hinge (A8111)	US26D	087100
1 Exit Device (Type 1, 08)	630	087100

1 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Door Stop (L02251 / L02121)	US26D	087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Perimeter/meeting stile seals by frame/door supplier.
• Coordinate exit device manufacturer at doors 150A & 150B to ensure they are the same.

Set: 13.0

Doors: B213

3 Hinge (A8112)	US26D	087100
1 Classroom Lock (F05)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Door Stop (L02251 / L02121)	US26D	087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Perimeter/meeting stile seals by frame/door supplier.

Set: 14.0

Doors: 110

3 Hinge (A8112)	US26D	087100
1 Classroom Lock (F05)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Door Stop (L02251 / L02121)	US26D	087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Perimeter/meeting stile seals by frame/door supplier.

Set: 15.0

Doors: 220A, 220B

3 Hinge (A8112)	US26D	087100
1 Classroom Lock (F05)	626	087100
1 Interchangeable Core (E09241)	626	087100

1 Surface Closer (C02011 / C02021)	689	087100
1 Door Stop (L02251 / L02121)	US26D	087100
1 Adhesive Gasketing (R0Y154)		087100
1 Door Bottom (R3G324)*		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Coordinate seals with aluminum door & frame manufacturer.

Set: 16.0

Doors: 218

3 Hinge (A8112)	US26D	087100
1 Classroom Lock (F05)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Surface Cam Closer (C02251)	689	087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Perimeter/meeting stile seals by frame/door supplier.

Set: 17.0

Doors: 173

3 Hinge (A8112)	US26D	087100
1 Privacy Lock (F19)	626	087100
1 Door Stop (L02251 / L02121)	US26D	087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Perimeter/meeting stile seals by frame/door supplier.

Set: 18.0

Doors: 111, 112, 113, 224, 336

3 Hinge (A8112)	US26D	087100
1 Passage Latch (F01)	626	087100
1 Door Stop (L02251 / L02121)	US26D	087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.

• Perimeter/meeting stile seals by frame/door supplier.

Set: 19.0

Doors: 120, 130, 140, B130, B140, 208B

3 Hinge (A8112)	US26D	087100
1 Passage Latch (F01)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Door Stop (L02251 / L02121)	US26D	087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Perimeter/meeting stile seals by frame/door supplier.

Set: 20.0

Doors: 334

3 Hinge (A8112)	US26D	087100
1 Passage Latch (F01)	626	087100
1 Surface Cam Closer (C02251)	689	087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Perimeter/meeting stile seals by frame/door supplier.

Set: 21.0

Doors: 205, 208, 210A, 210B, 320, 330, 334B

3 Hinge (A8112)	US26D	087100
1 Keypad Lock*	626	281500
1 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Door Stop (L02251 / L02121)	US26D	087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Perimeter/meeting stile seals by frame/door supplier.
• Valid code unlocks outside lever. Key retracts latchbolt. Free egress at all times.

Set: 22.0

Doors: 170A, 230A

1 Header*	US32D		084126
4 Door Rail/Patch*	US32D		084126
1 Single Acting Door Stop*	US28		084126
2 Bottom Pivot*	AL		084126
2 Interchangeable Core (E09241)	626		087100
2 Rim Cylinder Housing (E09261)	626		087100
2 Locking Pull*	US32D		084126
2 Dust Proof Strike (L04021)	US26D		084126
2 Concealed Closer*			084126

Notes:
• Door to remain unlocked during occupancy.
• Locking Pull to match architectural drawings (half-height requirement)

Set: 23.0

Doors: 160

1 Header*	US32D	GS	084126
2 Door Rail/Patch*	US32D	GS	084126
1 Single Acting Door Stop*	US28		084126
1 Bottom Pivot*	AL		084126
1 Interchangeable Core (E09241)	626		087100
1 Rim Cylinder Housing (E09261)	626		087100B215
1 Locking Pull*	US32D		084126
1 Dust Proof Strike (L04021)	US26D		084126
1 Concealed Closer*			084126

Notes:
• Door to remain unlocked during occupancy.
• Locking Pull to match architectural drawings (half-height requirement)

Set: 24.0

Doors: 171, 231

1 Header*	US32D	084126
2 Door Rail/Patch*	US32D	084126
1 Bottom Pivot*	AL	084126
1 Top Pivot*	US28	084126
1 Bottom Rail Deadbolt*	Aluminum	084126
1 Interchangeable Core (E09241)	626	087100

1 Mortise Cylinder Housing (E09251)	626	087100
1 Thumbturn*	US28	084126
1 Door Pull	US32D	084126

Set: 25.0

Doors: 200A, 300B

6 Hinge (A8111)	US26D	087100
2 Electric Power Transfer*		087100
1 Removable Mullion (Type 22)	600	087100
1 Exit Device (Type 1, 03, E01, E04)	630	087100
1 Exit Device (Type 1, 02, E01, E04)	630	087100
2 Interchangeable Core (E09241)	626	087100
1 Mortise Mullion Cylinder Housing (E09251)	626	087100
2 Surface Closer (C02021-PT4G)	689	087100
2 Kick Plate (J102)	US32D	087100
1 Adhesive Gasketing (R0Y154)	Black	087100
1 Astragal (R3E734) (acoustical)		087100
2 Frame Harness		087100
2 Door Harness		087100
2 Position Switch (E08)*		087100
1 Card Reader		
1 Power Supply*		087100

Notes: *Waiver may be required to comply with Trade Agreement Act.
• Electronic Operation: Valid card or key retracts latchbolt. Request to exit shows authorized egress. Free egress at all times. In case of power loss, door remains locked and latched.

Set: 26.0

Doors: X2-101, X3-101, XB1-101

3 Hinge (A8111)	US26D	087100
1 Electric Power Transfer*		087100
1 Exit Device (Type 1, E01, E05)	630	087100
1 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Kick Plate (J102)	US32D	087100
1 Adhesive Gasketing (R0Y154)		087100
1 Frame Harness		087100
1 Door Harness		087100

1 Position Switch (E08)*		087100
1 Card Reader		
1 Power Supply*		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Electronic Operation: Valid card unlocks outside lever or key retracts latchbolt. Request to exit shows authorized egress. Free egress at all times. In case of power loss or fire alarm, door remains unlocked and latched.

Set: 27.0

Doors: B303

6 Hinge (A8111)	US26D	087100
1 Removable Mullion (Type 22)	600	087100
1 Exit Device (Type 1, 03)	630	087100
1 Exit Device (Type 1, 01)	630	087100
2 Interchangeable Core (E09241)	626	087100
1 Mortise Mullion Cylinder Housing (E09251)	626	087100
2 Surface Closer (C02021-PT4G)	689	087100
2 Kick Plate (J102)	US32D	087100
1 Adhesive Gasketing (R0Y154)		087100
1 Astragal (R3E734)		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.

Set: 28.0

Doors: 316

3 Hinge (A8111)	US26D	087100
1 Exit Device (Type 1, 03)	630	087100
1 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Kick Plate (J102)	US32D	087100
1 Door Stop (L02251 / L02121)	US26D	087100
3 Silencer (L03011)		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.

Set: 29.0

Doors: B307A, X1-101, X1-102, X2-102, X3-102, X4-102, XB1-102, XB-201, XB2-102

3 Hinge (A8111)	US26D	087100
1 Exit Device (Type 1, 14)	630	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Kick Plate (J102)	US32D	087100
1 Door Stop (L02251 / L02121)	US26D	087100
1 Adhesive Gasketing (R0Y154)		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.

Set: 30.0

Doors: 300A

3 Hinge (A8111)	US26D	MK 087100
2 Exit Device (Type 2, 01)	630	087100
2 Surface Closer (C02011 / C02021)	689	087100
4 Kick Plate (J102)	US32D	087100
2 Door Stop (L02251 / L02121)	US26D	087100
1 Adhesive Gasketing (R0Y154)		087100
2 Door Bottom (R3G324)*		087100
1 Astragal (R3E734) (acoustical)		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.

Set: 31.0

Doors: 100D, 100E, 200B, 300C, 400, B100A, B100B, B2100B

8 Pocket Pivot (CO7611)*	626	087100
2 Exit Device (Type 2, 14)	630	087100
2 Surface Closer (C02011 / C02021)	689	087100
2 Electromagnetic Holder (C00011)*	689	087100
1 Adhesive Gasketing (R0Y154)		087100
1 Astragal (R3E734)		087100

Notes: *Waiver may be required to comply with Trade Agreement Act.
• Connect holder to fire alarm system to release upon fire alarm.

Set: 32.0

Doors: B2100A

4 Pocket Pivot (CO7611)*	626	087100
1 Exit Device (Type 1, 14)	630	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Electromagnetic Holder (C00011)*	689	087100
1 Adhesive Gasketing (R0Y154)		087100

Notes: *Waiver may be required to comply with Trade Agreement Act.
• Connect holder to fire alarm system to release upon fire alarm.

Set: 33.0

Doors: 410A, B159

3 Hinge (A8111)	US26D	087100
1 Electric Power Transfer*		087100
1 Fail Secure Lock (E01, E06)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Kick Plate (J102)	US32D	087100
1 Door Stop (L02251 / L02121)	US26D	087100
3 Silencer (L03011)		087100
1 Frame Harness		087100
1 Door Harness		087100
1 Position Switch (E08)*		087100
1 Card Reader		
1 Power Supply*		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Electronic Operation: Valid card unlocks outside lever or key retracts latchbolt. Request to exit shows authorized egress. Free egress at all times. In case of power loss or fire alarm, door remains locked and latched.
• Install hardware for door 410A for future card reader installation.

Set: 34.0

Doors: B156

3 Hinge (A8111)	US26D	087100
1 Electric Power Transfer*		087100
1 Fail Secure Lock (E01, E06)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Surface Cam Closer (C02251)	689	087100
1 Kick Plate (J102)	US32D	087100
3 Silencer (L03011)		087100
1 Frame Harness		087100
1 Door Harness		087100
1 Position Switch (E08)*		087100
1 Card Reader		
1 Power Supply*		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Electronic Operation: Valid card unlocks outside lever or key retracts latchbolt. Request to exit shows authorized egress. Free egress at all times. In case of power loss or fire alarm, door remains locked and latched..

Set: 35.0

Doors: 146, 209, 221, 337, 412, B107, B164, B215, B231, B236, B238, B304, B305

6 Hinge (A8112)	US26D	087100
2 Flush Bolt (L04251/L04261)	US26D	087100
1 Dust Proof Strike (L04021)	US26D	087100
1 Storeroom Lock (F07)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
2 Kick Plate (J102)	US32D	087100
at doors 221, 412, B164, B231, B236, B238, B304, B305		
2 Door Stop (L02251 / L02121)	US26D	087100
2 Silencer (L03011)		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.

Set: 36.0

Doors: B233

6 Hinge (A8112)	US26D	087100
2 Flush Bolt (L04251/L04261)	US26D	087100
1 Dust Proof Strike (L04021)	US26D	087100
1 Storeroom Lock (F07)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
2 Kick Plate (J102)	US32D	087100
2 Door Stop (L02251 / L02121)	US26D	087100
2 Silencer (L03011)		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Template door closer to swing 180 degrees.

Set: 37.0

Doors: 370, B302

6 Hinge (A8112)	US26D	087100
2 Flush Bolt (L04251/L04261)	US26D	087100
1 Dust Proof Strike (L04021)	US26D	087100
1 Storeroom Lock (F07)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Surf Overhead Stop (CO2541)	630	087100
1 Surface Closer (C02021-PT4G)	689	087100
2 Kick Plate (J102)	US32D	087100
2 Silencer (L03011)		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.

Set: 38.0

Doors: 312

6 Hinge (A8112)	US26D	087100
2 Flush Bolt (L04251/L04261)	US26D	087100
1 Dust Proof Strike (L04021)	US26D	087100
1 Storeroom Lock (F07)	626	087100

1 Interchangeable Core (E09241)	626	087100
1 Surf Overhead Stop (CO2541)	630	087100
1 Surface Closer (C02021-PT4G)	689	087100
2 Kick Plate (J102)	US32D	087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• STC seals by STC door supplier

Set: 39.0

Doors: B165

6 Hinge (A8112)	US26D	087100
2 Flush Bolt (L04251/L04261)	US26D	087100
1 Dust Proof Strike (L04021)	US26D	087100
1 Storeroom Lock (F07)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Surf Overhead Stop (CO2541)	630	087100
1 Surface Cam Closer (C02251)	689	087100
2 Kick Plate (J102)	US32D	087100
2 Silencer (L03011)		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.

Set: 40.0

Doors: 143, 182, 233, 335, B105, B106, B108, B210, B214, B216

3 Hinge (A8112)	US26D	087100
1 Storeroom Lock (F07)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
(no closer required for door 143)		
1 Kick Plate (J102)	US32D	087100
1 Door Stop (L02251 / L02121)	US26D	087100
3 Silencer (L03011)		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Perimeter/meeting stile seals by frame/door supplier on doors with aluminum frames.

Set: 41.0

Doors: 121, 181, 206, 242, 310, 361, 420, 421, B171, B235

3 Hinge (A8112)	US26D	087100
1 Storeroom Lock (F07)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Kick Plate (J102)	US32D	087100
1 Door Stop (L02251 / L02121)	US26D	087100
3 Silencer (L03011)		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Template door closer to swing 180 degrees.

Set: 42.0

Not Used

Set: 43.0

Doors: 413

3 Hinge (A8112)	US26D	087100
1 Office Lock (F04)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Door Stop (L02251 / L02121)	US26D	087100
3 Silencer (L03011)		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.

Set: 44.0

Doors: 313

3 Hinge (A8112)	US26D	087100
1 Office Lock (F04)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Door Stop (L02251 / L02121)	US26D	087100

1 Adhesive Gasketing (R0Y154)		087100
1 Door Bottom (R3G324)*		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.

Set: 45.0

Doors: 340

3 Hinge (A8112)	US26D	087100
1 Classroom Lock (F05)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Kick Plate (J102)	US32D	087100
1 Door Stop (L02251 / L02121)	US26D	087100
3 Silencer (L03011)		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.

Set: 46.0

Doors: 314

3 Hinge (A8112)	US26D	087100
1 Office Lock (F04)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Kick Plate (J102)	US32D	087100
1 Door Stop (L02251 / L02121)	US26D	087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• STC seals by STC door supplier.

Set: 47.0

Doors: 342, 343, 344, 345, 362

3 Hinge (A8112)	US26D	087100
1 Office Lock (F04)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100

1 Kick Plate (J102)	US32D	087100
1 Door Stop (L02251 / L02121)	US26D	087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• STC seals by STC door supplier.

Set: 48.0

Doors: 410B

6 Hinge (A8112)	US26D	087100
2 Flush Bolt (L04251/L04261)	US26D	087100
1 Dust Proof Strike (L04021)	US26D	087100
1 Exit Lock (F31)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Concealed Overhead Holder	689	087100
2 Kick Plate (J102)	US32D	087100
2 Door Stop (L02251 / L02121)	US26D	087100
2 Silencer (L03011)		087100

Notes: *Waiver may be required to comply with Trade Agreement Act.

Set: 49.0

Doors: 317

6 Hinge (A8112)	US26D	087100
2 Flush Bolt (L04251/L04261)	US26D	087100
1 Dust Proof Strike (L04021)	US26D	087100
1 Exit Lock (F31)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
2 Kick Plate (J102)	US32D	087100
2 Door Stop w/ Holder (L01291/L01301)	US26D	087100

Notes: *Waiver may be required to comply with Trade Agreement Act.
• STC seals by STC door supplier.

Set: 50.0

Doors: 341B

3 Hinge (A8112)	US26D	087100
1 Exit Lock (F31)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Kick Plate (J102)	US32D	087100
1 Door Stop w/ Holder (L01291/L01301)	US26D	087100

Notes: *Waiver may be required to comply with Trade Agreement Act.
• STC seals by STC door supplier.

Set: 51.0

Doors: B232

3 Hinge (A8112)	US26D	087100
1 Storeroom Lock (F07)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Kick Plate (J102)	US32D	087100
1 Door Stop (L02251 / L02121)	US26D	087100
3 Silencer (L03011)		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.

Set: 52.0

Doors: 315A, 411

3 Hinge (A8112)	US26D	087100
1 Classroom Lock (F05)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Kick Plate (J102)	US32D	087100
1 Door Stop (L02251 / L02121)	US26D	087100
1 Adhesive Gasketing (R0Y154)		087100
1 Door Bottom (R3G324)*		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.

Set: 53.0

Doors: 311, 341A

3 Hinge (A8112)	US26D	087100
1 Classroom Lock (F05)	626	087100
1 Interchangeable Core (E09241)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Kick Plate (J102)	US32D	087100
1 Door Stop (L02251 / L02121)	US26D	087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• STC seals by door supplier.

Set: 54.0

Doors: 338, 339

3 Hinge (A8112)	US26D	087100
1 Privacy Lock (F19)	626	087100
1 Kick Plate (J102)	US32D	087100
1 Door Stop (L02251 / L02121)	US26D	087100
3 Silencer (L03011)		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.

Set: 55.0

Doors: 207

3 Hinge (A8112)	US26D	087100
1 Privacy Lock (F19)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Mop Plate (J103)	US32D	087100
1 Door Stop (L02251 / L02121)	US26D	087100
3 Silencer (L03011)		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Mop plate at in-swinging doors only.

Set: 56.0

Doors: 315B

3 Hinge (A8112)	US26D	087100
1 Passage Latch (F01)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Kick Plate (J102)	US32D	087100
1 Door Stop (L02251 / L02121)	US26D	087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• STC seals by STC door supplier.

Set: 57.0

Doors: B306

3 Hinge (A8112)	US26D	087100
1 Passage Latch (F01)	626	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Kick Plate (J102)	US32D	087100
1 Door Stop (L02251 / L02121)	US26D	087100
1 Adhesive Gasketing (R0Y154)		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.

Set: 58.0

Doors: 183, 184, 243, 244, 363, 364, 423, 424, B173, B174, B211, B212

3 Hinge (A8111)	US26D	087100
1 Push Plate (J301)	US32D	087100
1 Door Pull w/ Plate (J405)	US32D	087100
1 Surface Closer (C02011 / C02021)	689	087100
1 Kick Plate (J102)	US32D	087100
1 Mop Plate (J103)	US32D	087100
1 Door Stop (L02251 / L02121)	US26D	087100
3 Silencer (L03011)		087100

Notes:
*Waiver may be required to comply with Trade Agreement Act.
• Mop plate at inswinging doors only.

Set: 59.0

Doors: R103

0 All Hardware	EXISTING TO REMAIN	OT

1. GS - ASSA ABLOY Glass Solutions
2. MK – McKinney
3. PE – Pemko
4. SU – Securitron
5. RF – Rixson
6. RO – Rockwood
7. YA – Yale
8. SA – SARGENT
9. NO – Norton
10. OT – Other note to Michelle -need to keep these for hardware set 4

END OF SECTION 080671

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SECTION 08 81 00

GLAZING
05/19

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1	(2015) Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

ASTM INTERNATIONAL (ASTM)

ASTM C509	(2006; R 2015) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM C864	(2005; R 2015) Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM C1021	(2008; R 2014) Standard Practice for Laboratories Engaged in Testing of Building Sealants
ASTM C1036	(2016) Standard Specification for Flat Glass
ASTM C1048	(2018) Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass
ASTM C1087	(2016) Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems
ASTM C1172	(2019) Standard Specification for Laminated Architectural Flat Glass
ASTM C1184	(2014) Standard Specification for Structural Silicone Sealants
ASTM D395	(2016; E 2017) Standard Test Methods for Rubber Property - Compression Set
ASTM E90	(2009; R2016) Standard Test Method for Laboratory Measurement of Airborne Sound

	Transmission Loss of Building Partitions and Elements
ASTM E119	(2020) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E413	(2016) Classification for Rating Sound Insulation
ASTM E1300	(2016) Standard Practice for Determining Load Resistance of Glass in Buildings
ASTM E2190	(2010) Standard Specification for Insulating Glass Unit Performance and Evaluation

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

GLASS ASSOCIATION OF NORTH AMERICA (GANA)

GANA Glazing Manual	(2008) Glazing Manual
GANA Sealant Manual	(2008) Sealant Manual

INSULATING GLASS MANUFACTURERS ALLIANCE (IGMA)

IGMA TB-1200	(1983; R 2016) Guidelines for Insulating Glass Dimensional Tolerances
IGMA TB-3001	(2001) Guidelines for Sloped Glazing
IGMA TM-3000	(1990; R 2016) North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 251	(2006) Standard Methods of Tests of Fire Resistance of Building Construction and Materials
NFPA 252	(2017) Standard Methods of Fire Tests of Door Assemblies
NFPA 257	(2012; ERTA 2017) Standard on Fire Test for Window and Glass Block Assemblies

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

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

16 CFR 1201	Safety Standard for Architectural Glazing Materials

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Insulating Glass

Interior Glazing

Glazing Accessories

Sealants

Joint Backer

SD-04 Samples

Insulating Glass

12" x 12" Samples of each of the following Glass Types

EXTERIOR GLAZING:

Type IGU-1 Clear

Type IGU-2 Translucent

Type IGU-3 Opaque

INTERIOR GLAZING:

TYPE GL-11

TYPE GL-12

TYPE GL-13

Type GL-14

Type GL-15

Type GL-16

Glazing Compound

SD-07 Certificates

Certificates from the manufacturer attesting that the units meet the luminous and solar radiant transmission requirements for heat absorbing glass.

Qualifications of Installer

Qualifications of Manufacturer

Indoor Air Quality of Adhesives and Sealants; S

Certificates of Conformance

Sub certificate from glass manufacturer stating that manufacturer has reviewed glazing details including use of sealants and gaskets and each product provided is recommended for application indicated, and that materials are compatible and will adhere to specified finish.

Submit certification from glass manufacturer stating that manufacturer has reviewed application of heat absorbing or reflective glass for effects of partial or full shading under expected service temperature ranges and that resulting thermal stresses will not reduce.

Submit certificate stating that the glass units can withstand design loads.

SD-08 Manufacturer's Instructions

Setting and Sealing Materials

Glass Setting

Submit glass manufacturer's recommendations for setting and sealing materials and for installation of each type of glazing material specified.

SD-11 Closeout Submittals

Warranty for Insulated Glass Units

Warranty for Monolithic Reflective Glass

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment for glazing, if available; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO

14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for glazing, if available, that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

3. Low-Emitting Materials - Interior adhesives and sealants:

a. Meet the VOC emissions evaluation and meet the VOC content evaluation. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

4. Low-Emitting Materials - Interior mastic coatings:

a. Meet the VOC emissions evaluation and meet the VOC content evaluation. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.3 SYSTEM DESCRIPTION

Fabricate and install watertight and airtight glazing systems to withstand thermal movement and wind loading without glass breakage, gasket failure, deterioration of glazing accessories, or defects in the work. Glazed panels must comply with the safety standards, in accordance with ANSI Z97.1, and comply with indicated wind/snow loading in accordance with ASTM E1300.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver products to the site in unopened containers, labeled plainly with manufacturers' names and brands. Store glass and setting materials in safe, enclosed dry locations and do not unpack until needed for installation. Handle and install materials in a manner that will protect them from damage.

1.5 ENVIRONMENTAL REQUIREMENTS

Do not start glazing work until the outdoor temperature is above40 degrees F and rising, unless procedures recommended by the glass manufacturer and approved by the Contracting Officer are made to warm the glass and rabbet surfaces. Provide ventilation to prevent condensation of moisture on glazing work during installation. Do not perform glazing work during damp or rainy weather.

1.6 WARRANTY

1.6.1 Warranty for Insulated Glass Units

Warranty insulating glass units against development of material obstruction to vision (such as dust, fogging, or film formation on the inner glass surfaces) caused by failure of the hermetic seal, other than through glass breakage, for a 10-year period following acceptance of the work. Provide new units for any units failing to comply with terms of this warranty within 45 working days after receipt of notice from the Government.

1.6.2 Monolithic Reflective Glass

Manufacturer must warrant the monolithic reflective glass to be free of peeling or deteriorating of coating for a period of 10 years after Date of Substantial Completion. Warranty must be signed by manufacturer.

PART 2 PRODUCTS

2.1 PRODUCT SUSTAINABILITY CRITERIA

Building Product Declarations: Provide glazing with EPD and Material Ingredient Report, if available Provide Indoor Air Quality of Adhesives and Sealants.

Indoor Air Quality Certification: Provide glazing sealants applied within the building interior with VOC emissions in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method and VOC content not to exceed 250 g/L.

Provide mirror mastic coatings applied within the building interior with VOC emissions in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method and VOC content not to exceed 300 g/L.

2.2 GLASS

ASTM C1036, unless specified otherwise. In doors and sidelights, provide safety glazing material conforming to 16 CFR 1201.

2.2.1 Clear Glass

For interior glazing (i.e., pass and observation windows), 1/4 inch thick glass should be used.

Type I, Class 1 (clear), Quality q4 (A) . Provide for glazing openings not indicated or specified otherwise. Use double-strength sheet glass or 1/8 inch float glass for openings up to and including 15 square feet, 3/16 inch for glazing openings over 15 square feet but not over 30 square feet, and 1/4 inch for glazing openings over 30 square feet but not over 45 square feet.

2.2.2 Annealed Glass

Annealed glass must be Type I transparent flat type, Class 1 - clear, Quality q3 - glazing select, conforming to ASTM C1036. Refer to insulated glass units for light transmittance and shading coefficient.

2.2.3 Laminated Glass

ASTM C1172, Laminated glass fabricated from two nominal 1/8 inch pieces of Type I, Class 1, Quality Q3, flat annealed; clear glass conforming to ASTM C1036. Flat glass to be laminated together with a minimum of 0.030 inch inch thick, clear polyvinyl butyral laminate, conforming to requirements of 16 CFR 1201 and ASTM C1172. The total thickness of nominally 1/4 inches. Color to be clear.

2.2.3.1 Translucent Laminated Glass

ASTM C1172, Laminated glass fabricated from one outer pane nominal 1/8 inch pieces of Type II, Class 1, Form 3, Quality q5, patterned on #3 surface; annealed clear glass conforming to ASTM C1036 and one inner pane nominal 1/8 inch pane of Type I, Class 1, Quality Q3, flat annealed clear glass conforming to ASTM C1036. Glass panes to be laminated together with a minimum of 0.030 inch inch thick, translucent polyvinyl butyral laminate, conforming to requirements of 16 CFR 1201 and ASTM C1172. The

total thickness of nominally 1/4 inches. Color to be translucent to obscure vision into a room and to retain the general color and appearance of the clear exterior IGU.

2.2.3.2 Interior Laminated Glass

ASTM C1172, Laminated glass fabricated from one outer pane nominal 1/8 inch pieces of Type I, Class 1, Quality q3, flat annealed; clear glass conforming to ASTM C1036 and one inner pane nominal 1/4 inch piece of Type I, Class 1, Quality Q3, flat annealed clear glass conforming to ASTM C1036. Glass panes to be laminated together with a minimum of 0.060 inch thick, clear polyvinyl butyral laminate, conforming to requirements of 16 CFR 1201 and ASTM C1172. The total thickness of nominally 3/8 inches. Color to be clear or opaque per laminated glass schedule.

2.2.3.3 Laminated glass schedule

IGU-1: 1/4" laminated glass, IGU Clear
IGU-2: 1/4" patterned laminated glass, IGU Translucent
GL-12a (Clear) or b (Opaque)or c (gradient transperant): 3/8" interior laminated glass, glazed interior partitions. See Interior Finish Schedule for color

2.2.4 Mirrors

2.2.4.1 Glass Mirrors

Glass for mirrors must be Type I transparent flat type, Class 1-clear, Glazing Quality q1 1/4 inch thick conforming to ASTM C1036. Glass must be coated on one surface with silver coating, copper protective coating, and mirror backing paint. Silver coating must be highly adhesive pure silver coating of a thickness which must provide reflectivity of 83 percent or more of incident light when viewed through 1/4 inch thick glass, and must be free of pinholes or other defects. Copper protective coating must be pure bright reflective copper, homogeneous without sludge, pinholes or other defects, and must be of proper thickness to prevent "adhesion pull" by mirror backing paint. Mirror backing paint must consist of two coats of special scratch and abrasion-resistant paint , and must be baked in uniform thickness to provide a protection for silver and copper coatings which will permit normal cutting and edge fabrication.

2.2.4.2 Glass mirrors schedule

GL-16: provide at interior toilet room mirrors.

2.2.5 Tempered Glass

ASTM C1048, Kind FT (fully tempered), Condition A (uncoated), Type I, Class 1 (transparent), Quality q3, 1/4 inch thick. Color must be clear . . Polish edges that will be exposed in finished work to bright flat polish. Refer to insulated glass units for light transmittance and shading coefficient.

2.2.5.1 Tempered glass schedule

GL-11: provide at interior doors and non-rated door sidelights as indicated;
GL-13: provide at structural glass baluster and frameless all glass interiors partitions, see section 05 72 00 DECORATIVE METAL SPECIALITIES.

GL-14 - provide low iron glass - thickness as required for System 4 wall and door system - Refer to Section 08 41 13

2.2.6 Heat-Strengthened Glass

ASTM C1048, Kind HS (heat strengthened), Condition A (uncoated), Type I, Class 1 (clear) , Quality q3, 1/4 inch thick. Refer to insulated glass units for light transmittance and shading coefficient.

2.2.7 Spandrel Glass

2.2.7.1 Ceramic-Opacified Spandrel Glass

Ceramic-opacified spandrel glass must be Kind HS heat-strengthened transparent flat type, Condition B, coated with a colored ceramic material on No. 2 surface, Quality q3 - glazing select, 1/4 inch thick, conforming to ASTM C1048. Architect to select color from manufacturer's standard color chart. Refer to Insulated Glass Units for light transmittance, shading coefficient, R-value

Ceramic-opacified spandrel glass schedule:

IGU-2: 1/4" ceramic opacified spandrel glass, IGU Opaque

2.2.8 Fire/Safety Rated Glass

2.2.8.1 Fire Protection Rated Glass

Clear tempered and meet 16 CFR 1201 Category I (under 9 square feet) or II (over 9 square feet) impact safety standard. Glass to make 45 minute rating when tested in accordance with NFPA 257 and NFPA 252. Glass to be permanently labeled with appropriate markings.

2.2.8.2 Fire/ Safety Rated Glass Schedule

GL-17: for use at rated egress doors

2.2.8.3 Fire Resistive Rated Glazing

Fire resistive glass must be laminated, with intumescent interlayer, Type I transparent flat type, Class 1-clear and meet 16 CFR 1201 Category I (under 9 square feet) or II (over 9 square feet). Glass must have a 120 minute rating when tested in accordance with ASTM E119 and NFPA 251. Glass must be permanently labeled with appropriate markings.

2.2.8.4 Fire Resistive Rated Glazing Schedule

GL-15 for use at interior fire rated glass partitions - refer to section 08 41 13

2.3 INSULATING GLASS UNITS

Two panes of glass separated by a dehydrated airspace, filled with argon gas and hermetically sealed, conforming to ASTM E2190. Submit performance and compliance documentation for each type of insulating glass.

See section 08 51 13 Aluminum Windows for energy performance requirements for glazed systems (glazing and frames). Glazed panels must be rated for not less than 35 Sound Transmission Class (STC) when tested for laboratory

sound transmission loss according to ASTM E90 and determined by ASTM E413.

Dimensional tolerances must be as specified in IGMA TB-1200. Spacer must be black, roll-formed, steel-reinforced butyl rubber , with bent or tightly welded or keyed and sealed joints to completely seal the spacer periphery and eliminate moisture and hydrocarbon vapor transmission into airspace through the corners. Primary seal must be compressed polyisobutylene and the secondary seal must be a specially formulated silicone.

IGU SCHEDULE

IGU-1 Clear:
Outer Light: 1/4" heat-strengthened or Tempered where required by code glass, clear, with low emissivity coating
Inner Light: 1/4" laminated glass

IGU-2 Translucent:
Outer Light: 1/4" heat-strengthened glass, clear, with low emissivity coating
Inner Light: 1/4" patterned laminated glass

IGU-3 Opaque:
Outer Light: 1/4" ceramic opacified spandrel glass
Inner Light: 1/4" laminated glass

2.3.1 Low Emissivity Coatings

Exterior glass panes for Low-E insulating units must be Type I heat-strengthened flat glass, Class 1-clear with anti-reflective low-emissivity coating complying with ASTM C1048, Condition C on No. 2 surface (inside surface of exterior pane), Quality q3 - glazing select, conforming to ASTM C1036. Color must be clear.

2.4 SETTING AND SEALING MATERIALS

Provide as specified in the GANA Glazing Manual, IGMA TM-3000, IGMA TB-3001, and manufacturer's recommendations, unless specified otherwise herein. Do not use metal sash putty, nonskinning compounds, nonresilient preformed sealers, or impregnated preformed gaskets. Materials exposed to view and unpainted must be gray or neutral color. Sealant testing must be performed by a testing agency qualified according to ASTM C1021.

Submit glass manufacturer's recommendations for setting and sealing materials and for installation of each type of glazing material specified.

2.4.1 Putty and Glazing Compound

Provide glazing compound as recommended by manufacturer for face-glazing metal sash. Putty must be linseed oil type. Do not use putty and glazing compounds with insulating glass or laminated glass.

2.4.2 Glazing Compound

Use for face glazing metal sash. Do not use with insulating glass units or laminated glass.

2.4.3 Sealants

Provide elastomeric and structural sealants.

2.4.3.1 Elastomeric Sealant

ASTM C920, Type S, Grade NS, Class 12.5, Use G. Use for channel or stop glazing wood and metal sash. Sealants must be chemically compatible with setting blocks, edge blocks, and sealing tapes, with sealants used in manufacture of insulating glass units . Color of sealant must be white.

2.4.3.2 Structural Sealant

ASTM C1184, Type S.

2.4.4 Joint Backer

Joint backer must have a diameter size at least 25 percent larger than joint width; type and material as recommended in writing by glass and sealant manufacturer.

2.4.5 Setting Blocks and Edge Blocks

Closed-cell neoprene setting blocks must be dense extruded type conforming to ASTM C509 and ASTM D395, Method B, Shore A durometer between 70 and 90. Edge blocking must be Shore A durometer of 50 (plus or minus 5). Provide silicone setting blocks when blocks are in contact with silicone sealant. Profiles, lengths and locations must be as required and recommended in writing by glass manufacturer. Block color must be black.

2.4.6 Glazing Gaskets

Glazing gaskets must be extruded with continuous integral locking projection designed to engage into metal glass holding members to provide a watertight seal during dynamic loading, building movements and thermal movements. Glazing gaskets for a single glazed opening must be continuous one-piece units with factory-fabricated injection-molded corners free of flashing and burrs. Glazing gaskets must be in lengths or units recommended by manufacturer to ensure against pull-back at corners. Provide glazing gasket profiles as recommended by the manufacturer for the intended application.

2.4.6.1 Fixed Glazing Gaskets

Fixed glazing gaskets must be closed-cell (sponge) smooth extruded compression gaskets of cured elastomeric virgin neoprene compounds conforming to ASTM C509, Type 2, Option 1.

2.4.6.2 Wedge Glazing Gaskets

Wedge glazing gaskets must be high-quality extrusions of cured elastomeric virgin neoprene compounds, ozone resistant, conforming to ASTM C864, Option 1, Shore A durometer between 65 and 75.

2.4.6.3 Aluminum Framing Glazing Gaskets

Glazing gaskets for aluminum framing must be permanent, elastic, non-shrinking, non-migrating, watertight and weathertight.

2.4.7 Accessories

Provide as required for a complete installation, including glazing points, clips, shims, angles, beads, and spacer strips. Provide noncorroding metal accessories. Provide primer-sealers and cleaners as recommended by the glass and sealant manufacturers. Use ASTM C1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to surface.

2.5 MIRROR ACCESSORIES

2.5.1 Mastic

Mastic for setting mirrors must be a polymer type mirror mastic resistant to water, shock, cracking, vibration and thermal expansion. Provide mastic compatible with mirror backing paint, and as approved by mirror manufacturer.

2.5.2 Mirror Frames

Provide mirrors with mirror frames (J-mold channels) fabricated of one-piece roll-formed Type 304 stainless steel with No. 4 brushed satin finish and concealed fasteners which will keep mirrors snug to wall. Frames must be 1-1/4 by 1/4 by 1/4 inch continuous at top and bottom of mirrors. Concealed fasteners of type to suit wall construction material must be provided with mirror frames.

2.5.3 Mirror Clips

Provide clips with concealed fasteners of type to suit wall construction material.

PART 3 EXECUTION

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

3.1 PREPARATION

Preparation, unless otherwise specified or approved, must conform to applicable recommendations in the GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, IGMA TM-3000, and manufacturer's recommendations. Determine the sizes to provide the required edge clearances by measuring the actual opening to receive the glass. Grind smooth in the shop glass edges that will be exposed in finish work. Leave labels in place until the installation is approved, except remove applied labels on heat-absorbing glass and on insulating glass units as soon as glass is installed. Securely fix movable items or keep in a closed and locked position until glazing compound has thoroughly set.

3.2 GLASS SETTING

Shop glaze or field glaze items to be glazed using glass of the quality and thickness specified or indicated. Glazing, unless otherwise specified or approved, must conform to applicable recommendations in the GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, IGMA TM-3000, and manufacturer's recommendations. Aluminum windows, wood doors, and wood windows may be glazed in conformance with one of the glazing methods described in the standards under which they are produced, except that face

puttying with no bedding will not be permitted. Handle and install glazing materials in accordance with manufacturer's instructions. Use beads or stops which are furnished with items to be glazed to secure the glass in place. Verify products are properly installed, connected, and adjusted.

3.2.1 Sheet Glass

Cut and set with the visible lines or waves horizontal.

3.2.2 Insulating Glass Units

Do not grind, nip, or cut edges or corners of units after the units have left the factory. Springing, forcing, or twisting of units during setting will not be permitted. Handle units so as not to strike frames or other objects. Installation must conform to applicable recommendations of IGMA TB-3001 and IGMA TM-3000.

3.2.3 Installation of Laminated Glass

Sashes which are to receive laminated glass must be weeped to the outside to allow water drainage into the channel.

3.3 CLEANING

Clean glass surfaces and remove labels, paint spots, putty, and other defacement as required to prevent staining. Glass must be clean at the time the work is accepted.

3.4 PROTECTION

Protect glass work immediately after installation. Identify glazed openings with suitable warning tapes, cloth or paper flags, attached with non-staining adhesives. Protect reflective glass with a protective material to eliminate any contamination of the reflective coating. Place protective material far enough away from the coated glass to allow air to circulate to reduce heat buildup and moisture accumulation on the glass. Upon removal, separate protective materials for reuse or recycling. Remove and replace glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities with new units.

-- End of Section --

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SECTION 08 87 23.13

SAFETY FILMS
08/09

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM C1048	(2018) Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials

1.2 SYSTEM DESCRIPTION

1.2.1 General Requirements

The applied fragment retention film shall be clean and free of peeling, splitting, scratches, creases, wrinkles, discoloration, and foreign particles. The film application shall be free of air bubbles after 30 days. Fragment retention film shall not show signs of waviness and distortion at the time the work is accepted. This determination shall be made by the unaided eye (except for corrective prescription glasses), when the film is viewed from a distance of 10 feet from the interior room side at angles up to 45 degrees when looking at a clear or uniformly overcast sky. Unacceptable fragment retention film applications shall be removed in accordance with manufacturer's instructions and new film applied.

1.2.2 Other Submittals Requirements

The following shall be submitted for fragment retention film:

a. Manufacturer's data consisting of catalog cuts, brochures, circulars, and a list of glazing compounds and/or gaskets known to be incompatible with the fragment retention film.

b. Manufacturer's application and cleaning instructions for fragment retention film.

c. A statement that the fragment retention film supplied was manufactured using the same materials and process as the material tested. A statement that the adhesive contains ultraviolet inhibitors which limit ultraviolet transmission to not more than 8 percent of the radiation between 300 and 380 nanometers. A statement that the film manufacturer or manufacturer's representative trained the personnel who will apply the film.

d. A sample consisting of a minimum 8 by 11 inch section of fragment retention film including the adhesive layer.

e. Certified test reports including analysis and interpretation of test results. Each report shall identify the manufacturer, the specific product name, the film thickness, the adhesive type and thickness, and the glass type and thickness. Test reports shall clearly identify the methods used and shall include the results recorded.

f. On applications where the film will contact the glazing beads or gaskets, a certificate from the Contractor stating that the glazing compounds and gaskets are compatible with the fragment retention film and adhesive.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Fragment Retention Film
Cleaning

SD-04 Samples

Fragment Retention Film; G, AE

SD-06 Test Reports

Fragment Retention Film

SD-07 Certificates

Fragment Retention Film

1.4 QUALITY ASSURANCE

The personnel applying the fragment retention film shall be trained by the film manufacturer or manufacturer's representative.

1.5 DELIVERY, STORAGE, AND HANDLING

The Contractor is responsible for delivery of the fragment retention film to the appropriate location for application. Fragment retention film shall be delivered, stored, and handled in accordance with the manufacturer's recommendations. Store glass, including glass in windows or doors with factory applied film, in a dry location free of dust, water, and other contaminants. Glass with factory applied film shall be delivered, stored, and handled so that the film is not damaged, scratched, or abraded and shall be stored in a manner which permits easy access for inspection and handling. Provide each roll of film with a tamperproof label containing full details of the roll, the batch number, and sufficient information to enable the Contracting Officer to ensure that

the correct film is supplied.

1.6 WARRANTY

Furnish a 5 year warranty for fragment retention film material, providing for replacement of film if cracking, crazing, peeling, or inadequate adhesion occurs.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Provide fragment retention film which is the standard product of a manufacturer regularly engaged in the manufacture of such products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

2.2 FRAGMENT RETENTION FILM

Fragment retention film shall be polyester, polyethylene terephthalate, or a composite, optically clear and free of waves, distortions, impurities, and adhesive lines. The film may be a single layer or laminated. Lamination of the film shall only occur at the factory of the fragment retention film manufacturer. The film shall include an abrasion resistant coating on the surface that does not receive the film adhesive. Fragment retention film shall be a minimum thickness of .033 inch and shall be frost. The film shall be supplied with an optically clear weatherable pressure sensitive adhesive. The adhesive shall contain ultraviolet inhibitors to protect the film for its required life and shall limit ultraviolet transmission to not more than 8 percent of the radiation between 300 and 380 nanometers. The adhesive shall not be water activated. A water soluble detackifier and/or release liner may be incorporated over the adhesive to facilitate film application. The adhesive shall be 90 percent cured within 30 days of installation. Adhesives on film thicknesses of 0.010 inch and greater shall be a minimum of 0.0008 inch thick. The following tests to indicate compliance with specified requirements shall be performed by an independent testing laboratory, and the laboratory reports shall be signed by a responsible official of the laboratory.

2.2.1 Flame Spread and Smoke Density

The fragment retention film shall exhibit a flame spread index not exceeding 25 and a smoke density index not exceeding 100 when tested in accordance with ASTM E84. For the test, the specimen shall be mounted to 1/4 inch thick tempered glass which conforms to the requirements of ASTM C1048, Kind FT, Type I, Class 1, Quality q3.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Clean the glass surface, to which the fragment retention film is to be applied, of paint, foreign compounds, smears, and spatters. After the initial cleaning, further clean the surface to receive the film in accordance with the film manufacturer's instructions.

3.2 APPLICATION

Provide fragment retention film on window and door glass where indicated.

After surface preparation, apply the fragment retention film in accordance with the manufacturer's recommendations and instructions. Film shall be applied to the interior (room) side of the glass for both single and double glazed sheets, unless otherwise indicated. Multiple applications of film to achieve specified thicknesses is not allowed. The film shall not be applied if there are visible dust particles in the air, if there is frost on the glazing, or if any room condition such as temperature and humidity do not meet the manufacturer's instructions. After film application, maintain room conditions as required by the manufacturer's instructions to allow for proper curing of the adhesive.

3.2.1 Application to New Glass Before Glazing

Apply fragment retention film so that it extends edge to edge of the glass sheet. The film reinforced glass shall then be set into the frame with glazing compounds or gaskets as specified in Section 08 81 00 GLAZING. Ensure compatibility when contact between the glazing compounds and/or gaskets and the film occurs. Coordinate fragment retention film application and curing with the glass supplier and window or door manufacturer prior to glazing installation.

3.2.2 Splicing

Splices or seams in fragment retention film are permitted only when a sheet of glass has a dimension exceeding 58 inches in both directions. All seams shall be applied with a minimum overlap of 1/4 inch unless submitted test reports indicate impact performance is not diminished when seam is applied with a different overlap or a gap.

3.3 CLEANING

Clean the fragment retention film in accordance with the manufacturer's instructions.

-- End of Section --

SECTION 08 91 00

METAL WALL LOUVERS
08/20

PART 1 GENERAL

1.1 REFERENCES

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

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC. (AMCA)

AMCA 500-L	(2015) Laboratory Methods of Testing Louvers for Rating
AMCA 511	(2010; R 2016) Certified Ratings Program for Air Control Devices

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 2605	(2020) Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels

ASTM INTERNATIONAL (ASTM)

ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Wall Louvers; G, AE

SD-03 Product Data

Metal Wall Louvers; G, AE

SD-04 Samples

Wall Louver Samples; G, AE

1.3 DELIVERY, STORAGE, AND PROTECTION

Deliver materials to the site in an undamaged condition. Carefully store materials off the ground to provide proper ventilation, drainage, and protection against dampness. Louvers must be free from nicks, scratches, and blemishes. Replace defective or damaged materials with new.

1.4 DETAIL DRAWINGS

Show all information necessary for fabrication and installation of wall louvers. Indicate materials, sizes, thicknesses, fastenings, and profiles.

1.5 COLOR SAMPLES

Colors of finishes for wall louver samples must closely approximate colors indicated. Where color is not indicated, submit the manufacturer's standard colors to the Contracting Officer for selection.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Aluminum Sheet

ASTM B209, alloy 3003 or 5005 with temper as required for forming.

2.1.2 Extruded Aluminum

ASTM B221, alloy 6063-T5 or -T52.

2.2 METAL WALL LOUVERS

Weather and wind driven rain resistant type, with bird screens and made to withstand a wind load as indicated on structural drawings. Wall louvers must bear the AMCA certified ratings program seal for air performance and water penetration in accordance with AMCA 500-L and AMCA 511. The rating must show a water penetration of 0.20 or less ounce per square foot of free area at a free velocity of 800 feet per minute.

2.2.1 Extruded Aluminum Louvers

Fabricated of extruded 6063-T5 or -T52 aluminum with a wall thickness of not less than 0.081 inch. Louvers shall be 4 inch, 35 degree blade application and design; stationary louver drainable blade. Integral insect screen.

2.2.2 Mullions and Mullion Covers

Same material and finish as louvers. Provide mullions where indicated . Provide mullion covers on both faces of joints between louvers.

2.2.3 Screens and Frames

For aluminum louvers, provide 1/2 inch square mesh, 14 or 16 gage aluminum or 1/4 inch square mesh, 16 gage aluminum bird screening. Mount screens in removable, rewirable frames of same material and finish as the louvers.

2.3 FASTENERS AND ACCESSORIES

Provide stainless steel screws and fasteners for aluminum louvers. Provide other accessories as required for complete and proper installation.

2.4 FINISHES

2.4.1 Aluminum

Exposed aluminum surfaces must be factory finished with an organic coating. Color must be as indicated. Louvers must have the same finish.

2.4.1.1 Organic Coating

Clean and prime exposed aluminum surfaces. Provide a high performance finish in accordance with AAMA 2605 with total dry film thickness of not less than 1.2 mil, color color selected by COR from manufacturer's standard colors.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Wall Louvers

Install using stops or moldings, flanges, strap anchors, or jamb fasteners as appropriate for the wall construction and in accordance with manufacturer's recommendations.

3.1.2 Screens and Frames

Attach frames to louvers with screws or bolts.

3.2 PROTECTION FROM CONTACT OF DISSIMILAR MATERIALS

3.2.1 Copper or Copper-Bearing Alloys

Paint copper or copper-bearing alloys in contact with dissimilar metal with heavy-bodied bituminous paint or separate with inert membrane.

3.2.2 Aluminum

Where aluminum contacts metal other than zinc, paint the dissimilar metal with a primer and two coats of aluminum paint.

-- End of Section --

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SECTION 09 01 90.50

PREPARATION OF HISTORIC WOOD AND METAL SURFACES FOR PAINTING
05/09

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH 0100	(2015; Suppl 2002-2016) Documentation of the Threshold Limit Values and Biological Exposure Indices

ASTM INTERNATIONAL (ASTM)

ASTM D3274	(2009; R 2017) Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Fungal or Algal Growth, or Soil and Dirt Accumulation
ASTM D3359	(2017) Standard Test Methods for Rating Adhesion by Tape Test
ASTM D4214	(2007; R 2015) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PA Guide 5	(2002; E 2004) Guide to Maintenance Coating of Steel Structures in Atmospheric Service
SSPC SP 1	(2015) Solvent Cleaning
SSPC SP 2	(2018) Hand Tool Cleaning
SSPC SP 3	(2018) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning

1.2 SUMMARY

The procedures proposed for the accomplishment of the work shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, and coordination with other work in progress. Submit the names, quantity represented, and intended use for proprietary brands of materials proposed to be substituted for the specified materials when the required quantity of a particular batch is 50 gallons or less. Submit manufacturer's current printed product description, safety data sheets

(SDS) and technical data sheets for each product. Detailed mixing, thinning and application instructions, minimum and maximum application temperature, and curing and drying times shall be provided for each product submitted. Include in the work plan a Safety and Health plan describing procedures for handling monitoring, and disposition of VOCs and other hazardous and toxic materials. Submit 2 copies of the Work Plan and a certificate stating that products proposed for use meet the VOC regulations of the local Air Pollution Control Districts having jurisdiction over the geographical area in which the project is located. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations. Test the materials designated by the Contracting Officer.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Work Plan; G
Materials
Qualifications

SD-07 Certificates

Work Plan

1.4 QUALITY ASSURANCE

Work shall comply with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis as specified in the CONTRACT CLAUSES. The Activity Hazard Analysis shall include analyses of the potential impact of surface preparation operations on personnel and on others involved in and adjacent to the work zone.

1.4.1 Worker Exposures

Exposure of workers to chemical substances shall not exceed limits as established by ACGIH 0100.

1.4.2 Training

Inform workers, having access to an affected work area, of the contents of the applicable SDS and of potential health and safety hazard and protective controls associated with materials used on the project. An affected work area is one which may receive dust, mists, and odors from the surface preparation operations. Workers involved in surface preparation and clean-up must be trained in the safe handling and application, and the exposure limit, for each material which the worker will use in the project. Instruct personnel having a need to use respirators and masks in the use and maintenance of such equipment.

1.4.3 Coordination

Coordinate work to minimize exposure of building occupants, other Contractor personnel, and visitors to mists and odors from surface preparation and cleaning operations. Coordinate work with other trades so that paint removal and blasting operations do not affect newly installed elements.

1.4.4 Qualifications

Provide qualified workers trained and experienced in the preparation for painting of wood and metal surfaces in historic structures, submit documentation of 5 consecutive years of work of this type and a statement certified by the Contractor attesting that the experience and qualifications of the workers (journeymen) comply with the specifications.. Provide a list of similar jobs identifying when, where, and for whom the work was done and a current point-of-contact for identified references.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver paint removers, solvents, and other chemicals, used for surface preparation, in sealed containers that legibly show the designated name, formula or specification number, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name of manufacturer. Furnish such materials in containers not larger than 5 gallons; store them in accordance with the manufacturer's written directions; and, as a minimum, store them off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors and at temperatures between 40 and 95 degrees F.

1.6 ENVIRONMENTAL REQUIREMENTS

Unless otherwise recommended by the product manufacturer, the ambient temperature shall be between 45 and 95 degrees F when applying paint removers, solvents, or other preparation materials.

PART 2 PRODUCTS

2.1 PAINT REMOVERS

Chemical paint removers shall be a commercial item specifically manufactured for the type of paint to be removed.

2.2 EPOXY CONSOLIDANTS

2.2.1 Liquid Consolidant

Provide liquid wood consolidant consisting of a 2-part, low-viscosity liquid epoxy that meets the criteria of Table 1.

2.2.2 Epoxy Paste

Provide epoxy paste consisting of a 2-part, thixotropic paste that meets the criteria of Table 1.

TABLE 1		
	LIQUID CONSOLIDANT	EPOXY PASTE
Properties	Low-Viscosity Liquid	No-Slump, Thixotropic Paste
Toxicity	Low	Very Low
Toxicity Cured	Non-Toxic	Non-Toxic
Ratios	1:1 by Volume	1:1 by Volume
Pot Life @ Room Temp.	30 minutes min.	50 minutes min
Hardening @ Room Temp.	1 hr. or longer	1 hr. or longer
Hardening @ 140 deg. F	16 min. or less	18 min. or less
Viscosity Poises @ 72 deg. F	4.7 max.	Thixotropic paste
Solids	95 percent min.	98 percent min.
Tensile Strength	4000 psi	2500 psi
Elongation	50 percent	4 percent
Compressive Strength		
Failure	19,000 psi	---
Yield	3500 psi	5500 psi

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Use methods for preparation of historic wood and metal surfaces for painting which are the gentlest possible to achieve the desired results. Historic substrate materials shall not be damaged or marred in the process of surface preparations. Collect and analyze samples of the existing paint finishes for the purpose of documentation or matching, if so directed by the Contracting Officer. Material and application requirements for paints are covered in Section 09 90 00 PAINTS AND COATINGS.

3.2 VENTILATION

Ventilate interior work zones, having a volume of 10,000 cubic feet or less, at a minimum of 2 air exchanges per hour. Maintain ventilation in larger work zones by means of mechanical exhaust. Solvent vapors shall be exhausted outdoors, away from air intakes and workers. Temporarily seal return air inlets in the work zone before start of work until the prepared surfaces have dried. Operators and personnel in the vicinity of paint removal processes involving chemicals or mechanical action (sanding or blasting) shall wear respirators.

3.3 PROTECTION OF AREAS NOT TO BE PAINTED

Remove or protect items not to be painted, which are in contact with or adjacent to painted surfaces, prior to surface preparation and painting operations. Replace items removed prior to painting when painting is completed. Following completion of painting, workers skilled in the trades involved shall reinstall removed items. Surfaces contaminated by preparation materials shall be restored to original condition.

3.4 CLEANING OF SURFACES

Surfaces to be painted shall be clean and free of grease, dirt, dust and other foreign matter before application of paint or surface treatments. After cleaning, surfaces shall exhibit a surface disfigurement rating of 7 or greater when evaluated in accordance with ASTM D3274. Dirt and surface contaminants shall be cleaned by brush with solutions of water and detergent or trisodium phosphate, then rinsed clean with water and let dry. Surfaces on which mildew or other microbiological growth is present shall be cleaned with a detergent solution containing household bleach. Oil and grease shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning. Cleaning solvents shall be of low toxicity with a flashpoint in excess of 100 degrees F. Cleaning shall be programmed so that dust and other contaminants will not fall on newly prepared or newly painted surfaces.

3.5 EXISTING PAINT

Existing paint shall be tested for adhesion to substrate in accordance with ASTM D3359, Test Method A and shall obtain a rating of 4 or better in order to be considered sound. Existing paint meeting this requirement may be considered a satisfactory base for repainting.

3.6 PAINT REMOVAL

Remove paint from elements as noted in the drawings. Remove flaking, cracking, blistering, peeling or otherwise deteriorated paint by scraping with hand scrapers. After scraping, removal of large areas of paint or paint on architectural details shall be accomplished using chemical paint removers. Paint shall be removed to bare substrate. Open flame heat devices shall not be used. Mechanical paint removal shall not damage or mar the substrate material.

3.6.1 Chemical Paint Removers

Use chemical paint removers in accordance with manufacturer's recommendations. If chemical strippers are used, substrate shall be neutralized after stripping to a pH of 5 to 8.5.

3.6.2 Lead Paint

In preparation of lead-based painted surfaces for repainting, follow the procedures described in Section 02 83 00 LEAD REMEDIATION.

3.7 SURFACE PREPARATION

After cleaning and removal of deteriorated paint, edges of remaining chipped paint shall be feather-edged and sanded smooth. Repair damaged areas such as, but not limited to, nail holes, cracks, chips, and spalls with suitable material to match adjacent undamaged areas. Slick surfaces

shall be roughened. Clean rusty metal surfaces in accordance with SSPC SP 6/NACE No.3. Remove chalk so that when tested in accordance with ASTM D4214, the chalk resistance rating is no less than 8. New, proposed coatings shall be compatible with existing coatings. If existing surfaces are glossy, the gloss shall be reduced.

3.8 WOOD SURFACES

Wood surfaces shall be cleaned of foreign matter. Wood surfaces adjacent to surfaces to receive water-thinned paints shall be primed and/or touched up before applying water-thinned paints. Small, dry seasoned knots shall be scraped, cleaned, and given a thin coat of commercial knot sealer before application of the priming coat. Pitch on large, open, unseasoned knots and all other beads or streaks of pitch shall be scraped off, or, if it is still soft, removed with mineral spirits or turpentine, and the resinous area shall be thinly coated with knot sealer.

3.8.1 Interior Wood Surfaces

Interior wood surfaces to receive stain shall be sanded. Oak and other open-grain wood to receive stain shall be given a coat of wood filler recommended by the finish manufacturer not less than 8 hours before the application of stain; excess filler shall be removed and the surface sanded smooth. Moisture content of the wood shall not exceed 12 percent as measured by a moisture meter, unless otherwise authorized.

3.8.2 Wood Repair

Remove and repair badly decayed areas. Replace areas and pieces decayed beyond repair with new pieces that match originals in all respects. Moderately decayed areas, weathered, or gouged wood shall be patched with approved patching compounds, and shall be sanded smooth. The source or cause of wood decay shall be identified and corrected prior to application of patching materials. Wet wood shall be completely dried to a moisture content not exceeding 12 percent, as measured by a moisture meter, to its full depth before patching, unless otherwise authorized. Wood that is to be patched shall be clean of dust, grease, and loose paint.

3.8.2.1 Epoxy Wood Repair

Epoxy wood repair materials shall be applied in accordance with manufacturer's written instructions. Health and safety instructions shall be followed in accordance with the manufacturer's instructions. Clean mixing equipment shall be used to avoid contamination. Mix and proportions shall be as directed by the manufacturer. Batches shall be only large enough to complete the specific job intended. Patching materials shall be completely cured before painting or reinstallation of patched pieces.

3.8.2.2 Epoxy Consolidant and Epoxy Paste

Epoxy liquid wood consolidant shall be used: 1) to penetrate and impregnate deteriorated wood sections in order to reinforce wood fibers that have become softened or absorbent. 2) as a primer for areas that are to receive epoxy paste filler. Epoxy paste shall be used to fill areas where portions of wood are missing such as holes, cracks, gaps, gouges, and other voids.

3.8.3 Exposed Ferrous Metals

Exposed ferrous metals such as nail heads on or in contact with wood surfaces to be painted with water-thinned paints, shall be spot-primed with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas.

3.8.4 Finishing Nails

Finishing nails shall be set, and all holes and surface imperfections shall be primed. After priming, holes and imperfections in finish surfaces shall be filled with putty or plastic wood filler, colored to match the finish coat if natural finish is required, allowed to dry, and sanded smooth. Putty or wood filler shall be compatible with subsequent coatings.

3.9 METAL SURFACES

Metal surfaces shall be cleaned of foreign matter. Programs for preparation of metal shall be in accordance with SSPC PA Guide 5. Grease, oil, and other soluble contaminants shall be removed by solvent cleaning in accordance with SSPC SP 1. Surfaces shall be free from soils and corrosion; e.g. grease, oil, solder flux, welding flux, weld spatter, sand, rust, scale, and other contaminants that might interfere with the application of the new finish. Cleaning methods shall be the gentlest possible to achieve the desired result. Metals which are soft, thin, or exhibit fine detail shall not be abrasively cleaned. Evidence of corrosion or contamination on a previously cleaned surface shall be cause for recleaning prior to painting.

3.9.1 Ferrous Surfaces

Ferrous surfaces that contain loose rust, loose mill scale, and other foreign substances shall be cleaned mechanically with hand tools according to SSPC SP 2, power tools according to SSPC SP 3 or by blast cleaning according to SSPC SP 6/NACE No.3. Shop-coated ferrous surfaces shall be protected from corrosion by treating and touching up corroded areas immediately upon detection.

3.10 TIMING

Surfaces that have been cleaned, pretreated, and otherwise prepared for painting shall be given a coat of the specified first coat as soon as practical after such pretreatment has been completed, but prior to any deterioration of the prepared surface. Unless otherwise directed, the first coat primer shall be applied within 48 hours of surface preparation.

3.11 SURFACES TO BE PREPARED FOR PAINTING

Surfaces shall be prepared as specified and as shown in the painting schedule in Section 09 90 00 PAINTS AND COATINGS.

3.12 CLEANING

Place cloths, cotton waste and other debris, that might constitute a fire hazard, in closed metal containers for removal at the end of each day. Containers shall be removed from the site or destroyed in an approved manner. Preparation materials and other deposits on adjacent surfaces shall be removed and the entire job left clean and ready for painting.

-- End of Section --

SECTION 09 22 00

SUPPORTS FOR PLASTER AND GYPSUM BOARD
02/10

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM A463/A463M	(2015; R 2020; E 2020) Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process
ASTM A653/A653M	(2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM C645	(2014; E 2015) Nonstructural Steel Framing Members
ASTM C754	(2020) Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
ASTM C841	(2003; R 2013) Installation of Interior Lathing and Furring
ASTM C847	(2014a) Standard Specification for Metal Lath

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM EMLA 920	(2009) Guide Specifications for Metal Lathing and Furring

UNDERWRITERS LABORATORIES (UL)

UL Fire Resistance	(2014) Fire Resistance Directory

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Metal Support Systems; G, RO

Submit for the erection of metal framing, furring, and ceiling suspension systems. Indicate materials, sizes, thicknesses, and fastenings.

SD-03 Product Data

Metal Support Systems

Recycled Content for Metal Support Systems; S

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the job site and store in ventilated dry locations permitting easy access for inspection and handling. If materials are stored outdoors, stack materials off the ground, supported on a level platform, and fully protected from the weather. Handle materials carefully to prevent damage. Remove damaged items and provide new items.

PART 2 PRODUCTS

2.1 MATERIALS

Provide steel materials for metal support systems with galvanized coating ASTM A653/A653M, G-60; aluminum coating ASTM A463/A463M, T1-25; or a 55-percent aluminum-zinc coating.

Provide metal support systems containing a minimum of 25 percent recycled content. Provide data identifying percentage of recycled content for metal support systems.

2.1.1 Materials for Attachment of Lath

2.1.1.1 Suspended and Furred Ceiling Systems and Wall Furring

ASTM C841, and ASTM C847.

2.1.1.2 Non-load Bearing Wall Framing

NAAMM EMLA 920.

2.1.2 Materials for Attachment of Gypsum Wallboard

2.1.2.1 Suspended and Furred Ceiling Systems

ASTM C645.

2.1.2.2 Non-load Bearing Wall Framing and Furring

ASTM C645, but not thinner than 0.0179 inch thickness, with 0.0329 inch minimum thickness supporting wall hung items such as cabinetwork, equipment and fixtures unless thicker guage is required for acoustical or other performance standards indicated elswhere.

2.1.2.3 Furring Structural Steel Columns

ASTM C645. Steel (furring) clips and support angles listed in UL Fire Resistance may be provided in lieu of steel studs for erection of gypsum wallboard around structural steel columns.

2.1.2.4 Z-Furring Channels with Wall Insulation

Not lighter than 26 gage galvanized steel, Z-shaped, with 1-1/4 inch and 3/4 inch flanges and depth as required by the insulation thickness provided.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Systems for Attachment of Lath

3.1.1.1 Suspended and Furred Ceiling Systems and Wall Furring

ASTM C841, except as indicated otherwise.

3.1.1.2 Non-load Bearing Wall Framing

NAAMM EMLA 920, except provide framing members 16 inches o.c. unless indicated otherwise.

3.1.2 Systems for Attachment of Gypsum Wallboard

3.1.2.1 Suspended and Furred Ceiling Systems

ASTM C754, except provide framing members 16 inches o.c. unless indicated otherwise.

3.1.2.2 Installing Gypsum Board Shaft Wall Assemblies

a. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.

    1. Provide bracing where shaft wall exceeds 10 feet in height.

b. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind

boxes containing wiring devices, elevator call buttons, elevator floor indicators,and similar items.

c. Sound-Rated Shaft Wall Assemblies: Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.

d. Cant Panels: At projections into shaft exceeding 4 inches, install 5/8-inch thick gypsum board cants covering tops of protections.

1. Slope cant panels at least 75 degrees from horizontal.

2. Install framing at 24 inches o.c. and extend studs from the projection to shaft wall framing.

e. 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.

3.1.2.3 Non-load Bearing Wall Framing and Furring

ASTM C754, except as indicated otherwise.

3.1.2.4 Furring Structural Steel Columns

Install studs or galvanized steel clips and support angles for erection of gypsum wallboard around structural steel columns in accordance with the UL Fire Resistance, design number(s) of the fire resistance rating indicated.

3.1.2.5 Z-Furring Channels with Wall Insulation

Install Z-furring channels vertically spaced not more than 24 inches o.c. Locate Z-furring channels at interior and exterior corners in accordance with manufacturer's printed erection instructions. Fasten furring channels to masonry and concrete walls with powder-driven fasteners or hardened concrete steel nails through narrow flange of channel. Space fasteners not more than 24 inches o.c.

3.2 ERECTION TOLERANCES

Provide framing members which will be covered by finish materials such as wallboard, plaster, or ceramic tile set in a mortar setting bed, within the following limits:

a. Layout of walls and partitions: 1/4 inch from intended position;

b. Plates and runners: 1/4 inch in 8 feet from a straight line;

c. Studs: 1/4 inch in 8 feet out of plumb, not cumulative; and

d. Face of framing members: 1/4 inch in 8 feet from a true plane.

Provide framing members which will be covered by ceramic tile set in dry-set mortar, latex-portland cement mortar, or organic adhesive within the following limits:

a. Layout of walls and partitions: 1/4 inch from intended position;

b. Plates and runners: 1/8 inch in 8 feet from a straight line;

c. Studs: 1/8 inch in 8 feet out of plumb, not cumulative; and

d. Face of framing members: 1/8 inch in 8 feet from a true plane.

-- End of Section --

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SECTION 09 22 36

LATH
01/08

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM A580/A580M	(2018) Standard Specification for Stainless Steel Wire
ASTM C636/C636M	(2013) Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
ASTM C841	(2003; R 2013) Installation of Interior Lathing and Furring
ASTM C1063	(2020) Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster

GYPSUM ASSOCIATION (GA)

GA 600	(2009) Fire Resistance Design Manual

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

UNDERWRITERS LABORATORIES (UL)

UL Fire Resistance	(2014) Fire Resistance Directory

1.2 SUBMITTALS

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

SD-03 Product Data

Lath

Recycled Content for Metal Lath; S

Accessories

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment, if available; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.3 DELIVERY AND STORAGE

Deliver materials in the manufacturer's original unbroken packages or containers that are labeled plainly with the manufacturer's names and brands. Store materials in dry locations with adequate ventilation, free from water, and in such a manner to permit easy access for inspection and handling. Stack gypsum lath flat to avoid sagging or damage to edges, ends, or surfaces, and protect from exposure to direct sunlight.

PART 2 PRODUCTS

2.1 LATH

Provide metal lath containing a minimum of 20 percent recycled content. Provide data identifying percentage of recycled content for metal lath.

2.1.1 Metal Plastering Base (Lath)

Provide the type(s) and weight(s) required for the type and spacing of supports shown for the kind of plaster indicated and specified. Do not use rib lath for ceramic tile scratch coat.

2.1.1.1 For Gypsum Plaster

ASTM C841, diamond mesh metal lath weighing not less than .616 pounds per square yard.

2.1.1.2 Paper Backing (Waterproofed Kraft Building Paper)

Provide metal plastering base with paper backing, "Water-vapor permeable" as indicated for room(s) .

2.1.1.3 Galvanized Metal Plastering Base

Provide for plastering as indicated in all locations.

2.1.2 Accessories

ASTM C1063. Provide only galvanized steel or zinc alloy accessories.

2.2 HANGERS

2.2.1 Wires
Conform wires to ASTM A580/A580M, composition 302 or 304, condition annealed stainless steel, 0.08 inch (12 gauge).

2.2.2 Masonry Anchorage Devices

Comply with ASTM C636/C636M for anchorage devices for machine screws and wood screws.

PART 3 EXECUTION

3.1 INSPECTION

Verify that framing, furring and accessories are securely attached and of proper sizes and spacing necessary to provide a suitable substrate to receive lath. Do not proceed with work until framing, furring and accessories are acceptable to the Contracting Officer for application of lath.

3.2 INSTALLATION

3.2.1 Lathing Materials and Accessories

Install in accordance with ASTM C841 for gypsum plaster work, except where indicated or specified otherwise herein.

3.2.1.1 Metal Plastering Base

Install where indicated on surfaces to receive plaster.

3.2.1.2 Metal Plaster Base with Paper Backing

Where used, lap joints to provide backing on backing and metal-on-metal. Lap backing not less than one inch. Lap backing so that water will flow to the exterior.

3.2.1.3 Control (Expansion and Contraction) Joints

a. For portland cement-based plaster (ceilings and walls), install to create panels no larger than l00 square feet with no dimension exceeding 10 feet.

b. For unrestrained gypsum plaster ceilings install to create panels no larger than 2,500 square feet with no dimension exceeding 50 feet. For gypsum plaster walls, partitions and ceilings without perimeter relief install not more than 30 feet on centers in either direction.

c. Install where indicated, where expansion joints occur in the structural walls and ceilings and where ceiling framing or furring changes direction. Terminate lath at each side of joint and fasten joints securely to lath.

3.2.1.4 Plastering Beads

Install edge trim (casing bead) at the edges of plaster which abuts or adjoins an unplastered surface, on each side of the joint between walls or partitions constructed of dissimilar materials which require plastering, and between plasters of a different composition. Fill voids formed in corners with sealant. Install corner beads at all vertical external corners of plaster walls.

3.2.2 Fire-Resistant Assemblies

Wherever fire-resistant construction is indicated, provide all materials and application methods, including types and spacing of fasteners, in accordance with the specifications contained in the UL Fire Resistance for the Design Number(s) indicated or GA 600 for the File Number(s) indicated.

-- End of Section --

SECTION 09 23 00

GYPSUM PLASTERING
08/16

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM C28/C28M	(2010) Gypsum Plasters
ASTM C35	(2001; R 2019) Inorganic Aggregates for Use in Gypsum Plaster
ASTM C59/C59M	(2000; R 2011) Gypsum Casting Plaster and Gypsum Molding Plaster
ASTM C206	(2014) Standard Specification for Finishing Hydrated Lime
ASTM C631	(2009; R 2020) Bonding Compounds for Interior Gypsum Plastering
ASTM C842	(2005; E 2010; R 2010) Application of Interior Gypsum Plaster

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

UNDERWRITERS LABORATORIES (UL)

UL Fire Resistance	(2014) Fire Resistance Directory

1.2 SUBMITTALS

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that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Gypsum Base Coat Plaster

Gypsum Finish Coat Plaster

SD-04 Samples

Sample Panel; G, AE

Submit four 36 inch square panels of varying texture for the Contracting Officer's approval.

Gypsum Plaster Full Size Sample; G, AE

SD-07 Certificates

Indoor Air Quality For Plaster; S

SD-08 Manufacturer's Instructions

Ready-Mix Gypsum Plaster

Submit manufacturer's printed mixing instructions for ready-mix plaster.

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment, if available; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly

recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for plaster, if available, that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

3. Low-Emitting Materials - Wall panels:

a. Meet the VOC emissions evaluation, or inherently nonemitting sources criteria, or salvaged and reused materials criteria. The wall panels product category includes all finish wall treatments (wall coverings, wall paneling, wall tile), surface wall structures such as gypsum or plaste. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

4. Low-Emitting Materials - Ceilings:

a. Meet the VOC emissions evaluation. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.3 QUALITY ASSURANCE

1.3.1 Sample Panels

Erect sample panel at the building site, or as otherwise directed. Finished gypsum plaster work must match the approved sample panel.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver manufactured materials in the manufacturers' original unbroken packages or containers which are labeled plainly with the manufacturers' names and brands. Keep cementitious materials dry and stored off the ground, under cover, and away from sweating walls and other damp surfaces until ready for use. Keep materials wrapped and separate from off-gassing materials, such as paints and adhesives. Do not use materials that have visible moisture or biological growth.

1.5 GYPSUM PLASTER FULL SIZE SAMPLE

After selection of an acceptable texture, construct a sample panel separate from the building, minimum size of 8 ftin height, by 8 ft in length, using6 inch metal studs, and gypsum board, metal lath and gypsum plaster. The sample wall must show all aspects of gypsum plaster work, including but not limited to, expansion joints, control joints, corner extrusions, electrical mechanical and fire sprinkler penetrations and casing beads. A sample of a control joint and extrusion butt joint must also be incorporated into the sample wall. Finish work must match the approved sample panel. Divide the panel into four equal quadrants with the expansion and control joints to show each phase of work, lath, scratch coat, brown coat, and finish coats. Provide and protect the sample wall from damage during the length of the contract.

1.6 SCHEDULING AND ENVIRONMENTAL REQUIREMENTS

Commence application only after the area scheduled for gypsum plastering work is completely weathertight. The heating, ventilating, and air-conditioning systems must be complete and in operation prior to application of the plaster. If the mechanical system cannot be activated before veneer plastering is begun, the plastering may proceed in accordance with an approved plan to maintain the environmental requirements specified below. Apply plaster prior to the installation of finish flooring and acoustic ceiling.

1.6.1 Environmental Requirements

Do not expose the gypsum base to excessive sunlight prior to plaster application, as bond failure of the plaster may result. Maintain a continuous uniform temperature of not less than 50 degrees F and not more than 80 degrees F for at least one week prior to the application of veneer plaster, while the plastering is being done, and for at least one week after the plaster is set. Shield air supply and distribution devices to prevent any uneven flow of air across the plastered surfaces. Provide ventilation to exhaust moist air to the outside during plaster

application, set, and until plaster is dry. In glazed areas, keep windows open top and bottom or side to side 3 to 4 inches. Openings can be reduced in cold weather. For enclosed areas lacking natural ventilation, provide temporary mechanical means for ventilation. In unglazed areas subjected to hot, dry winds or temperature differentials from day to night of 20 degrees F or more, screen openings with cheesecloth or similar materials. Avoid rapid drying. During periods of low indoor humidity, provide minimum air circulation following plastering and until plaster is dry.

1.7 FIRE RESISTIVE COATINGS

Comply with specified fire-rated assemblies for design numbers indicated per UL Fire Resistance or FM APP GUIDE.

1.8 CERTIFICATIONS

1.8.1 Indoor Air Quality

Provide wall and ceiling plaster installed within the building interior with VOC emissions certified in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method.

1.8.2 Building Product Declarations

Provide plaster with EPD and Material Ingredient Report, if available. Provide validation of Indoor Air Quality For Plaster.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to the specifications, standards, and requirements specified herein. Provide asbestos-free materials.

2.2 GYPSUM BASE COAT PLASTER

2.2.1 Gypsum Neat Plaster Base Coat

ASTM C28/C28M.

2.2.2 Gypsum Ready-Mixed Plaster Base Coat

ASTM C28/C28M.

2.3 GYPSUM FINISH COAT PLASTER

2.3.1 Gypsum Gauging Plaster Finish Coat

ASTM C28/C28M.

2.3.2 Gypsum Molding Plaster for Ornamental Plaster

ASTM C59/C59M.

2.4 HYDRATED LIME

ASTM C206, Type S.

2.5 AGGREGATES

2.5.1 Sand for Gypsum Base Coats

ASTM C35.

Sand Gradation: Percentage retained by weight (plus or minus 2 percent) on each sieve.

Sieve Size	Maximum	Minimum
No. 4 4760 microns	0	0
No. 8 2380 microns	5	0
No. 16 1190 microns	30	5
No. 30 590 microns	65	30
No. 50 300 microns	95	65
No. 100 150 microns	100	90

2.5.2 Sand for Gypsum Sand Float Finish

ASTM C842.

Sand Gradation: Percentage retained by weight (plus or minus 2 percent) on each sieve.

Sieve Size	Maximum	Minimum
No. 20 850 microns	0	
No. 30 590 microns	0.5	
No. 100 150 microns	100	40
No. 200 75 microns	100	70

2.5.3 Lightweight Aggregates, Perlite or Vermiculite for Gypsum Base Coat

ASTM C35.

2.5.4 Silica Sand or Perlite Fines

For use in lime-putty gypsum-gauged finish, aggregated white coat, must have the following gradation: 10 percent maximum retained on a No. 30 sieve, 4 percent minimum and 70 percent maximum retained on a No. 100 sieve, and 70 percent minimum and 100 percent maximum retained on No. 200 sieve.

2.6 WATER

Use only potable water, free of mineral and organic substances that affect the hardening and durability of the plaster or stucco.

2.7 PROPORTIONING

Unless specified otherwise, materials are specified on a volume basis and must be measured in approved containers, to ensure that the specified proportions will be controlled and accurately maintained during the progress of the work. Measuring materials with shovels (shovel count) is not be permitted. Prepare ready-mix gypsum plaster for use by the addition of water only.

2.7.1 Gypsum Base Coat Plaster

Use of sand or lightweight aggregate is optional in gypsum plaster basecoats, except provide (1) sand for Keene's cement and high strength gypsum-gauged finish coats; (2) lightweight aggregate when necessary for a required fire resistance rating.

2.7.1.1 Sand and Gypsum Plaster Base Coat

Mix scratch coat in the proportion of 100 lb of gypsum neat plaster to not more than 2 cu ft of damp loose sand; mix brown coat in the proportion of 100 lb of gypsum neat plaster to not more than 3 cu ft of damp loose sand; or scratch and brown coats may both be mixed in the proportion of 100 lb of gypsum neat plaster to not more than 2-1/2 cubic feet of damp loose sand. Mix the basecoats for double-up work in the proportion of 100 lb of gypsum neat plaster to not more than 2-1/2 cu ft of damp loose sand on gypsum lath and not more than 3 cu ft of damp loose sand on masonry.

2.7.1.2 Lightweight Aggregate and Gypsum Plaster Base Coat

Mix scratch coat in the proportion of 100 lb of gypsum neat plaster to not more than 2-1/2 cu ft of lightweight aggregate on gypsum lath, and not more than 3 cu ft of lightweight aggregate on masonry. Mix brown coat in the proportion of 100 lb of gypsum neat plaster to not more than 2-1/2 cu ft of lightweight aggregate on gypsum lath and not more than 3 cu ft of light weight aggregate on masonry. Where plaster thickness exceeds one inch, the aggregate proportion may be increased to 3 cu ft. Mix the basecoats in two-coat double-up work in the proportion of 100 lb of gypsum neat plaster to not more than 2-1/2 cu ft of lightweight aggregate on gypsum lath and not more than 3 cu ft of lightweight aggregate on masonry. Gypsum ready-mixed plaster with perlite aggregate may be provided in lieu of field-mixed lightweight aggregate and gypsum plaster, provided the specified proportion of aggregate to plaster does not exceed the proportion specified for field-mixed plaster.

2.7.1.3 Sand and Wood Fibered Gypsum Plaster Base Coat

Mix basecoats in the proportion of 100 lb of wood-fibered gypsum plaster to not more than one cu ft of damp loose sand.

2.7.1.4 Sand and High-Strength Gypsum Plaster Base Coat

Mix scratch coat in the proportion of 100 lb of high strength gypsum base coat plaster to not more than 2 cu ft of damp loose sand. Mix brown coat in the proportion of 100 lb of high strength gypsum basecoat plaster to not more than 3 cu ft of damp loose sand.

2.7.2 Gypsum Plaster Finish Coat

As indicated to match existing adjacent plastering finish.

2.7.2.1 Lime-Putty

Prepare lime-putty in accordance with the printed directions of the manufacturer. Use putty following preparation or following a soaking period as recommended by the manufacturer.

2.7.2.2 Lime-Putty Gypsum-Gauged (White Coat)

Use over sand and gypsum plaster. Mix finish coat in the proportions of one part of gypsum gauging plaster to a volume of hydrated lime or lime putty.

This mix is approximately equivalent to one 100 lb bag of gypsum gauging plaster to:

a. Not more than four 50 lb bags of hydrated lime, or

b. Not more than 4-1/2 cu ft of lime putty, or

c. Not more than 35 gal of lime putty.

2.7.2.3 Aggregated Finish Coat

Finish coat must consist of the lime-putty, gypsum-gauged finish specified herein with the addition of fine pulverized silica sand or perlite fines in the following proportions:

a. 1/2 cu ft per 100 lb bag of gypsum gauging plaster used in finish, or

b. 1/8 cu ft per 50 lb bag of hydrated lime, or

c. one gal per cu ft of lime-putty.

2.7.2.4 Gypsum Sand Float Finish:

Mix finish in the proportion of one part neat unfibered gypsum plaster to not more than two parts of sand, by weight.

2.8 MIXING

2.8.1 Job-Mixed Materials

Mix materials in mechanical mixers except finish coats containing lime may be hand mixed. Mechanical mixers must be an approved type that accurately and uniformly controls the quantity of water. When mixing by hand, mix dry plaster aggregate to a uniform color in the mixing box, add water, and hoe the plaster immediately into the water and mix thoroughly to a proper consistency.

2.8.1.1 Water

Water used for rinsing and cleaning containers and tools must not be used in mixing the materials.

2.8.1.2 Sand

Sand proportions must be damp and in loose condition. A volume of damp loose sand must contain a minimum of 80 lb of dry sand in one cu ft.

2.8.1.3 Mixing (Do's)

Mix the material while the mixer is in continuous operation in the following sequence:

a. Add maximum close to 90 percent of estimated quantity of water.

b. Add approximately one-half of the sand. If vermiculite or perlite is used, add all the aggregate.

c. Add cement and approved admixtures. Add lime prior to cement.

d. Add remainder of sand.

e. Mix with remainder of water as required. Mix until the mixture is uniform in color and consistency.

2.8.1.4 Mixing (Don'ts)

Avoid excessive mixing and agitation. Discard gypsum plaster which has begun to set before it is used; do not permit retempering. Do not use frozen, caked, or lumped materials. Empty mixers and mixing boxes after each batch is mixed, and keep free of old plaster.

2.8.2 Ready-Mixed Packaged Materials

Mix ready-mixed packaged gypsum plaster in accordance with manufacturer's printed instructions.

2.9 BONDING AGENT

ASTM C631, interior application.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Clean surfaces before application of gypsum plaster of projections, dust, loose particles, grease, bond breakers, and foreign matter. Do not apply plaster directly to surfaces (1) of masonry or concrete that have been coated with bituminous compound or other waterproofing agents, or (2) that have been painted or previously plastered. Before plaster work is started, wet masonry and concrete surfaces thoroughly with a fine fog spray of clean water to produce a uniformly moist condition. Check metal grounds, corner beads, screeds, and other accessories carefully for alignment before starting work. Do not apply gypsum plaster to surfaces containing frost.

3.2 WORKMANSHIP

3.2.1 Slump Tests

Apply Plaster by hand or machine. When a plastering machine is used, control the fluidity of gypsum plaster to have a slump of not more than 3 inch when tested using a 2 by 4 by 6 inch high slump cone. Subsequent to determining water content to meet the specified slump, do not add additional water to the mix. Conduct the slump test according to the following procedure:

a. Place cone on level, dry, non-absorptive base plate.

b. While holding cone firmly against base plate, fill cone with plaster taken directly from the hose or nozzle of the plastering machine, tamping with metal rod during filling to release air bubbles.

c. Screed off plaster level with top of cone. Remove cone by lifting it straight up with a slow and smooth motion.

d. Place cone in a vertical position adjacent to freed plaster sample, using care not to shake or move base plate.

e. Lay a straightedge across top of cone, being careful not to shake or move cone. Measure slump in inch from the bottom edge of the straightedge to the top of the slumped plaster sample.

3.2.2 Application

Apply gypsum plaster in three coats, except as follows:

Gypsum plaster applied to masonry and gypsum lath using the two-coat double-up method.

Apply base coats with sufficient pressure and ensure plaster is sufficiently plastic to provide a strong bond to bases. Work base coats into screeds at intervals from 5 to 8 ft. Plaster must not be continuous across expansion and control joints occurring in walls, partitions, and ceilings. Finish work level, plumb, square, and true, within a tolerance of 1/8 inch in 8 ft, without waves, cracks, blisters, pits, crazing, discoloration, projections, or other imperfections. Form plaster work carefully around angles and contours, and well-up to screeds. Take special care to prevent sagging and consequent dropping of applications. There must be no visible junction marks in finish coat where one day's work adjoins another. Plastered surfaces to receive rubber or vinyl base coves or wood base boards must extend to wood ground indicated as backing for base. Plaster not required behind built-in cabinets and equipment, unless part of a fire-rated assembly.

3.2.3 Control And Expansion Joints

Install control joints at locations indicated before applying gypsum plaster. Vertical joints must be continuous and butt horizontal joints against the vertical joints. Check expansion, control joints and accessories to ensure unrestrained movement, metal lath not continuous behind the joints, and area between joints do not exceed 150 sq ft.

3.2.4 Curing

3.2.4.1 Gypsum Plaster

Before the plaster has set, provide environmental controls to prevent the plaster from drying too fast. After the plaster has set, provide for rapid drying to develop high strength.

3.3 GYPSUM PLASTER WORK

ASTM C842.

3.3.1 Gypsum Plaster Thickness Requirements

Plaster thicknesses are from face of metal lath plaster base (scratch coat) or solid base surfaces.

a. Vertical Surfaces

Base Types	Base Coat	Finish Coat	Total Thickness
Metal Lath	1/2 inch	1/8 inch	5/8 inch
Masonry	1/2 inch	1/8 inch	5/8 inch
Concrete	1/2 inch	1/8 inch	5/8 inch
Other Bases	3/8 inch	1/8 inch	1/2 inch

b. Horizontal Surfaces. Total plaster thickness for metal lath plaster, masonry and concrete bases is 5/8 inch. Total thickness of plaster for horizontal concrete surfaces is 1/8 to 3/8 inch.

c. Where vertical and horizontal concrete surfaces require more than 5/8 inch and 3/8 inch, to produce required lines or surfaces, attach metal plaster base for plaster application.

3.3.2 Gypsum Plaster Basecoat Work

3.3.2.1 Gypsum Two-Coat System

Apply the first coat to cover the base with sufficient material and pressure to form a good bond on the wall or ceiling base. Before the first coat has set and without scratching or cracking the surface, apply a second coat (double back) of the same material proportion as the base coat to the screeds. Straighten to a true surface without application of water, and cross rake or scratch to receive the finish coat.

3.3.2.2 Gypsum Three-Coat System

Apply scratch coat 3/16 to 1/4 inch thick to cover the base with sufficient material and pressure to form a good bond on the wall or ceiling base. Rake or scratch the surface and allow to set firm and hard. Apply the brown coat to bring the base coat out to the screeds, compact and straighten to a true surface without the application of water, and cross rake or scratch to receive the finish coat.

3.3.3 Gypsum Plaster Finish Coats

Moderately moisten or fog spray base coat of plaster that has become dry before finish coat is applied. Accelerate plaster, if necessary, to provide a setting time of not more than 4 hours from the time the plaster is mixed.

3.3.3.1 Lime-Putty and Gypsum-Gauged Finish Coats

Apply lime-putty gypsum-gauged finish white coat or aggregated white coat over the base coat, scratch in thoroughly, lay on well, double back, and fill out to a true, even surface. Allow the finish to dry a few minutes, then trowel well with water. Apply maximum pressure in order to compact

the finish coat and provide a smooth finish free from blemishes and irregularities. Apply trowel finish coats of gypsum-gauged lime-putty over properly prepared base coats as thin as possible and 1/16 to 1/8 inch thick for conventional plaster system, except as necessary in spots to level out hollows in base coat.

3.3.3.2 Gypsum Sand Float Finish Coat

Apply finish over the base coat, scratch in thoroughly, lay on with a trowel to an even surface, and then float with required to match existing floats to a true, even surface, free of slick spots or other blemishes. Apply sand float finishes to a maximum thickness of 1/8 inch except as necessary to level out hollow spots.

3.4 ORNAMENTAL PLASTER WORK

Complete ornamental work before the finish coat of plaster is applied to adjoining areas. Plaster for ornamental work must consist of a mixture that will produce satisfactory results for the respective conditions, be reinforced properly with fiber or zinc-coated steel wire netting as necessary to provide permanent construction, and be rigidly secured in place. Run plain moldings in place to templates and guides, with true radial lines for curved work; where it is not practicable to run such moldings, cast or run them on a bench and then secure in place firmly. Cornices and moldings must be straight or curved, true to line, and corners neat.

3.5 PATCHING AND POINTING

Cut out and patch loose, cracked, damaged, or defective gypsum plaster. Patch must match existing work in texture, color and finish flush with previously applied gypsum plaster surfaces. Point work abutting or adjoining finish work in a neat manner. Remove droppings or spatterings from surfaces. Leave clean and in a condition to receive paint or other finish. Remove protective covering from floors and other surfaces, and rubbish and debris from the interior and exterior of the building.

-- End of Section --

SECTION 09 29 00

GYPSUM BOARD
08/16

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108.11	(1992; Reaffirmed 2005) Specifications for Interior Installation of Cementitious Backer Units

ASTM INTERNATIONAL (ASTM)

ASTM C475/C475M	(2017) Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board
ASTM C840	(2020) Standard Specification for Application and Finishing of Gypsum Board
ASTM C954	(2018) Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
ASTM C1002	(2018) Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
ASTM C1047	(2019) Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base
ASTM C1177/C1177M	(2017) Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
ASTM C1178/C1178M	(2013) Standard Specification for Glass Mat Water-Resistant Gypsum Backing Panel
ASTM C1396/C1396M	(2017) Standard Specification for Gypsum Board
ASTM C1766	(2015; R2019) Standard Specification for Factory-Laminated Gypsum Panel Products
ASTM D226/D226M	(2017) Standard Specification for Asphalt-Saturated Organic Felt Used in

Roofing and Waterproofing

ASTM D412	(2016) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D624	(2000; R 2020) Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
ASTM D1149	(2007; R 2012) Standard Test Method for Rubber Deterioration - Surface Ozone Cracking in a Chamber
ASTM D3273	(2016) Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
ASTM E90	(2009; R2016) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
ASTM E336	(2020) Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/

GYPSUM ASSOCIATION (GA)

GA 214	(2010) Recommended Levels of Gypsum Board Finish
GA 216	(2010) Application and Finishing of Gypsum Panel Products
GA 253	(2012) Application of Gypsum Sheathing

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

UNDERWRITERS LABORATORIES (UL)

UL Fire Resistance	(2014) Fire Resistance Directory

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Cementitious Backer Units

Glass Mat Water-Resistant Gypsum Tile Backing Board

Water-Resistant Gypsum Backing Board

Glass Mat Covered or Reinforced Gypsum Sheathing

Glass Mat Covered or Reinforced Gypsum Sheathing Sealant

Accessories

Submit for each type of gypsum board and for cementitious backer units.

Gypsum Board

Recycled Content for Gypsum Board; S

Recycled Content for Paper Facing and Gypsum Cores; S

VOC Content of Joint Compound; S

Recycled Content for Sound Attenuation Blankets; S

Sound Attenuation Blankets

SD-04 Samples

Submit for each color and pattern of predecorated gypsum board. Where colors are not indicated, submit color selection samples of not less than eight of the manufacturer's standard colors.

SD-06 Test Reports

ASTM E90 Factory Test Report; G

ASTM E336 Field Test Report; G

SD-07 Certificates

Asbestos Free Materials; G, RO

Certify that gypsum board types, gypsum backing board types, cementitious backer units, and joint treating materials do not contain asbestos.

Indoor Air Quality for Gypsum Board; S

Indoor Air Quality for Adhesives; S

Indoor Air Quality for Sound Attenuation Blankets; S

SD-08 Manufacturer's Instructions

Safety Data Sheets

SD-10 Operation and Maintenance Data

Manufacturer Maintenance Instructions

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of

the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for gypsum board and joint compound that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

4. Low-Emitting Materials - Wall panels:

a. Meet the VOC emissions evaluation, or inherently nonemitting sources criteria, or salvaged and reused materials criteria. The wall panels product category includes all finish wall treatments (wall coverings, wall paneling, wall tile), surface wall structures such as gypsum or plaster, cubicle/curtain/partition walls. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

5. Low-Emitting Materials - Ceilings:

a. Meet the VOC emissions evaluation, or inherently nonemitting sources criteria, or salvaged and reused materials criteria. The ceilings

product category includes surface ceiling structures such as gypsum or plaster. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full emissions requirements.

6. Low-Emitting Materials - Interior insulation (sound attenuation blankets):

a. Meet the VOC emissions evaluation of California Department of Public Health (CDPH) Standard Method.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

7. Low-Emitting Materials - Interior adhesives and sealants applied on site:

a. Meet the VOC emissions evaluation and meet the VOC content evaluation. The adhesives and sealants product category include all interior adhesives and sealants applied on site. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality Certifications

Submit required indoor air quality certifications in one submittal package.

1.3.1.1 Ceiling and Wall Systems

Provide gypsum board and joint compound installed within building interior with VOC emissions in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method.

Provide acoustic insulation (sound attenuation blankets) installed within building interior with VOC emissions in compliance with California Department of Public Health (CDPH) Standard Method.

1.3.1.2 Adhesives and Sealants

Provide adhesives and sealants applied within the building interior with VOC emissions in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method and VOC content limits of SCAQMD Rule 1168.

1.3.1.3 Interior insulation

Provide Indoor Air Quality for Sound Attenuation Blankets.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery

Deliver materials in the original packages, containers, or bundles with each bearing the brand name, applicable standard designation, and name of manufacturer, or supplier.

1.4.2 Storage

Keep materials dry by storing inside a sheltered building. Where necessary to store gypsum board and cementitious backer units outside, store off the ground, properly supported on a level platform, and protected from direct exposure to rain, snow, sunlight, and other extreme weather conditions. Provide adequate ventilation to prevent condensation. Store per manufacturer's recommendations for allowable temperature and humidity range. Do not store gypsum wallboard with materials which have high emissions of volatile organic compounds (VOCs) or other contaminants. Do not store panels near materials that may offgas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives. Do not use materials that have visible moisture or biological growth.

1.4.3 Handling

Neatly stack gypsum board and cementitious backer units flat to prevent sagging or damage to the edges, ends, and surfaces.

1.5 QUALIFICATIONS

Furnish type of gypsum board work specialized by the installer with a minimum of 3 years of documented successful experience.

1.6 SCHEDULING

The gypsum wallboard must be taped, finished and primed before the installation of the highly-emitting materials. The gypsum wallboard must be installed after the installation and ventilation period of the highly-emitting materials.

Commence application only after the area scheduled for gypsum board work is completely weathertight. The heating, ventilating, and air-conditioning systems must be complete and in operation prior to application of the gypsum board. If the mechanical system cannot be activated before gypsum board is begun, the gypsum board work may proceed in accordance with an approved plan to maintain the environmental conditions specified below. Apply gypsum board prior to the installation of finish flooring and acoustic ceiling.

1.7 ENVIRONMENTAL REQUIREMENTS

Do not expose the gypsum board to excessive sunlight prior to gypsum board application. Maintain a continuous uniform temperature of not less than 50 degrees F and not more than 80 degrees F for at least one week prior to the application of gypsum board work, while the gypsum board application is being done, and for at least one week after the gypsum board is set. Shield air supply and distribution devices to prevent any uneven flow of air across the plastered surfaces. Provide ventilation to exhaust moist air to the outside during gypsum board application, set, and until gypsum board jointing is dry. In glazed areas, keep windows open top and bottom or side to side 3 to 4 inches. Reduce openings in cold weather to prevent freezing of joint compound when applied. For enclosed areas lacking natural ventilation, provide temporary mechanical means for ventilation. In unglazed areas subjected to hot, dry winds or temperature differentials from day to night of 20 degrees F or more, screen openings with cheesecloth or similar materials. Avoid rapid drying. During periods of low indoor humidity, provide minimum air circulation following gypsum

boarding and until gypsum board jointing complete and is dry.

1.8 FIRE RESISTIVE CONSTRUCTION

Comply with specified fire-rated assemblies for design numbers indicated per UL Fire Resistance or FM APP GUIDE.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to specifications, standards and requirements specified. Provide gypsum board types, gypsum backing board types, cementitious backing units, and joint treating materials manufactured from asbestos free materials only. Submit Safety Data Sheets and manufacturer maintenance instructions for gypsum materials including adhesives.

Building Product Declarations: Provide gypsum board, joint compound, and insulation with EPD and Material Ingredient Report, if available.

2.1.1 Gypsum Board

ASTM C1396/C1396M. Provide regular gypsum board with minimum 95 percent recycled content and all other gypsum boards types with minimum 10 percent recycled content. Provide data identifying percentage of recycled content for gypsum board. Paper facings must contain a minimum of 100 percent recycled paper content. Provide data identifying percentage of recycled content for paper facing and gypsum cores. Provide gypsum wall board and panels meeting the emissions requirements of CDPH SECTION 01350 (limit requirements for office space type). Provide certification or validation of indoor air quality for gypsum board.

2.1.1.1 Regular

48 inch wide, 5/8 inch thick, unless noted otherwise on the drawings, tapered edges.

2.1.1.2 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, tapered edges.

2.1.1.3 Mold Resistant / Anti-Microbial Gypsum

ASTM D3273. 48 inch wide, 5/8 inch thick, tapered edges.

2.1.2 Regular Water-Resistant Gypsum Backing Board

ASTM C1396/C1396M

2.1.2.1 Regular

48 inch wide, 5/8 inch thick, tapered edges.

2.1.2.2 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, tapered edges.

2.1.3 Glass Mat Water-Resistant Gypsum Tile Backing Board

ASTM C1178/C1178M

2.1.3.1 Regular

48 inch wide, 5/8 inch thick, square edges.

2.1.3.2 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, square edges.

2.1.4 Glass Mat Covered or Reinforced Gypsum Sheathing

Exceeds physical properties of ASTM C1396/C1396M and ASTM C1177/C1177M. Provide 5/8 inch, gypsum sheathing. Provide gypsum board of with a noncombustible water-resistant core, with glass mat surfaces embedded to the gypsum core or reinforcing embedded throughout the gypsum core. Warrant gypsum sheathing board for at least twelve months against delamination due to direct weather exposure. Provide continuous, asphalt impregnated, building felt to cover exterior face of sheathing. Seal all joints, seams, and penetrations with compatible sealant.

2.1.4.1 Glass Mat Covered or Reinforced Gypsum Sheathing Sealant

Provide sealant compatible with glass mat covered or reinforced gypsum sheathing, rubber washers for masonry veneer anchors, and other associated cavity wall components such as anchors and through wall flashing. Provide sealants for glass mat covered or reinforced gypsum sheathing board edge seams and veneer anchor penetrations recommended by the glass mat covered or reinforced gypsum sheathing manufacturer and have the following performance requirements:

a. ASTM D412: Tensile Strength, 80 psi
b. ASTM D412: Ultimate Tensile Strength (maximum elongation), 170 psi
c. ASTM D624: Tear Strength, dieB, 27 ppi
d. ASTM D1149: Joint Movement Capability after 14 Days cure, plus or minus 50 percent.

2.1.5 Factory-Laminated Gypsum Board

ASTM C1766, Type X, 48 inch wide 5/8 inch thick, sound dampening gypsum panel products composed of two or morefactory-laminated gypsum panel laminated into a composite panel.

2.1.5.1 ASTM E90 Factory Test Report

Submit Factory Test Report for proposed STC Rated wall assembly. Test reports must be prepared by an independent acoustical laboratory qualified under the National Voluntary Laboratory Accreditation Program (NVLAP) by the National Institute for Science and Technology (NIST). Test reports must indicate that the sound transmission classification (STC) of the proposed wall and ceiling assembly, based on tests at 16 third-octave band frequencies from 125 to 4,000 hertz, is no less than STC 50 for STC 45 assemblies and no less than STC 55 for STC 50 assemblies when tested in accordance with ASTM E90.

2.1.6 Cementitious Backer Units

In accordance with the Tile Council of America (TCA) Handbook.

2.1.7 Joint Treatment Materials

ASTM C475/C475M. Product must be low emitting VOC types with VOC limits not exceeding 50 g/L. Provide data identifying VOC content of joint compound. Use all purpose joint and texturing compound containing inert fillers and natural binders, including lime compound. Pre-mixed compounds must be free of antifreeze, vinyl adhesives, preservatives, biocides and other slow releasing compounds.

2.1.7.1 Embedding Compound

Specifically formulated and manufactured for use in embedding tape at gypsum board joints and compatible with tape, substrate and fasteners.

2.1.7.2 Finishing or Topping Compound

Specifically formulated and manufactured for use as a finishing compound.

2.1.7.3 All-Purpose Compound

Specifically formulated and manufactured to serve as both a taping and a finishing compound and compatible with tape, substrate and fasteners.

2.1.7.4 Setting or Hardening Type Compound

Specifically formulated and manufactured for use with fiber glass mesh tape.

2.1.7.5 Joint Tape

Use cross-laminated, tapered edge, reinforced paper, or fiber glass mesh tape recommended by the manufacturer.

2.1.8 Fasteners

2.1.8.1 Screws

ASTM C1002, Type "G", Type "S" or Type "W" steel drill screws for fastening gypsum board to gypsum board, wood framing members and steel framing members less than 0.033 inch thick. ASTM C954 steel drill screws for fastening gypsum board to steel framing members 0.033 to 0.112 inch thick. Provide cementitious backer unit screws with a polymer coating.

2.1.9 Adhesives

Provide adhesive products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for office space type) and VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for adhesives applied on the interior of the building (inside of the weatherproofing system).

2.1.9.1 Adhesive for Fastening Gypsum Board to Metal Framing

Not permitted.

2.1.9.2 Adhesive for Fastening Gypsum Board to Wood Framing

Not permitted.

2.1.9.3 Adhesive for Laminating

Not permitted.

2.1.10 Shaftwall Liner Panel

ASTM C1396/C1396M. Conform to the UL Fire Resistance for the Design Numbers(s) indicated for shaftwall liner panels. Manufacture liner panel for cavity shaftwall system, with water-resistant paper faces, bevel edges, single lengths to fit required conditions, 1 inch thick, by 24 inch es wide.

2.1.11 Sound Attenuation Blankets (SAFB)

ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from slag wool or rock wool. Blankets shall be the proper width and depth required to completely fill the stud/drywall cavity and prevent sag. Blankets installed where drywall is not applied on each side of the stud shall be mechanically held in place. Minimum required recycled materials content by weight for Rock Wool shall be 75 percent slag. Submit Recycled Content for Sound Attenuation Blankets.

2.1.12 Accessories

ASTM C1047. Fabricate from corrosion protected steel or plastic designed for intended use. Accessories manufactured with paper flanges are not acceptable. Flanges must be free of dirt, grease, and other materials that may adversely affect bond of joint treatment. Provide prefinished or job decorated materials.

2.1.13 Asphalt Impregnated Building Felt

Provide a 15 lb asphalt moisture barrier over glass mat covered or reinforced gypsum sheathing. Conforming to ASTM D226/D226M Type 1 (No. 15) for asphalt impregnated building felt.

2.1.14 Water

Provide clean, fresh, and potable water.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Framing and Furring

Verify that framing and furring are securely attached and of sizes and spacing to provide a suitable substrate to receive gypsum board and cementitious backer units. Verify that all blocking, headers and supports are in place to support plumbing fixtures and to receive soap dishes, grab bars, towel racks, and similar items. Do not proceed with work until framing and furring are acceptable for application of gypsum board and cementitious backer units.

3.1.2 Gypsum Board and Framing

Verify that surfaces of gypsum board and framing to be bonded with an adhesive are free of dust, dirt, grease, and any other foreign matter. Do not proceed with work until surfaces are acceptable for application of gypsum board with adhesive.

3.1.3 Building Construction Materials

Do not install building construction materials that show visual evidence of biological growth.

3.2 APPLICATION OF GYPSUM BOARD

Apply gypsum board to framing and furring members in accordance with ASTM C840 or GA 216 and the requirements specified. Apply gypsum board with separate panels in moderate contact; do not force in place. Stagger end joints of adjoining panels. Neatly fit abutting end and edge joints. Use gypsum board of maximum practical length; select panel sizes to minimize waste. Cut out gypsum board to make neat, close, and tight joints around openings. In vertical application of gypsum board, provide panels in lengths required to reach full height of vertical surfaces in one continuous piece. Lay out panels to minimize waste; reuse cutoffs whenever feasible. Surfaces of gypsum board and substrate members may be bonded together with an adhesive, except where prohibited by fire rating(s). Treat edges of cutouts for plumbing pipes, screwheads, and joints with water-resistant compound as recommended by the gypsum board manufacturer. Minimize framing by floating corners with single studs and drywall clips. Provide type of gypsum board for use in each system specified herein as indicated.

3.2.1 Solid Gypsum Board Partitions

Provide in accordance with ASTM C840, System V or GA 216.

3.2.2 Application of Gypsum Board to Steel Framing and Furring

Apply in accordance with ASTM C840, System VIII or GA 216.

3.2.3 Arches and Bending Radii

Apply gypsum board in accordance with ASTM C840, System IX or GA 216.

3.2.4 Gypsum Board for Wall Tile or Tile Base Applied with Adhesive

In dry areas (areas other than tubs, shower enclosures, saunas, steam rooms, gang shower rooms), apply glass mat water-resistant gypsum tile backing board in accordance with ASTM C840, System X or GA 216.

3.2.5 Exterior Application

Apply exterior gypsum board (such as at soffits) in accordance with ASTM C840, System XI or GA 216.

3.2.6 Glass Mat Covered or Fiber Reinforced Gypsum Sheathing

Apply glass mat covered or fiber reinforced gypsum sheathing in accordance to gypsum association publications GA 253. Follow gypsum sheathing

manufacturer's requirements of design details for joints and fasteners and be properly installed to protect the substrate from moisture intrusion. Do not leave exposed surfaces of the glass mat covered or fiber reinforced gypsum sheathing beyond the manufacturer's recommendation without a weather barrier cladding. Provide continuous asphalt impregnated building felt over sheathing surface in shingle fashion with edges and ends lapped a minimum of 6 inch. Properly flash the openings. Seal all joints, seams, and penetrations with a compatible silicone sealant.

3.2.7 Floating Interior Angles

Minimize framing by floating corners with single studs and drywall clips. Locate the attachment fasteners adjacent to ceiling and wall intersections in accordance with ASTM C840, System XII or GA 216, for single-ply and two-ply applications of gypsum board to wood framing.

3.2.8 Control Joints

Install expansion and contraction joints in ceilings and walls in accordance with ASTM C840, System XIII or GA 216. Fill control joints between studs in fire-rated construction with firesafing insulation to match the fire-rating of construction.

3.3 APPLICATION OF CEMENTITIOUS BACKER UNITS

3.3.1 Application

In wet areas (tubs, shower enclosures, saunas, steam rooms, gang shower rooms), apply cementitious backer units in accordance with ANSI A108.11. Place a 15 lb asphalt impregnated, continuous felt paper membrane behind cementitious backer units, between backer units and studs or base layer of gypsum board. Place membrane with a minimum 6 inch overlap of sheets laid shingle style.

3.3.2 Joint Treatment

ANSI A108.11.

3.4 FINISHING OF GYPSUM BOARD

Tape and finish gypsum board in accordance with ASTM C840, GA 214 and GA 216. Finish plenum areas above ceilings to Level 1 in accordance with GA 214. Finish water resistant gypsum backing board, ASTM C1396/C1396M, to receive ceramic tile to Level 2 in accordance with GA 214. Finish walls and ceilings to receive a heavy-grade wall covering or heave textured finish before painting to Level 3 in accordance with GA 214. Finish walls and ceilings without critical lighting to receive flat paints, light textures, or wall coverings to Level 4 in accordance with GA 214. Unless otherwise specified, finish all gypsum board walls, partitions and ceilings to Level 5 in accordance with GA 214. Provide joint, fastener depression, and corner treatment. Tool joints as smoothly as possible to minimize sanding and dust. Do not use self-adhering fiber glass mesh tape with conventional drying type joint compounds; use setting or hardening type compounds only. Provide treatment for water-resistant gypsum board as recommended by the gypsum board manufacturer. Protect workers, building occupants, and HVAC systems from gypsum dust.

3.4.1 Uniform Surface

Wherever gypsum board is to receive eggshell, semigloss or gloss paint finish, or where severe, up or down lighting conditions occur, finish gypsum wall surface in accordance to GA 214 Level 5. In accordance with GA 214 Level 5, apply a thin skim coat of joint compound to the entire gypsum board surface, after the two-coat joint and fastener treatment is complete and dry.

3.5 SEALING

Seal openings around pipes, fixtures, and other items projecting through gypsum board and cementitious backer units as specified in Section 07 92 00 JOINT SEALANTS. Apply material with exposed surface flush with gypsum board or cementitious backer units.

3.6 FIRE-RESISTANT ASSEMBLIES

Wherever fire-rated construction is indicated, provide materials and application methods, including types and spacing of fasteners, wall and ceiling framing in accordance with the specifications contained in UL Fire Resistance for the Design Number(s) indicated, . Joints of fire-rated gypsum board enclosures must be closed and sealed in accordance with UL test requirements or GA requirements. Seal penetrations through rated partitions and ceilings tight in accordance with tested systems.

3.7 SOUND RATED ASSEMBLIES

When sound rated assemblies are required, provide materials and application methods, including panels, insulation, types and spacing of fasteners, wall and ceiling framing in accordance with the contract document and the description of the assembly in the ASTM E90 Factory Test Report. Seal partitions continuously with acoustical foam or sealant (both sides) and finished to match wall wherever it abuts another element such as the floor, ceiling, wall, column, mullion, or another system or assembly.

3.8 PATCHING

Patch surface defects in gypsum board to a smooth, uniform appearance, ready to receive finishes.

3.9 SHAFTWALL FRAMING

Install the shaftwall system in accordance with the system manufacturer's published instructions. Coordinate bucks, anchors, blocking and other items placed in or behind shaftwall framing with electrical and mechanical work. Patch or replace fireproofing materials which are damaged or removed during shaftwall construction.

3.9.1 Existing Conditions

Before installing insulation, ensure that areas that will be in contact with the insulation are dry and free of projections which could cause voids or compressed insulation. If moisture or other conditions are found that do not allow the workmanlike installation of the insulation, do not proceed but notify Contracting Officer of such conditions.

3.10 SOUND RATED ASSEMBLY FIELD TESTING

Provide third party testing of sound rated assemblies tested in accordance with ASTM E336. Provide the ASTM E336 Field Test Report verifying that the installed assemblies perform no less than five ASTC rating points below the ASTM E90 Factory Test Report. Examine, modify adjust, and retest any installation not meeting the STC Rating until compliance is obtained.

-- End of Section --

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SECTION 09 30 10

CERAMIC, QUARRY, AND GLASS TILING
08/20

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108/A118/A136.1	(2019) American National Standard Specifications for theInstallation of Ceramic Tile
ANSI A137.1	(2019) American National Standards Specifications for Ceramic Tile

ASTM INTERNATIONAL (ASTM)

ASTM A1064/A1064M	(2017) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C33/C33M	(2018) Standard Specification for Concrete Aggregates
ASTM C144	(2018) Standard Specification for Aggregate for Masonry Mortar
ASTM C150/C150M	(2020) Standard Specification for Portland Cement
ASTM C206	(2014) Standard Specification for Finishing Hydrated Lime
ASTM C207	(2018) Standard Specification for Hydrated Lime for Masonry Purposes
ASTM C373	(2018)Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products
ASTM C648	(2020) Standard Test Method for Breaking Strength of Ceramic Tile
ASTM C847	(2014a) Standard Specification for Metal Lath

ASTM C1027	(2009; R 2017) Standard Test Method for Determining Visible Abrasion Resistance of Glazed Ceramic Tile

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

TILE COUNCIL OF NORTH AMERICA (TCNA)

TCNA Hdbk	(2017) Handbook for Ceramic, Glass, and Stone Tile Installation

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

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

36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G

SD-03 Product Data

Porcelain Tile; G

Recycled Content for Porcelain Tile; S

Porcelain Tile; G

Mosaic Tile; G

Recycled Content for Mosaic Tile; S

Transition Strips; G

Metal Strips; G

Setting-Bed; G

Mortar, Grout, and Adhesive; G

Cementitious Backer Units; G

Waterproof Membrane; G

Crack Isolation Membrane; G

SD-04 Samples

Tile; G, AE

Accessories; G, AE

Transition Strips; G, AE

Metal Strips; G

Grout; G, AE

SD-07 Certificates

Indoor Air Quality for Adhesives; S

Indoor Air Quality for Sealants; S

Indoor Air Quality for Cementitious Backer Units; S

Indoor Air Quality for Mortar and Grout; S

Indoor Air Quality for Sealer and Waterproofing Membrane; S

Water Absorption Rates

SD-08 Manufacturer's Instructions

Manufacturer's Approved Cleaning Instructions

SD-10 Operation and Maintenance Data

Porcelain Tile, Data Package 1; G

Mosaic Tile, Data Package 1; G

Transition Strips, Data Package 1; G

Metal Strips, Data Package 1; G

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment for tile, grout, mortar,

glass-mat backing board, if available; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for tile, grout, mortar, glass-mat backing board, if available, that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

4. Low-Emitting Materials - Flooring: (tile, mortar, cementitious backer units, gypsum backing board)

a. All flooring shall comply with the 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." All flooring must meet the VOC emissions evaluation OR inherently non-emitting sources criteria, OR salvaged and reused materials criteria. The flooring product category includes all types of hard and soft surface flooring (carpet, ceramic, vinyl, rubber, engineered, solid wood, laminates), wall base, underlayment, and other floor coverings. Subflooring is excluded. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

5. Low-Emitting Materials - Wall panels: (tile and glass-mat gypsum backing board, cementitious backer board)

a. Meet the VOC emissions evaluation, or inherently nonemitting sources criteria, or salvaged and reused materials criteria. The wall panels product category includes all finish wall treatments (wall coverings, wall paneling, wall tile), surface wall structures such as gypsum or plaster, cubicle/curtain/partition walls, trim, doors, frames, windows, and window treatments. Removable/interchangeable fabric panels, built-in cabinetry, and vertical structural elements are excluded. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full emissions requirements.

b. Product is considered an inherently non-emitting source of VOCs if it is one of the following, and has no integral organic-based surface coatings, binders, or sealants: stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood.

c. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

6. Low-Emitting Materials - Interior adhesives and sealants (including grout):

a. Meet the VOC emissions evaluation and meet the VOC content evaluation. The adhesives and sealants product category include all interior adhesives and sealants applied on site. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

7. Low-Emitting Materials - Interior coatings (including grout sealer, waterproofing membrane):

a. Meet the VOC emissions evaluation and meet the VOC content evaluation. The paints and coatings product category include all interior paints and coatings applied on site. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality Certifications

Provide mortar, grout, grout sealer, waterproofing membrane, and sealants applied within the building interior with VOC emissions in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method and the following VOC content limits.

a. Mortar and grout VOC content: Not to exceed 65 g/L.

b. Grout sealer VOC content: Not to exceed 200 g/L.

c. Waterproofing membrane VOC content: Not to exceed 100 g/L.

d. Sealant (caulk) VOC content: Not to exceed 250 g/L.

Provide tile, glass-mat gypsum backer board and cementitious backer units installed within building interior with VOC emissions in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method.

a. Exemption: Inherently nonemitting source of VOCs tile (stone, ceramic, glass, concrete, clay brick) with no binders, surface coatings, or sealants that include organic chemicals.

Provide validation for Indoor Air Quality for Cementitious Backer Units, Indoor Air Quality for Mortar and Grout, and Indoor Air Quality for Sealer and Waterproofing Membrane.

1.3.2 Water Absorption Rates Certification

Provide certification for each tile type indicating compliance with the following water absorption (wa) rates per ANSI A137.1 criteria as tested per ASTM C373 requirements.

a. Porcelain Tile (Impervious): Provide water absorption (wa) of 0.5 percent or less.

1.3.3 Building Product Declarations

Provide tile, grout, mortar, glass-mat backing board with EPD and Material Ingredient Report, if available.

1.4 QUALITY ASSURANCE

Provide installers having a minimum of two years of experience with a company specializing in performing the type of work described. Each type and color of tile to be provided from a single source. Each type and color of mortar, adhesive, and grout to be provided from the same source.

1.5 DELIVERY, STORAGE, AND HANDLING

Ship tiles in sealed packages and clearly marked with the grade, type of tile, producer identification, and country of origin. Deliver materials to the project site in manufacturer's original unopened containers with seals unbroken and labels and hallmarks intact. Protect materials from weather, and store them under cover in accordance with manufacturer's printed instructions. Store and handle tiles per manufacturer's instructions for gauged porcelain tile and gauged porcelain tile panels/slabs.

1.6 ENVIRONMENTAL REQUIREMENTS

Do not perform ceramic tile work unless the substrate and ambient temperature is at least 50 degrees F and rising. Maintain temperature above 50 degrees F while the work is being performed and for at least 7 days after completion of the work. When temporary heaters are used, ventilate the area to the outside to avoid carbon dioxide damage to new tilework.

1.7 WARRANTY

Provide manufacturer's warranty to repair or replace defective tiling materials and workmanship, including tile, mortar and grout products and installation as a system, for a period of one year from date of final acceptance of the work.

1.8 EXTRA MATERIALS

Supply an extra 3 percent of each type tile used in clean and marked cartons.

PART 2 PRODUCTS

2.1 TILE

Provide tiles that comply with ANSI A137.1 and are standard grade tiles. Provide a minimum breaking strength of 125 lbs. for wall tile and 250 lbs. for floor tile in accordance with ASTM C648. Provide floor tiles with a minimum wet dynamic coefficient of friction (DCOF) value of 0.42 when tested in accordance with ANSI A137.1 requirements. Provide glazed floor tile with a Class IV-Commercial and V-Heavy Commercial classification as rated by the manufacturer when tested in accordance with ASTM C1027 for visible abrasion resistance as related to foot traffic. For materials like tile, accessories, and transition strips submit samples of sufficient size to show color range, pattern, type and joints.

Submit manufacturers' descriptive product data for each type of tiling indicated. Include manufacturers' literature, finishes, profiles and thicknesses of materials.

Submit manufacturers' operations and maintenance data for each type of tiling indicated in accordance with Section 01 78 23 OPERATIONS AND MAINTENANCE DATA.

2.1.1 Porcelain Tile

Provide unglazed through body (surface color and pattern go all the way through the tile body) and glazed color body (body of tile is stained to match the glaze color), rectified porcelain tile and covebullnose base and trim pieces. Provide tile with a V2 and V3 aesthetic classification. Blend tiles in factory and in a packages to have same color range and continuous blend for installation. Provide nominal tile size(s) of 12 by 24, 3 by 9, 3 by 12, 8 by 8, and 12 by 27 inches and 3/8 and 5/16 inch, and 8 mm thick.

Provide porcelain tiling materials that contain a minimum of 10 percent recycled content. Provide data identifying percentage of recycled content for porcelain tile.

2.1.2 Mosaic Tile

Furnish unglazed, mosaic tile and trim composed of porcelain. Provide nominal tile size(s) of 3/4 by 3/4 inch.

Provide mosaic tiling materials that contain a minimum of 3 percent recycled content. Provide data identifying percentage of recycled content for mosaic tile.

2.1.3 Quarry Tile

Furnish red quarry tile with a smooth surface size and color to match existing.

2.1.4 Stone Tile

Furnish bluestone tile, size and color to match existing.

2.2 SETTING-BED

Submit manufacturer's catalog data. Compose the setting-bed of the following materials:

2.2.1 Aggregate for Concrete Fill

Conform to ASTM C33/C33M for aggregate fill. Do not exceed one-half the thickness of concrete fill for maximum size of coarse aggregate.

2.2.2 Portland Cement

Conform to ASTM C150/C150M for cement, Type I, white for wall mortar and gray for other uses.

2.2.3 Sand

Conform to ASTM C144 for sand.

2.2.4 Hydrated Lime

Conform to ASTM C206 for hydrated lime, Type S or ASTM C207, Type S.

2.2.5 Metal Lath

Conform to ASTM C847 for flat expanded type metal lath, and weighing a minimum 2.5 pound/square yard.

2.2.6 Reinforcing Wire Fabric

Conform to ASTM A1064/A1064M for wire fabric. Provide 2 by 2 inch mesh, 16/16 wire or 1-1/2 by 2 inch mesh, 16/13 wire.

2.3 WATER

Provide potable water.

2.4 MORTAR, GROUT, AND ADHESIVE

Provide adhesive products used on the interior of the building (defined as inside of the weatherproofing system) meeting emissions requirements of CDPH SECTION 01350 (limit requirements for office space type) and VOC content requirements of SCAQMD Rule 1168. For products located on the interior of the building (inside of the weatherproofing system, provide certification or validation of indoor air quality for adhesives. Provide bond coat, mortar, and grout supplied from the same manufacturer.

2.4.1 Dry-Set Portland Cement Mortar

TCNA Hdbk.

2.4.2 Latex-Portland Cement Mortar

TCNA Hdbk.

2.4.3 Ceramic, Quarry, and Stone Tile Grout

TCNA Hdbk; petroleum-free and plastic-free high-performance cement grout (latex-portland cement grout) and standard cement commercial portland cement grout.

2.4.4 Epoxy Resin Grout

TCNA Hdbk. 100% solid epoxy grout. Comply with ANSI A108/A118/A136.1.

2.4.5 Sealants

Comply with applicable regulations regarding toxic and hazardous materials and as specified. Provide sealant that does not change the color or alter the appearance of the grout. Refer to Section 07 92 00 JOINT SEALANTS.

Provide sealants used on the interior of the building (defined as inside of the weatherproofing system) meeting emissions requirements of CDPH SECTION 01350 (limit requirements for office space type) and VOC

content requirements of SCAQMD Rule 1168. For products located on the interior of the building (inside of the weatherproofing system), provide certification or validation of indoor air quality for sealants.

2.5 SUBSTRATES

Refer to Section 09 29 00 GYPSUM BOARD for cementitious backer units.

2.5.1 Cementitious Backer Units

Provide cementitious backer unit, for use as tile substrate as indicated, in accordance with TCNA Hdbk. Furnish 1/2 inch thick cementitious backer units.

2.6 MISCELLANEOUS TRIMS

2.6.1 Transition Strips

Provide clear anodized aluminum transitions between tile and carpet or resilient flooring. Provide types as recommended by flooring manufacturer for both edges and transitions of flooring materials specified and as indicated on the color material legend on the drawings. . Provide transition strips that comply with 36 CFR 1191requirements.

2.6.2 Metal Strips

Provide L-shape trim shapes, height to match tile and setting thickness, designed specifically for flooring, and wall applications. Provide extruded radiused, clear anodized aluminum edging at tile surfaces with exposed outside corners.

2.7 WATERPROOF MEMBRANE

2.7.1 General

Manufacturer's standard product that complies with ANSI A108/A118/A136.1 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

2.8 CRACK ISOLATION MEMBRANE

2.8.1 General

Manufacturer's standard product that complies with ANSI A108/A118/A136.1 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

2.8.2 Chlorinated-Polyethylene Crack Isolation Membrane

Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030 inch nominal thickness.

2.9 COLOR, TEXTURE, AND PATTERN

Provide color, pattern and texture as indicated on the color material legend on the drawings; colors listed are not intended to limit the selection of equal colors from other manufacturers.

2.10 CLEANING MATERIALS

Use products that have a minimum 5 year performance record on similar projects. Selection of the masonry rather than current level of cleanliness of the comparable structure.

2.10.1 Floor Coating Removers

Provide chemical floor coating removers for the existing quarry tile and bluestone paving.

2.10.2 Chemical Cleaners

Provide chemical cleaners to remove general soiling from the quarry tile and bluestone that do not alters, damage, or discolor the substrate surface.

2.10.3 Cleaning Implements

Furnish brushes that contain natural or nylon fiber bristles only. Do not use wire brushes. Scrapers and application paddles shall be made of wood with rounded edges. Metallic tools are not permitted.

2.10.4 Water

Obtain potable water from a local source. Filter to remove minerals resulting in a neutral pH prior to application.

2.11 STONE FLOORING SEALER

Provide manufacturer's standard water-resistant sealer compatible with bluestone flooring. Sealer shall be a penetrating type specially prepared for use on bluestone flooring. The sealer shall not discolor or amber the bluestone and shall produce a slip resistant surface.

PART 3 EXECUTION

3.1 FLOOR TILE CLEANING

Cleaning shall be performed on the existing quarry tile and bluestone flooring of the main stair. Historic materials shall not be damaged or marred in the process of cleaning. Cleaning shall conform to NPS TPS Brief 1. Protect non-masonry materials by approved methods prior to initiation of cleaning operations. Cleaning shall remove all organic and inorganic contaminants from the surface and pores of the substrate, without causing any short or long-term negative consequences. Surfaces shall be evenly cleaned with no evidence of streaking or bleaching. The cleaning process shall not affect the density, porosity, or color of the tile. Cleaned surfaces shall have a neutral pH. Use the gentlest methods possible to achieve the desired results. Make test patches to determine a satisfactory cleaning result.

3.1.1 Test Patches

Demonstrate the materials, equipment, and methods to be used in cleaning in a test section approximately 1 foot by 1 foot. The location of the test section, and the completed test section is subject to approval. Adjust the cleaning process as required and the test section rerun until an acceptable process is obtained. Locate test patches in inconspicuous

areas. The areas tested shall exhibit soiling characteristics representative of those larger areas to be cleaned. Allow tested areas to dry before a determination is made on the effectiveness of a particular treatment.

3.1.2 Coating Removal

Remove coatings from floor tiles in areas indicated prior to general cleaning. Tiles shall not be damaged or marred in the process of coating removal. Apply chemical removers in accordance with manufacturer's instructions. Surrounding painted surfaces to remain intact shall be protected from exposure to chemical coating removers to avoid damage.

3.1.3 Chemical Cleaning

Chemical cleaning of historic tile shall use the gentlest means possible to achieve the desired result as determined by test patches. Chemical cleaning is the use of any product in addition to water, including detergents, ammonia, vinegar, and bleach. Cleaning shall result in uniform coverage of all surfaces, including corners and interstices and produce an even effect without streaking or damage to the tile. Do not apply chemical cleaners to the same surfaces more than twice.

3.1.3.1 Surface Prewetting

Wet surfaces to be cleaned with chemical cleaners with water using a low pressure spray before application of any cleaner.

3.1.3.2 Chemical Cleaning Procedure

Apply chemical cleaners according to manufacturer's instructions. Cleaner shall remain on masonry surface for the time period recommended by manufacturer. Manual scrubbing by brushes shall be employed as indicated by test patches for the specific location. Cleaned surfaces shall be rinsed with a low-to-moderate pressure spray of water to remove all traces of chemical cleaner.

3.1.3.3 pH Testing

Determine the pH of the cleaned surfaces using pH monitoring pencils or papers. Rinse chemically cleaned masonry of all chemical residues until a neutral pH 7 reading is obtained from the treated surface.

3.2 PREPARATORY WORK AND WORKMANSHIP

Inspect surface to receive tile in conformance to the requirements of TCNA Hdbk for surface conditions for the type setting bed specified and for workmanship. Provide variations of tiled surfaces that fall within maximum values shown below:

TYPE	WALLS	FLOORS
Dry-Set Mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.
Latex-Portland Cement Mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.

TYPE	WALLS	FLOORS
Epoxy	1/8 inch in 8 ft.	1/8 inch in 10 ft.

3.3 GENERAL INSTALLATION REQUIREMENTS

Do not start tile work until roughing in for mechanical and electrical work has been completed and tested, and built-in items requiring membrane waterproofing have been installed and tested. Close space, in which tile is being set, to traffic and other work. Keep closed until tile is firmly set. Do not start floor tile installation in spaces requiring wall tile until after wall tile has been installed. Apply tile in colors and patterns indicated in the area shown on the drawings. Install tile with the respective surfaces in true even planes to the elevations and grades shown. Provide special shapes as required for sills, jambs, recesses, offsets, external corners, and other conditions to provide a complete and neatly finished installation. Solidly back tile bases and coves with mortar. Do not walk or work on newly tiled floors without using kneeling boards or equivalent protection of the tiled surface. Keep traffic off horizontal portland cement mortar installations for at least 72 hours. Keep all traffic off epoxy installed floors for at least 40 hours after grouting, and heavy traffic off for at least 7 days, unless otherwise specifically authorized by manufacturer. Dimension and draw detail drawings at a minimum scale of 1/4 inch = 1 foot. Include drawings of pattern at inside corners, outside corners, termination points and location of all equipment items such as thermostats, switch plates, mirrors and toilet accessories mounted on surface. Submit drawings showing ceramic tile pattern elevations and floor plans. Submit manufacturer's preprinted installation instructions.

Do not install building construction materials that show visual evidence of biological growth.

3.4 INSTALLATION OF SUBSTRATES

3.4.1 Cementitious Backer Units

Install in accordance with manufacturer's written instructions.

3.5 INSTALLATION OF WALL TILE

Install wall tile in accordance with the TCNA Hdbk, method and with grout joints as recommended by the manufacturer for the type of tile. Install thinner wall tile flush with thicker wall tile applied on same wall and provide installation materials as recommended by the tile and setting materials manufacturer's to achieve flush installation.

3.5.1 Workable or Cured Mortar Bed

Install tile over workable mortar bed or a cured mortar bed at the option of the Contractor. Install a 4 mil polyethylene membrane, metal lath, and scratch coat. Conform to TCNA Hdbk method for workable mortar bed, materials, and installation of tile. Conform to TCNA Hdbk method for cured mortar bed and materials.

3.5.2 Dry-Set Mortar and Latex-Portland Cement Mortar

Use dry-set or latex-portland cement to install tile in accordance with TCNA Hdbk. Use latex-portland cement when installing porcelain ceramic tile.

3.5.3 Ceramic Tile Grout

Prepare and install ceramic tile grout in accordance with TCNA Hdbk. Provide and apply manufacturer's standard product for sealing grout joints in accordance with manufacturer's recommendations.

3.5.4 Epoxy Resin Grout

Prepare and install epoxy resin grout in accordance with TCNA Hdbk.

3.6 DETERIORATED QUARRY TILE REMOVAL AND REPLACEMENT

Before removing any deteriorated tile units, establish bonding patterns and coursing. Remove quarry tile that has deteriorated or is damaged beyond repair, as determined through investigation and evaluation. Carefully demolish or remove entire units from joint to joint, without damaging surrounding units in a manner that permits replacement with full-size units. Notify Contracting Officer of unforeseen detrimental conditions including voids, cracks, bulges, and loose substrate, rotted wood, rusted metal, and other deteriorated items.

a. Clean surrounding tile areas by removing mortar and grout, dust, and loose particles in preparation for replacement.

b. Replace removed tile with new tile that matches existing tile.

c. Clean replacement areas with a non-metallic brush and water to remove excess mortar.

3.7 HONING BLUESTON PAVERS IN SITU

Hone isolated bluestone pavers as necessary to reduce cupping, delamination, and any tripping hazards. Any unit that is designated for honing in situ can became a candidate for removal if, after honing is completed, the paver is too thin or out of plane with the adjacent.

3.8 INSTALLATION OF FLOOR TILE

Install floor tile in accordance with TCNA Hdbk method and with grout joints as recommended by the manufacturer for the type of tile.

3.8.1 Workable or Cured Mortar Bed

Install floor tile over a workable mortar bed or a cured mortar bed at the option of the Contractor. Conform to TCNA Hdbk for workable mortar bed materials and installation. Conform to TCNA Hdbk for cured mortar bed materials and installation. Provide minimum 1/4 inch to maximum 3/8 inch joints in uniformed width.

3.8.2 Dry-Set and Latex-Portland Cement

Use dry-set or latex-portland cement mortar to install tile directly over properly cured, plane, clean concrete slabs in accordance with TCNA Hdbk

method. Use latex-portland cement when installing porcelain ceramic tile.

3.8.3 Resinous Grout

When resinous grout is indicated, grout quarry tile with epoxy resin grout conforming to ANSI A108/A118/A136.1. Rake and clean joints to the full depth of the tile and neutralize when recommended by the resin manufacturer. Install epoxy resin grout in conformance with TCNA Hdbk. Install resin grout in accordance with manufacturer's printed installation instructions. Follow manufacturer's printed installation instructions of installed resin grout for proportioning, mixing, installing, and curing. Maintain the recommended temperature in the area and on the surface to be grouted. Protect finished grout of grout stain.

3.8.4 Ceramic Tile Grout

Prepare and install ceramic tile grout in accordance with TCNA Hdbk. Provide and apply manufacturer's standard product for sealing grout joints in accordance with manufacturer's recommendations.

3.8.5 Concrete Fill

Provide a 3500 psi concrete fill mix to dry as consistency as practicable. Compose concrete fill by volume of 1 part Portland cement to 3 parts fine aggregate to 4 parts coarse aggregate, and mix with water to as dry a consistency as practicable. Spread, tamp, and screed concrete fill to a true plane, and pitch to drains or levels as shown. Thoroughly damp concrete fill before applying setting-bed material. Reinforce concrete fill with one layer of reinforcement, with the uncut edges lapped the width of one mesh and the cut ends and edges lapped a minimum 2 inch. Tie laps together with 18 gauge wire every 10 inch along the finished edges and every 6 inch along the cut ends and edges. Provide reinforcement with support and secure in the centers of concrete fills. Provide a continuous mesh; except where expansion joints occur, cut mesh and discontinue across such joints. Provide reinforced concrete fill under the setting-bed where the distance between the under-floor surface and the finished tiles floor surface is a minimum of 2 inches, and of the same thickness that the mortar setting-bed over the concrete fill with the thickness required in the specified TCNA Hdbk method.

3.9 APPLICATION OF A SEALER

Apply sealer to bluestone pavers after restoration is complete. First apply to sample panels before wholesale usage to evaluate the effect on the final appearance.

3.10 INSTALLATION OF MISCELLANEOUS TRIMS

3.10.1 Transition Strips

Install transition strips where indicated, in a manner similar to that of the ceramic tile floor and as recommended by the manufacturer. Provide thresholds full width of the opening. Install head joints at ends not exceeding 1/4 inch in width and grouted full.

3.10.2 Metal Trims

Install trim where indicated. Embed anchoring leg in setting mortar in accordance with manufacturer's instructions. During grouting of tile

joints, immediately wipe grout from finish surface.

3.11 EXPANSION JOINTS

Form and seal joints as specified in Section 07 92 00 JOINT SEALANTS.

3.11.1 Walls

Provide expansion joints at control joints in backing material. Wherever backing material changes, install an expansion joint to separate the different materials.

3.11.2 Floors

Provide expansion joints over construction joints, control joints, and expansion joints in concrete slabs in accordance with TCNA Hdbk method EJ171 type to suit conditions. Provide expansion joints where tile abuts restraining surfaces such as perimeter walls, curbs and columns and at intervals of 20 to 25 feet each way in large interior floor areas. Extend expansion joints through setting-beds and fill.

3.12 CLEANING AND PROTECTING

Upon completion, thoroughly clean tile surfaces in accordance with manufacturer's approved cleaning instructions. Do not use acid for cleaning glazed tile. Clean floor tile with resinous grout or with factory mixed grout in accordance with printed instructions of the grout manufacturer. After the grout has set, provide a protective coat of a noncorrosive soap or other approved method of protection for tile wall surfaces. Cover tiled floor areas with building paper before foot traffic is permitted over the finished tile floors. Provide board walkways on tiled floors that are to be continuously used as passageways by workmen. Replace damaged or defective tiles.

-- End of Section --

SECTION 09 51 00

ACOUSTICAL CEILINGS
08/20

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM A489	(2018; E 2018) Standard Specification for Carbon Steel Eyebolts
ASTM A580/A580M	(2018) Standard Specification for Stainless Steel Wire
ASTM A641/A641M	(2019) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM A653/A653M	(2020) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A1008/A1008M	(2020) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
ASTM B633	(2019) Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
ASTM C423	(2009a) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
ASTM C635/C635M	(2017) Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings
ASTM C636/C636M	(2013) Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
ASTM C834	(2017) Standard Specification for Latex Sealants
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building

	Materials
ASTM E413	(2016) Classification for Rating Sound Insulation
ASTM E580/E580M	(2020) Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions
ASTM E795	(2016) Standard Practices for Mounting Test Specimens During Sound Absorption Tests
ASTM E1111/E1111M	(2014) Standard Test Method for Measuring the Interzone Attenuation of Open Office Components
ASTM E1264	(2019) Acoustical Ceiling Products
ASTM E1414/E1414M	(2011a; E 2014) Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
ASTM E1477	(1998a; R 2017; E 2018) Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers
CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)	
CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers
SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)	
SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications
U.S. DEPARTMENT OF DEFENSE (DOD)	
UFC 3-301-01	(2019) Structural Engineering
U.S. GREEN BUILDING COUNCIL (USGBC)	
LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Approved Detail Drawings; G

SD-03 Product Data

Acoustical Ceiling Systems; G

Metal Ceiling; G

Wood Grill Ceiling; G

Acoustical Baffle Ceiling; G

Recycled Content for Type III Ceiling Tiles; S

Recycled Content for Suspension Systems; S

Acoustical Performance; G

SD-04 Samples

Acoustical Units; G

Acoustical Ceiling Tiles; G

Metal Ceiling; G

Wood Grill Ceiling; G

Acoustical Baffle Ceiling; G

SD-07 Certificates

Indoor Air Quality for Type III Ceiling Tiles; S

Indoor Air Quality for Adhesives; S

Indoor Air Quality for Sealants; S

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment for ceiling tiles and grid suspension system; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party

certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for ceiling tiles and grid suspension system that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia

for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

4. Low-Emitting Materials - Ceilings:

a. Meet the VOC emissions evaluation and or inherently nonemitting sources criteria, or salvaged and reused materials criteria. The ceilings product category includes all ceiling panels, ceiling tile, surface ceiling structures such as gypsum or plaster, suspended systems (including canopies and clouds), and glazed skylights. Overhead structural elements (exposed, finished, and unfinished) are excluded. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full emissions requirements.

b. Product is an inherently non-emitting source of VOCs if it is one of the following and has no integral organic-based surface coatings, binders, or sealants: stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood.

c. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

5. Low-Emitting Materials - Interior adhesives and sealants applied on site:

a. Meet the VOC emissions evaluation and meet the VOC content evaluation. The adhesives and sealants product category include all interior adhesives and sealants applied on site. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality Certifications

1.3.1.1 Ceiling Tiles

Provide acoustical ceiling system installed within building interior with VOC emissions in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method. Provide current product certification documentation from certification body.

1.3.1.2 Adhesives and Sealants

Provide acoustical sealants within building interior with VOC emissions in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method and VOC content limits of SCAQMD Rule 1168. Provide current product certification documentation from certification body.

1.3.2 Building Product Declarations

Provide ceiling tiles and grid suspension system with EPD and Material

Ingredient Report, if available.

1.4 DELIVERY, STORAGE. AND HANDLING

Deliver materials to the site in the manufacturer's original unopened containers with brand name and type clearly marked. Carefully handle and store materials in dry, watertight enclosures. Immediately before installation, store acoustical units for not less than 24 hours at the same temperature and relative humidity as the space where they will be installed in order to assure proper temperature and moisture acclimation.

1.5 ENVIRONMENTAL REQUIREMENTS

Maintain a uniform temperature of not less than 60 degrees F nor more than 85 degrees F and a relative humidity of not more than 70 percent for 24 hours before, during, and 24 hours after installation of acoustical units.

1.6 SCHEDULING

Complete and dry interior finish work such as plastering, concrete and terrazzo work before ceiling installation. Complete mechanical, electrical, and other work above the ceiling line; install and start operating heating, ventilating, and air conditioning systems in order to maintain temperature and humidity requirements.

1.7 WARRANTY

Provide manufacturer's warranty to repair or replace defective materials and workmanship including but not limited to, sagging and warping of panels and rusting and of grid systems, for a period of 5 years from date of final acceptance of the work.

1.8 EXTRA MATERIALS

Furnish spare product, from the same lot/style as those installed, of each color and material at the rate of 5 tiles for each 1000 tiles installed.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION - Acoustical Ceiling Systems

Provide sound controlling units mechanically mounted on a ceiling suspension system for acoustical treatment. Provide the unit size, texture, finish, and color as specified. Coordinate the entire ceiling system with other details, like the location of access panels and ceiling penetrations, for instance, shown on the drawings. The Contractor is responsible for the final assembly and performance of the specified work. Provide the location and extent of acoustical treatment as shown on the approved detail drawings. Submit drawings showing suspension system, method of anchoring and fastening, details, and reflected ceiling plan.

2.1.1 Acoustical Performance

2.1.1.1 Ceiling Sound Transmission

Provide ceiling systems with the specified Ceiling Attenuation Class (CAC) ratings as determined in accordance with ASTM E1414/E1414M and ASTM E413. Provide sound attenuators over light fixtures, air terminals and other ceiling penetrations, provide acoustical blanket insulation on top of the

ceiling or adjacent to partitions to provide lightweight acoustical plenum barriers above partitions as required to achieve the specified CAC ratings. Provide test ceiling continuous at the partition and assembled in the suspension system in the same manner that the ceiling will be installed on the project.

2.1.1.2 Ceiling Sound Absorption

Determine the Noise Reduction Coefficient (NRC) in accordance with ASTM C423. Determine Articulation Class (AC) in accordance with ASTM E1111/E1111M.

2.1.2 Light Reflectance

Determine light reflectance factor in accordance with ASTM E1477 test method.

2.2 ACOUSTICAL UNITS

Submit samples of each type of acoustical unit and each type of suspension grid tee section showing texture, finish, and color. Conform acoustical units to ASTM E1264, Class A, and the following requirements:

2.2.1 Units for Exposed-Grid System A

2.2.1.1 Type

Type III non-asbestos mineral fiber with painted finish metal and wood panel. Provide Type III Acoustical Ceiling Tiles containing a minimum of 30 percent recycled content. Provide data identifying percentage of recycled content for Type III ceiling tiles. Provide certification of indoor air quality for Type III Ceiling Tiles.

2.2.1.2 Flame Spread

Class A, 25 or less

2.2.1.3 Pattern

Reference Material Legend

2.2.1.4 Minimum NRC

.90 when tested on mounting Type E-400 of ASTM E795.

2.2.1.5 Minimum Light Reflectance Coefficient
LR-1, 0.75 or greater

2.2.1.6 Nominal Size

24 by 48 and 24 by 24 inch varies, reference drawings

2.2.1.7 Edge Detail

Square and Reveal.

2.2.1.8 Finish

Factory-applied standard finish. See paragraph COLORS AND STANDARDS.

2.2.1.9 Minimum CAC

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2.2.2 WOOD GRILL CEILING

2.2.2.1 Materials

a. Fire-rated particle board (FRPB) with real wood veneers.

b. Vertical Grain Fir (NVF) is FRPB with a reconstituted veneer.

c. Finish Clear semi-gloss coating

2.2.2.2 Fire Performance

Class A: ASTM E84 surface burning characteristics. Flame Spread Index 25 or less. Smoke Developed Index 50 or less.

Class A: CAN/ULC S102 surface burning characteristics. Flame Spread Rating 25 or less. Smoke Developed Classification 50 or less.

These panels, as with other architectural features located at the ceiling, may obstruct or skew the planned fire sprinkler water distribution pattern, or possibly delay or accelerate the activation of the sprinkler or fire detection systems by channeling heat from a fire either toward or away from the device. Consult a fire protection engineer, NFPA 13, and local codes for guidance where automatic fire detection and suppression systems are present.

2.2.3 ACOUSTICAL BAFFLE CEILING

2.2.3.1 Materials

7/8" thick fiberglass with scrim on face and sides or custom 1-3/4" thick fiberglass with DuraBrite scrim on all sides (360º finishing).

2.2.3.2 Surface Finsish

Scrim with factory-applied paint on face and sides. Standard White has energy-saving, high light-reflective finish (LR 0.90). Back of panel is unfinished with embedded metal extrusions.

2.2.3.3 Fire Performance

ASTM E84 Class A: Flame Spread 25 or under and Smoke Developed 50 or less.

CAN/ULC S102 surface burning characteristics. Flame Spread Rating 25 or less. Smoke Developed Classification 50 or less.

Acoustical clouds, as with other architectural features located in the ceiling plane, may obstruct or skew the existing or planned fire sprinkler

water distribution pattern, or possibly delay the activation of the fire sprinkler or fire detection system. Consult a fire protection engineer, NFPA 13, and local codes for guidance on the proper installation techniques where fire detection or suppression systems are present.

2.2.3.4 Classification

ASTM E1264 Classification: Type XII, Form 2, Pattern E

2.2.3.5 Acoustical Performance

Standard Shapes – 1.18 Sabins/SF; 360°

Finished Shapes – 1.47 Sabins/SF; color shapes have slightly reduced acoustical performance.

2.2.3.6 Suspension Systems

Acoustical clouds are pre-assembled with metal extrusions in the back of the panels. Standard accessory kits facilitate quick and easy installation from the deck, through a ceiling, or directly attached to drywall.

2.2.4 Unit Acoustical Absorbers

Provide individually mounted sound absorbing plaques composed of glass fibers or non-asbestos mineral fibers and having a NRC range of not less than 0.60 - 0.70 when tested in accordance with ASTM C423 and reported as a 4 frequency average.

2.3 SUSPENSION SYSTEM

Provide standard snap-in metal pan exposed-grid indirect hung concealed H and T or Zee direct hung, concealed, downward access direct hung, concealed, upward access standard width flange narrow width flange as indicated suspension system conforming to ASTM C635/C635M for intermediate-duty systems. Provide surfaces exposed to view of aluminum or steel with a factory-applied baked-enamel finish. Provide wall molding having a flange of not less than 15/16 inch or 9/16 inch. Provide inside and outside corner caps standard mitered corners. Provide a suspension system with a maximum deflection of 1/360 of the span length capable of supporting the finished ceiling, light fixtures, air diffusers, and accessories, as shown. Conform seismic details to the guidance in UFC 3-301-01 and ASTM E580/E580M.

Provide Suspension System containing a minimum of 25 percent recycled content. Provide data identifying percentage of recycled content for suspension systems.

2.4 HANGERS

Provide hangers and attachment capable of supporting a minimum 300 pound ultimate vertical load without failure of supporting material or attachment.

2.4.1 Wires

Conform wires to ASTM A641/A641M, Class 1, 0.08 inch (12 gauge). ASTM A580/A580M, composition 302 or 304, condition annealed stainless

steel, 0.08 inch (12 gauge).

2.4.2 Straps

Provide straps of 1 by 3/16 inch galvanized steel conforming to ASTM A653/A653M, with a light commercial zinc coating or ASTM A1008/A1008M with an electrodeposited zinc coating conforming to ASTM B633, Type RS.

2.4.3 Rods

Provide 3/16 inch diameter threaded steel rods, zinc or cadmium coated.

2.4.4 Eyebolts

Provide eyebolts of weldless, forged-carbon-steel, with a straight-shank in accordance with ASTM A489. Provide minimum 1/4 inch, zinc coated eyebolts.

2.4.5 Masonry Anchorage Devices

Comply with ASTM C636/C636M for anchorage devices for eyebolts and machine screws.

2.5 ACCESS PANELS

Provide access panels that match adjacent acoustical units, designed and equipped with suitable framing and fastenings for removal and replacement without damage. Size panel to be not less than 12 by 12 inch or more than 12 by 24 inch.

a. Attach an identification plate of 0.032 inch thick aluminum, 3/4 inch in diameter, stamped with the letters "AP" and finished the same as the unit, near one corner on the face of each access panel.

b. Identify ceiling access panel by a number utilizing white identification plates or plastic buttons with contrasting numerals. Provide plates or buttons of minimum 1 inch diameter and securely attached to one corner of each access unit. Provide a typewritten card framed under glass listing the code identification numbers and corresponding system descriptions listed above. Mount the framed card where directed and furnish a duplicate card to the Contracting Officer. Code identification system is as follows:

(1) Fire detection/alarm system

(2) Air conditioning controls

(3) Plumbing system

(4) Heating and steam systems

(5) Air conditioning duct system

(6) Sprinkler system

(7) Intercommunication system

2.6 ADHESIVE

Use adhesive as recommended by tile manufacturer. Provide adhesive products used on the interior of the building (defined as inside of the weatherproofing system) that meet emissions requirements of CDPH SECTION 01350 (limit requirements for office space type) and VOC content requirements of SCAQMD Rule 1168. For products located on the interior of the building (inside of the weatherproofing system), provide certification or validation of indoor air quality for adhesives.

2.7 FINISHES

Use manufacturer's standard textures, patterns and finishes as specified for acoustical units and suspension system members. Treat ceiling suspension system components to inhibit corrosion.

2.8 COLORS AND PATTERNS

Use colors and patterns for acoustical units and suspension system components as indicated on the material legend; colors listed are not intended to limit the selection of equal colors from other manufacturers.

2.9 ACOUSTICAL SEALANT

Conform acoustical sealant to ASTM C834, nonstaining. Provide sealants used on the interior of the building (defined as inside of the weatherproofing system) in accordance with requirements of Section 07 92 00 JOINT SEALANTS. For products located on the interior of the building (inside of the weatherproofing system), provide certification of indoor air quality for Sealants.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

Examine surfaces to receive directly attached acoustical units for unevenness, irregularities, and dampness that would affect quality and execution of the work. Rid areas, where acoustical units will be cemented, of oils, form residue, or other materials that reduce bonding capabilities of the adhesive. Complete and dry interior finish work such as plastering, concrete, and terrazzo work before installation. Complete and approve mechanical, electrical, and other work above the ceiling line prior to the start of acoustical ceiling installation. Provide acoustical work complete with necessary fastenings, clips, and other accessories required for a complete installation. Do not expose mechanical fastenings in the finished work. Lay out hangers for each individual room or space. Provide hangers to support framing around beams, ducts, columns, grilles, and other penetrations through ceilings. Keep main runners and carrying channels clear of abutting walls and partitions. Provide at least two main runners for each ceiling span. Wherever required to bypass an object with the hanger wires, install a subsuspension system so that all hanger wires will be plumb.

3.1.1 Suspension System

Install suspension system in accordance with ASTM C636/C636M and as

specified herein. Do not suspend hanger wires or other loads from underside of steel decking.

3.1.1.1 Plumb Hangers

Install hangers plumb and not pressing against insulation covering ducts and pipes. Where lighting fixtures are supported from the suspended ceiling system, provide hangers at a minimum of four hangers per fixture and located not more than 6 inch from each corner of each fixture.

3.1.1.2 Splayed Hangers

Splay (slope or slant) hangers around obstructions, offsetting the resulting horizontal force by bracing, countersplaying, or other acceptable means.

3.1.2 Wall Molding

Provide wall molding where ceilings abut vertical surfaces. Miter corners where wall moldings intersect or install corner caps. Secure wall molding not more than 3 inch from ends of each length and not more than 16 inch on centers between end fastenings. Provide wall molding springs at each acoustical unit in semi-exposed or concealed systems.

3.1.3 Acoustical Units

Install acoustical units in accordance with the approved installation instructions of the manufacturer. Ensure that edges of acoustical units are in close contact with metal supports, with each other, and in true alignment. Arrange acoustical units so that units less than one-half width are minimized. Hold units in exposed-grid system in place with manufacturer's standard hold-down clips, if units weigh less than 1 psf or if required for fire resistance rating.

3.1.4 Acoustical Sealant

Seal all joints around pipes, ducts or electrical outlets penetrating the ceiling. Apply a continuous ribbon of acoustical sealant on vertical web of wall or edge moldings.

3.1.5 Adhesive Application

Wipe back of tile to remove accumulated dust. Daub acoustical units on back side with four equal daubs of adhesive. Apply daubs near corners of tiles. Ensure that contact area of each daub is at least 2 inch diameter in final position. Press units into place, aligning joints and abutting units tight and uniform without differences in joint widths.

3.2 CEILING ACCESS PANELS

Locate ceiling access panels directly under the items which require access.

3.2.1 Performance

Metal ceiling is manufactured from authentic T1 grade tin-plated steel.

3.2.2 Hanging System

Required substrate for installation is a 2'-0" x 4'-0" or 2'-0" x 2'-0"

ceiling grid. Tiles shall sit flush in the grid system. Tiles shall fit standard 15/16" grid system on 24" centers. Installation shall start in one corner at a full 2'-0" x 2'-0" opening. Some smaller spaces or tiles that accommodate light fixtures will require cut tiles. Turn the ceiling panel at a slight angle, sliding it through the opening. Lay ceiling tile into the grid opening. Attach hold down clips to keep the tile tight to the grid. There shall be no gap between the grid and the panel. Proceed with the installation to the right or left. Place two hold down clips on the side where the two ceiling panels are installed on the same t-rail. Provide moldings required for inside/outside corners and straight runs. Accommodate the light fixtures by tracing the fixture perimeter onto the tin panel, cut out the traced area with tin snips, install the cut tin on the ceiling and install the fixture of the installed tin.

3.2.3 Nominal Size

The material thickness shall be a minimum 0.010" thick and a minimum of 2'-0" x 2'-0" in size. Moldings shall be available in 4'-0" lengths.

3.2.4 Finish

Powder coated finish using an electrostatic process where polyester resin is baked onto the panels at a minimum of 400-degrees F. If a faux finish is required, the finish is hand applied over a powder coated base color. Suspended grid system shall be painted to match the tile color. Product must carry a ASTM E84-03b approval. Product shall be available in a minimum of 40 patterns and 50 colors. See finish schedule and color legend for additional information.

3.3 CLEANING

Following installation, clean dirty or discolored surfaces of acoustical units and leave them free from defects. Remove units that are damaged or improperly installed and provide new units as directed.

-- End of Section --

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SECTION 09 62 38

STATIC-CONTROL FLOORING
08/17

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM E648	(2019a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
ASTM F150	(2006; R 2013) Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring
ASTM F1700	(2020) Standard Specification for Solid Vinyl Floor Tile
ASTM F1869	(2016) Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
ASTM F2170	(2019a) Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

ELECTROSTATIC DISCHARGE ASSOCIATION (ESD)

ESD S6.1	(2014) Standard for the Protection of Electrostatic Discharge Susceptible Items – Grounding

RESILIENT FLOOR COVERING INSTITUTE (RFCI)

FLOORSCORE	FLOORSCORE IAQ Certification

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SCHEDULING

Schedule static-control flooring work after any other work which would damage the finished surface of the flooring.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Static-Control Resilient Flooring; G

Recycled content for Conductive Vinyl Tile; S

Accessories; G

Adhesives; G

Warranty

SD-04 Samples

Static-Control Resilient Flooring; G, AE

Accessories; G, AE

SD-06 Test Reports

Fire Resistance

Moisture, Alkalinity and Bond

Testing

SD-07 Certificates

Indoor Air Quality for Conductive Vinyl Tile; S

Indoor Air Quality for Adhesives; S

Qualifications of Applicator

SD-08 Manufacturer's Instructions

Static-Control Resilient Flooring; G

Accessories; G

SD-10 Operation and Maintenance Data

Static-Control Resilient Flooring; G

Accessories; G

1.3.1 Samples

1.3.1.1 Static-Control Resilient Flooring

Submit three samples of each indicated color and type of flooring, and accessories sized a minimum 2-1/2 by 4 inch.

1.3.1.2 Operations and Maintenance Data

a. Submit Data Package 1 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

b. Submit three copies of manufacturer's maintenance instructions for each type of flooring material describing recommended type of cleaning equipment and materials, spotting and cleaning methods, and cleaning cycles.

1.3.2 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment for tile and base; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for tile, base and adhesive, if available that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33

29.

4. Low-Emitting Materials - Interior adhesives and sealants applied on site (including flooring adhesive):

a. Meet the VOC emissions evaluation and meet the VOC content evaluation. The adhesives and sealants product category include all interior adhesives and sealants applied on site. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

5. Low-Emitting Materials - Flooring:

a. All flooring shall comply with the 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." All flooring must meet the VOC emissions evaluation OR inherently non-emitting sources criteria, OR salvaged and reused materials criteria. The flooring product category includes all types of hard and soft surface flooring (carpet, ceramic, vinyl, rubber, engineered, solid wood, laminates), wall base, underlayment, and other floor coverings. Subflooring is excluded. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.4 CERTIFICATIONS

1.4.1 Indoor Air Quality Certifications

1.4.1.1 Floor Covering Materials

Provide Conductive Vinyl Tile and wall base products certified to meet indoor air quality requirements by FLOORSCORE, UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold.

1.4.1.2 Adhesives

Provide adhesives with VOC emissions in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method and VOC content limits of SCAQMD Rule 1168.. Provide current product certification documentation from certification body.

1.4.2 Building Product Declarations

Provide tile and base with EPD and Material Ingredient Report, if available.

1.5 EXTRA MATERIALS

Provide extra material from same dye lot for future maintenance. Provide a minimum of 3 percent of total square yards of each flooring and base type, pattern, and color.

1.6 QUALITY ASSURANCE

The flooring manufacturer will approve the Qualifications of Applicator and certify that he/she has a minimum of 3 years of experience in the application of the materials to be used.

1.7 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the building site in original unopened containers bearing the manufacturer's name, style name, pattern color name and number, size, production run, project identification, handling instructions and related information. Observe ventilation and safety procedures specified in the Safety Data Sheets (SDS). Do not store flooring near materials that may off-gas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives.

1.7.1 Static-Control Resilient Flooring

Store materials in a clean, dry, secure, and well-ventilated area free from strong contaminant sources and residues with ambient air temperature range as recommended by the manufacturer but not less than 68 degrees F or more than 85 degrees F. Stack materials according to manufacturer's recommendations. Protect materials from the direct flow of heat from hot-air registers, radiators and other heating fixtures and appliances.

1.8 ENVIRONMENTAL CONDITIONS

Provide temporary ventilation during work of this section.

1.8.1 Static-Control Resilient Flooring

Maintain areas in which resilient flooring is to be installed at a temperature range as recommended by the manufacturer but not less than 68 degrees F or more than 85 degrees F for 3 days before application, during application and 2 days after application, unless otherwise directed by the flooring manufacturer for the flooring being installed. Maintain a minimum temperature range as recommended by the manufacturer but not less than 55 degrees F thereafter for the duration of the contract. Provide adequate ventilation to remove moisture from area and to comply with regulations limiting concentrations of hazardous vapors.

1.9 WARRANTY

1.9.1 Static-Control Resilient Flooring

Provide manufacturer's standard performance guarantees or warranties including a five year wear warranty and ten year conductivity warranty.

PART 2 PRODUCTS

2.1 STATIC-CONTROL RESILIENT FLOORING

2.1.1 Conductive Resilient Flooring

2.1.1.1 Conductive Vinyl Tile

Conductive vinyl tile must be a homogeneous vinyl product and conform to ASTM F1700. Provide electrical resistance from surface to surface and surface to ground between 25,000 ohms (2.5 x 10 to the 4th) and 1,000,000

ohms (1.0 x 10 to the 6th) when tested in accordance with ASTM F150. Tile must be 24 inches square and 1/8 inch thick.

Provide Conductive Vinyl Tile containing a minimum of 10 percent recycled content. Provide data identifying percentage of recycled content for Conductive Vinyl Tile.

Provide certification of indoor air quality for Conductive Vinyl Tile.

2.2 ADHESIVES

Provide conductive adhesive as recommended by the manufacturer of the static-control flooring.

Provide adhesive products used on the interior of the building (defined as inside of the weatherproofing system) that meet emissions requirements of CDPH SECTION 01350 (use the office space type) and VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for adhesives.

2.3 ACCESSORIES

Use accessories recommended by the manufacturer of the flooring.

2.4 ELECTRICAL GROUND CONNECTION

Provide an electrical ground connection that meets the requirements of ESD S6.1. Connection between the static-control floor system and the external grounding system must be provided. Contact with the static-control floor system must be with conductive grounding strip and must have the greater of the following: a minimum contact area of 9 square inch or the dimensions recommended by the manufacturer. Provide the grounding conductor recommended by the manufacturer of the flooring. Connect and install the grounding conductor as recommend by the flooring manufacturer.

2.5 MANUFACTURER'S COLOR, PATTERN AND TEXTURE

Provide color, pattern and texture as indicated on the color material legend in the construction documents. Provide flooring in any one continuous area or replacement of damaged flooring in continuous area from same production run with same shade and pattern.

2.6 FIRE RESISTANCE TESTING REQUIREMENTS

Provide a minimum average critical radiant flux of 0.45 watts per square centimeter for flooring in corridors and exits when tested in accordance with ASTM E648.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Before any work under this section is begun, defects such as rough or scaling concrete, low spots, high spots, and uneven surfaces must be corrected, and damaged portions of concrete slabs must be repaired in accordance with flooring manufacturer's recommended instructions. Floor must be in a level plane with a maximum variation of 1/8 inch every 10 feet, except where indicated as sloped. Repair cracks and irregularities and

prepare the subfloor in accordance with flooring manufacturer's recommended instructions. Curing and sealing compounds should not be used on concrete surfaces to receive flooring unless they have been tested and approved by the flooring manufacturer. In addition, remove paint, varnish, oils, release agents, sealers, waxes, and adhesives, as required by the flooring product in accordance with manufacturer's printed installation instructions. If a curing compound is required, it must be coordinated for compatibility with the flooring adhesive.

3.2 MOISTURE, ALKALINITY AND BOND TESTS

Determine the suitability of the concrete subfloor for receiving the flooring with regard to moisture content and pH level by moisture and alkalinity tests. Conduct moisture testing in accordance with ASTM F1869 or ASTM F2170, unless otherwise recommended by the flooring manufacturer. Conduct alkalinity testing as recommended by the flooring manufacturer. Determine the compatibility of the flooring adhesives to the concrete floors by a bond test in accordance with the flooring manufacturer's recommendations.

3.3 GENERAL INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

3.4 INSTALLATION OF STATIC-CONTROL RESILIENT TILE FLOORING

Install static-control resilient flooring, ground connections and accessories in accordance with the approved manufacturer's installation instructions. Tile lines and joints must be kept square, symmetrical, tight, and even. Tile at the perimeter of the area to be finished may vary as necessary to maintain full-size tiles in the field, but no perimeter tile may be less than one-half the field tile size, except where irregular shaped rooms make it impossible. Tile must be cut, fitted, and scribed to walls, partitions, and projections after field flooring has been applied. Install grounding strips in accordance with manufacturer's installation instructions. Protect edges of flooring material meeting hard surface flooring with molding and install in accordance with the molding manufacturer's printed instructions.

3.5 CLEANING AND PROTECTION

The flooring must be cleaned in accordance with the manufacturer's recommendations. Flooring must be protected by a covering of heavy-duty building paper before foot traffic is permitted. Lap and secure edges of kraft paper protection to provide a continuous cover. Boardwalks must be placed over flooring in areas where subsequent building operations might damage the floor. Remove and replace flooring that becomes loose, broken, or curled prior to acceptance, or flooring that does not conform to resistance requirements of ASTM F150.

3.6 TESTING

Test the flooring in accordance with and conform to the requirements of ESD S6.1.

-- End of Section --

SECTION 09 65 00

RESILIENT FLOORING
08/10

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM E648	(2019a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
ASTM F710	(2019; E 2020) Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
ASTM F1344	(2015) Rubber Floor Tile
ASTM F1482	(2015) Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring
ASTM F1700	(2020) Standard Specification for Solid Vinyl Floor Tile
ASTM F1861	(2016) Standard Specification for Resilient Wall Base
ASTM F1869	(2016) Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
ASTM F2170	(2019a) Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Resilient Flooring and Accessories; G

SD-03 Product Data

Resilient Flooring and Accessories; G

Adhesives

Luxury Vinyl Tile

Recycled content for Luxury Vinyl Tile; S

Rubber Tile

Wall Base

Recycled content for Wall Base; S

SD-04 Samples

Resilient Flooring and Accessories; G, AE

SD-06 Test Reports

Moisture, Alkalinity and Bond Tests; G, AE

SD-07 Certificates

Indoor Air Quality for Rubber Tile; S

Indoor Air Quality for Luxury Vinyl Tile; S

Indoor Air Quality for Wall Base; S

Indoor Air Quality for Adhesives; S

SD-08 Manufacturer's Instructions

Surface Preparation; G

Installation; G

SD-10 Operation and Maintenance Data

Resilient Flooring and Accessories; G

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment tile and wall base; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients:

Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for tile, wall base, and adhesive, if available, that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

4. Low-Emitting Materials - Interior paints and coatings applied on site:

a. Meet the VOC emissions evaluation and the VOC content evaluation. The paints and coatings product category include all interior paints and coatings applied on site. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

1. For CDPH version compliance information, refer to LEED interpretation #ID 10495 “LEM for v4 projects”: https://www.usgbc.org/leedaddenda/10495

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

5. Low-Emitting Materials - Interior adhesives and sealants applied on site (including flooring adhesive):

a. Meet the VOC emissions evaluation and meet the VOC content evaluation. The adhesives and sealants product category include all interior adhesives and sealants applied on site. Refer to Division 01 33 29 and

the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

6. Low-Emitting Materials - Flooring:

a. All flooring shall comply with the 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." All flooring must meet the VOC emissions evaluation OR inherently non-emitting sources criteria, OR salvaged and reused materials criteria. The flooring product category includes all types of hard and soft surface flooring (carpet, ceramic, vinyl, rubber, engineered, solid wood, laminates), wall base, underlayment, and other floor coverings. Subflooring is excluded. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.3 CERTIFICATES

1.3.1 Indoor Air Quality

Submit required indoor air quality certifications and validations in one submittal package.

1.3.1.1 Floor Covering Materials

Provide Rubber Tile, Luxury Vinyl Tile, and wall base products certified to meet indoor air quality requirements by FLOORSCORE, UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification by other third-party programs. Provide current product certification documentation from certification body.

1.3.1.2 Adhesives, Caulking and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold and VOC content limits of SCAQMD Rule 1168. Provide current product certification documentation from certification body.

1.3.2 Building Product Declarations

Provide tile and base with EPD and Material Ingredient Report, if available.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the building site in original unopened containers bearing the manufacturer's name, style name, pattern color name and number, production run, project identification, and handling instructions. Store materials in a clean, dry, secure, and well-ventilated area free from strong contaminant sources and residues with ambient air temperature maintained above 68 degrees F and below 85 degrees F, stacked according to manufacturer's recommendations. Remove resilient flooring products from packaging to allow ventilation prior to installation. Protect materials from the direct flow of heat from hot-air

registers, radiators and other heating fixtures and appliances. Observe ventilation and safety procedures specified in the MSDS. Do not store rubber surface products with materials that have a high capacity to adsorb volatile organic compound (VOC) emissions. Do not store exposed rubber surface materials in occupied spaces.

1.5 ENVIRONMENTAL REQUIREMENTS

Maintain areas to receive resilient flooring at a temperature above 68 degrees F and below 85 degrees F for 3 days before application, during application and 2 days after application, unless otherwise directed by the flooring manufacturer for the flooring being installed. Maintain a minimum temperature of 55 degrees F thereafter. Provide adequate ventilation to remove moisture from area and to comply with regulations limiting concentrations of hazardous vapors.

1.6 SCHEDULING

Schedule resilient flooring application after the completion of other work which would damage the finished surface of the flooring.

1.7 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a one year period.

1.8 EXTRA MATERIALS

Provide extra flooring material at a minimum of 3% of the total square footage of each flooring material of each color and pattern. Provide extra wall base material composed of 20 linear feet of each type, color and pattern. Package all extra materials in original properly marked containers bearing the manufacturer's name, brand name, pattern color name and number, production run, and handling instructions. Provide extra materials from the same lot as those installed. Leave extra stock at the site in location assigned by Contracting Officer.

PART 2 PRODUCTS

2.1 RUBBER TILE TYPE

Conform to ASTM F1344 homogeneous with random scattered design, 24 inch square. Provide smooth surface studs with chamfered edges. Provide 0.125 inch overall thickness.

Provide certification of indoor air quality for Rubber Tile.

2.2 LUXURY VINYL TILE TYPE B

Conform to ASTM F1700 Class III printed film with a minimum wear layer thickness 0.020 inch (20 mil) and minimum overall thickness 0.197 inch, Type B (embossed). Provide 24 by 24 inch and 6 by 48 inch tile. Provide tile with a factory protective finish that enhances cleanability and durability.

Provide Luxury Vinyl Tile containing a minimum of 30 percent recycled content. Provide data identifying percentage of recycled content for Luxury Vinyl Tile.

Provide certification of indoor air quality for Luxury Vinyl Tile.

2.3 WALL BASE

Conform to ASTM F1861, Type TP (thermoplastic rubber), Style B (coved - with toe). Provide 4.25 inch high and a minimum 1/8 inch thick wall base. Provide job formed corners in matching height, shape, and color. Provide data identifying percentage ofRecycled content for Wall Base.

Provide certification of indoor air quality for Wall Base.

2.4 MOULDING

Provide tapered mouldings of vinyl or rubber clear anodized aluminum and types as recommended by flooring manufacturer for both edges and transitions of flooring materials specified. Provide vertical lip on moulding of maximum 1/4 inch. Provide bevel change in level between 1/4 and 1/2 inch with a slope no greater than 1:2.

2.5 ADHESIVES

Provide adhesives for flooring, base and accessories as recommended by the manufacturer and comply with local indoor air quality standards. Submit manufacturer's descriptive data, documentation stating physical characteristics, and mildew and germicidal characteristics.

Provide adhesive products used on the interior of the building (defined as inside of the weatherproofing system) that meet emissions requirements of CDPH SECTION 01350 (limit requirements for office space type) and VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for adhesives.

2.6 SURFACE PREPARATION MATERIALS

Provide surface preparation materials, such as panel type underlayment, lining felt, and floor crack fillers as recommended by the flooring manufacturer for the subfloor conditions. Comply with ASTM F1482 for panel type underlayment products. Use one of the following substrates:

a. Particleboard: As specified in Section 06 10 00 ROUGH CARPENTRY.

b. Fiberboard: As specified in Section 06 10 00 ROUGH CARPENTRY.

c. Cement-fiber board: As specified in Section 09 29 00 GYPSUM BOARD.

d. Plywood: As specified in Section 06 10 00 ROUGH CARPENTRY.

e. Concrete.

2.7 CAULKING AND SEALANTS

Provide caulking and sealants in accordance with Section 07 92 00 JOINT SEALANTS.

2.8 MANUFACTURER'S COLOR, PATTERN AND TEXTURE

Provide color, pattern and texture for resilient flooring and accessories as indicated on the color material legend on the drawings. Color listed is not intended to limit the selection of equal colors from other

manufacturers. Provide floor patterns as specified on the drawings. Provide flooring in any one continuous area or replacement of damaged flooring in continuous area from same production run with same shade and pattern. Submit scaled drawings indicating patterns (including location of patterns and colors) and dimensions. Submit manufacturer's descriptive data and three samples of each indicated color and type of flooring, base, and accessories sized a minimum 2-1/2 by 4 inch. Submit Data Package 1 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

2.9 FIRE RESISTANCE TESTING REQUIREMENTS

Provide a minimum average critical radiant flux of 0.22 or 0.45 watts per square centimeter for flooring in corridors and exits when tested in accordance with ASTM E648.

PART 3 EXECUTION

3.1 EXAMINATION

Examine and verify that site conditions are in agreement with the design package. Report all conditions that will prevent a proper installation. Do not take any corrective action without written permission from the Government. Work will proceed only when conditions have been corrected and accepted by the installer. Submit manufacturer's printed installation instructions for all flooring materials and accessories, including preparation of substrate, seaming techniques, and recommended adhesives.

3.2 SURFACE PREPARATION

Provide a smooth, true, level plane for surface preparation of the flooring, except where indicated as sloped. Floor to be flat to within 3/16 inch in 10 feet. Prepare subfloor in accordance with flooring manufacturer's recommended instructions. Prepare the surfaces of lightweight concrete slabs (as defined by the flooring manufacturer) as recommended by the flooring manufacturer. Comply with ASTM F710 for concrete subfloor preparation. Floor fills or toppings may be required as recommended by the flooring manufacturer. Install underlayments, when required by the flooring manufacturer, in accordance with manufacturer's recommended printed installation instructions. Comply with ASTM F1482 for panel type underlayments. Before any work under this section is begun, correct all defects such as rough or scaling concrete, chalk and dust, cracks, low spots, high spots, and uneven surfaces. Repair all damaged portions of concrete slabs as recommended by the flooring manufacturer. Remove concrete curing and sealer compounds from the slabs, other than the type that does not adversely affect adhesion. Remove paint, varnish, oils, release agents, sealers, waxes, and adhesives, as required by the flooring product in accordance with manufacturer's printed installation instructions.

3.3 MOISTURE, ALKALINITY AND BOND TESTS

Determine the suitability of the concrete subfloor for receiving the resilient flooring with regard to moisture content and pH level by moisture and alkalinity tests. Conduct moisture testing in accordance with ASTM F1869 or ASTM F2170, unless otherwise recommended by the flooring manufacturer. Conduct alkalinity testing as recommended by the flooring manufacturer. Determine the compatibility of the resilient flooring adhesives to the concrete floors by a bond test in accordance with the flooring manufacturer's recommendations. Submit copy of test

reports for moisture and alkalinity content of concrete slab, and bond test stating date of test, person conducting the test, and the area tested.

3.4 GENERAL INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

3.5 PLACING LUXURY VINYL TILES

Install luxury vinyl tile flooring using glue down installation. Install flooring and accessories in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's directions for installation method specified. Keep tile lines and joints square, symmetrical, tight, and even. Keep each floor in true, level plane, except where slope is indicated. Vary edge width as necessary to maintain full-size tiles in the field, no edge tile to be less than one-half the field tile size, except where irregular shaped rooms make it impossible. Cut flooring to fit around all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Cut, fit, and scribe edge tile to walls and partitions after field flooring has been applied.

3.6 PLACING RUBBER TILE

Install rubber tile and accessories in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's printed directions. Provide square, symmetrical, tight, and even flooring lines and joints. Keep each floor in true, level plane, except where slope is indicated. Vary width of edge tiles as necessary to maintain full-size tiles, except where irregular-shaped rooms makes it impossible. Cut flooring to fit around all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Cut, fit, and scribe flooring to walls and partitions after field flooring has been applied.

3.7 PLACING MOULDING

Provide moulding where flooring termination is higher than the adjacent finished flooring and at transitions between different flooring materials. When required, locate moulding under door centerline. Moulding is not required at doorways where thresholds are provided. Secure moulding with adhesive as recommended by the manufacturer. Prepare and apply adhesives in accordance with manufacturer's printed directions. Anchor aluminum moulding to floor surfaces as recommended by the manufacturer.

3.8 PLACING WALL BASE

Install wall base in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's printed directions. Tighten base joints and make even with adjacent resilient flooring. Fill voids along the top edge of base at masonry walls with caulk. Roll entire vertical surface of base with hand roller, and press toe of base with a straight piece of wood to ensure proper alignment. Avoid excess adhesive in corners.

3.9 CLEANING

Immediately upon completion of installation of flooring in a room or an area, dry and clean the flooring and adjacent surfaces to remove all surplus adhesive. Clean flooring as recommended in accordance with manufacturer's printed maintenance instructions and within the recommended time frame. As required by the manufacturer, apply the recommended number of coats and type of polish and finish in accordance with manufacturer's written instructions.

3.10 PROTECTION

From the time of installation until acceptance, protect flooring from damage as recommended by the flooring manufacturer. Remove and replace flooring which becomes damaged, loose, broken, or curled and wall base which is not tight to wall or securely adhered.

-- End of Section --

SECTION 09 66 23

RESINOUS MATRIX TERRAZZO FLOORING
08/16

PART 1 GENERAL

1.1 SUMMARY

Apply resinous terrazzo flooring, in the colors indicated, in the areas shown on the detail drawings. Submit two 6 x 6 inches, (minimum) samples of each color of resinous terrazzo and two 6 inches lengths, of each type of strip. Flooring must be an epoxy terrazzo system that conforms to the requirements specified in paragraphs 2.01A and B of NTMA Info Guide.

1.2 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM D56	(2016a) Standard Test Method for Flash Point by Tag Closed Cup Tester

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 99	(2018; TIA 18-1; ERTA 2 2018; ERTA 3 2020) Health Care Facilities Code

NATIONAL TERRAZZO AND MOSAIC ASSOCIATION (NTMA)

NTMA Info Guide	(2017) Terrazzo Reference Guide

NSF INTERNATIONAL (NSF)

NSF/ANSI 336	(2018) Sustainability Assessment for Commercial Furnishings Fabric

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1113	(2016) Architectural Coatings
SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G

Strips; G

Control Joint Strips; G

SD-03 Product Data

Resin Flooring System

Recycled Content for Marble Chips; S

Indoor Air Quality for Primer; S

Indoor Air Quality for Resin; S

Indoor Air Quality for Grout; S

Indoor Air Quality for Sealer; S

Mixing, Proportioning, and Installation

Cleaning and Sealing

SD-04 Samples

Resinous Terrazzo Flooring

SD-06 Test Reports

Certified Test Reports; G

SD-07 Certificates

Qualifications of Installer; G

1.3.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment for terrazzo, if available; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for terrazzo, if available, that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification; Facts – NSF/ANSI 336.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

4. Low-Emitting Materials - Interior primer, sealer, grout, adhesives and sealants applied on site (including flooring adhesive):

a. Meet the VOC emissions evaluation and meet the VOC content evaluation. The adhesives and sealants product category include all interior adhesives and sealants applied on site. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

5. Low-Emitting Materials - Flooring:

a. All flooring shall comply with the 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." All flooring must meet the VOC emissions evaluation OR inherently non-emitting sources criteria, OR salvaged and reused materials criteria. The flooring product category includes all types of hard and soft surface flooring (carpet, ceramic, vinyl, rubber, engineered, solid wood, laminates), wall base, underlayment, and other floor coverings. Subflooring is excluded. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.4 QUALITY ASSURANCE

Applicator must be approved by the resin manufacturer and shall have a minimum of 3 years experience in the application of the materials to be used and must have completed 8 successful installations within the past 2 years. Furnish a written statement from the manufacturer detailing the Qualifications of Installer.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the project site in manufacturer's original unopened containers. Keep materials in a clean, dry, area with temperatures controlled between 50 and 90 degrees F.

1.6 ENVIRONMENTAL REQUIREMENTS

Maintain areas to receive terrazzo at a temperature above 50 degrees F for 2 days prior to installation and for 7 days following installation.

PART 2 PRODUCTS

2.1 PRIMER

Primer must be a material recommended by the resin manufacturer which will penetrate the pores of the substrate and bond with the topping to form a permanent monolithic bond between the substrate and the topping. Primer products used on the interior of the building (defined as inside of the weatherproofing system) must meet emissions requirements of CDPH SECTION 01350 (limit requirements for office space type) and VOC content requirements of SCAQMD Rule 1113. Provide validation of indoor air quality for primer.

2.2 RESIN FLOORING SYSTEM

Resin for the specified terrazzo flooring must conform to the requirements shown in NTMA Info Guide. Submit resin manufacturer's descriptive data, plus mixing, proportioning, and installation instructions. Resin products used on the interior of the building (defined as inside of the weatherproofing system) must meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1113. Provide validation of indoor air quality for resin.

2.2.1 Building Product Declarations

Provide resin flooring system with EPD and Material Ingredient Report, if available.

2.3 FILLERS

Fillers, if required, must be inert mineral or cellulosic material as recommended by the manufacturer and best suited for the resin binder used. Fillers must be furnished in the quantity necessary to impart the required color and physical characteristics.

2.4 MARBLE CHIPS

Marble chips must be of domestic origin of sizes and colors to match NTMA Info Guide color plate indicated on the drawings . Chips must be a range of sizes up to and including the NTMA Standard No. 0 and Standard No. 1 for 1/4 inch thick floors and Standard No. 0 through Standard No. 2 for 3/8 inch thick floors.

Provide Marble Chips with 100 percent recycled content. Provide data identifying percentage of recycled content for marble chips.

2.5 STRIPS

Submit drawings indicating the type, size, and layout of divider strips and control joint strips.

2.5.1 Divider Strips

Divider strips must be as deep as required, 16 gauge and of zinc as indicated on the color material legend on the drawings.

2.5.2 Control Joint Strips

Control joint strips must be as deep as required, gauge per manufacturers requirements and of zinc. Provide neoprene filler 1/4 inch-thick in field installed custom color joint filler to match white field terrazzo.

2.6 GROUT

Grout must be as recommended by the manufacturer of the resin. Grout products used on the interior of the building (defined as inside of the weatherproofing system) must meet emissions requirements of CDPH SECTION 01350 (limit requirements for office space type) and VOC content requirements of SCAQMD Rule 1168. Provide validation of indoor air quality for grout.

2.7 SEALER

Sealer must have a pH factor between 7 and 10 and must be a penetrating type specially prepared for use on terrazzo. The sealer must not discolor or amber the terrazzo and must produce a slip resistant surface. Flash point of sealer must be a minimum of 80 degrees F when tested in accordance with ASTM D56. Sealer products used on the interior of the building (defined as inside of the weatherproofing system) must meet emissions requirements of CDPH SECTION 01350 (limit requirements for office space type) and VOC content requirements of SCAQMD Rule 1113. Provide validation of indoor air quality for sealer.

PART 3 EXECUTION

3.1 PREPARATION OF CONCRETE SUBFLOOR

Do not commence installation of the floor topping until the concrete substrate has cured for at least 28 calendar days. Prepare the concrete surfaces in accordance with the instructions of the resin manufacturer.

3.2 MIXING, PROPORTIONING, AND INSTALLATION

Mixing, proportioning, and installing must be in accordance with the approved instructions of the manufacturer. Install strips in locations indicated. Appply the topping to give a finish thickness of 3/8 inch.

3.3 TESTING

Between 30 and 45 days after flooring installation is completed, and prior to its use, test the conductive resinous terrazzo flooring in accordance with paragraph 12-4.1.3.8(b)(7) of NFPA 99. The resistance of the conductive floor at any one location must be more than 5,000 ohms in areas with 110 volts service, more than 10,000 ohms in areas with 220 volt service, and average less than 1,000,000 ohms and more than 25,000 ohms in all areas. Submit certificates indicating conformance with specified requirements. Accompany certificates with certified test reports showing that the conductive resinous terrazzo floor has been tested and meets the requirements specified.

3.4 CLEANING AND SEALING

Wash the terrazzo with a neutral cleaner and where required, clean with a fine abrasive to remove any stains or cement smears. Rinse the cleaned surfaces. When dry, apply a terrazzo sealer in accordance with the manufacturer's directions. Submit maintenance literature for terrazzo cleaning and sealing.

3.5 PROTECTION

cover and protect the terrazzo work from damage until completion of the work of all other trades.

-- End of Section --

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SECTION 09 67 23.13

STANDARD RESINOUS FLOORING
11/19

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM A990/A990M	(2018) Standard Specification for Castings, Iron-Nickel-Chromium and Nickel Alloys, Specially Controlled for Pressure-Retaining Parts for Corrosive Service
ASTM C881/C881M	(2020) Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
ASTM D445	(2019a) Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)
ASTM D523	(2014; R 2018) Standard Test Method for Specular Gloss
ASTM D570	(1998; E 2010; R 2010) Standard Test Method for Water Absorption of Plastics
ASTM D638	(2014) Standard Test Method for Tensile Properties of Plastics
ASTM D696	(2016) Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C With a Vitreous Silica Dilatometer
ASTM D1475	(2013) Standard Test Method for Density of Liquid Coatings, Inks, and Related Products
ASTM D1544	(2004; R 2010) Standard Test Method for Color of Transparent Liquids (Gardner Color Scale)
ASTM D1652	(2011; E 2012) Standard Test Method for Epoxy Content of Epoxy Resins
ASTM D2240	(2015; E 2017) Standard Test Method for Rubber Property - Durometer Hardness

ASTM D2471	(1999) Standard Test Method for Gel Time and Peak Exothermic Temperature of Reacting Thermosetting Resins
ASTM D4259	(2018) Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application
ASTM F1869	(2016) Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
ASTM F2170	(2019a) Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

NSF INTERNATIONAL (NSF)

NSF/ANSI 336	(2018) Sustainability Assessment for Commercial Furnishings Fabric

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

1.2 ADMINISTRATIVE REQUIREMENTS

1.2.1 Pre-Installation Meetings

Pre-installation Conference: Conduct conference at Project site.

1.2.2 Product Data

Within 30 days of contract award, submit manufacturer's catalog data for the following items:

a. Epoxy-Resin Binder/Matrix

b. Cured Epoxy Binder

c. Aggregate

d. Surface Sealing Coat

1.2.3 Design Mix Data

Within 30 days of contract award, submit design mix data for the following items, including a complete list of ingredients and admixtures:

a. Epoxy-Resin Binder/Matrix

b. Cured Epoxy Binder

c. Surface Sealing Coat

Ensure applicable test reports verify the mix has been successfully tested and meets design requirements.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that reviews the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation Drawings; G

SD-03 Product Data

Manufacturer's Catalog Data; G

SD-04 Samples

Hardboard Mounted Epoxy Flooring; G

Floor Topping; G

Mockups; G

SD-05 Design Data

Design Mix Data; G

SD-07 Certificates

Listing of Product Installations

Referenced Standards Certificates

Indoor Air Quality for Flooring System; S

SD-11 Closeout Submittals

Warranty; G

1.3.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for resinous flooring, if available, that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification; Facts – NSF/ANSI 336.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

3. Low-Emitting Materials - Flooring:

a. All flooring shall comply with the 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." All flooring must meet the VOC emissions evaluation OR inherently non-emitting sources criteria, OR salvaged and reused materials criteria. The flooring product category includes all types of hard and soft surface flooring (carpet, ceramic, vinyl, rubber, engineered, solid wood, laminates), wall base, underlayment, and other floor coverings. Subflooring is excluded. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.4 DELIVERY, STORAGE, AND HANDLING

Protect materials from weather, soil, and damage during delivery, storage, and construction. Deliver materials in original packages, containers, or bundles bearing brand name and name of material.

Maintain materials used in the installation of floor topping at a temperature between 65 and 85 degrees F.

1.5 QUALITY CONTROL

Prior to commencement of work, submit referenced standards certificates for the following, showing conformance with the referenced standards contained in this section:

a. Epoxy-Resin Binder/Matrix

b. Cured Epoxy Binder

c. Aggregate

d. Surface Sealing Coat

1.5.1 Mockups

Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution. Apply full-thickness mockups on 96 inch square floor area selected by Contracting Officer. Simulate finished lighting conditions for the review of mockups.

1.5.2 Qualifications

Submit a listing of product installations for heavy duty epoxy flooring including identification of at least 10 units, similar to those proposed for use, that have been in successful service for a minimum period of 10

years. Identify purchaser, address of installation, service organization, and date of installation.

Ensure floor system applicators are experienced in the applying resinous flooring systems similar in material, design, and extent to those indicated for this project, whose work has resulted in applications with a record of successful in-service performance.

1.5.3 Sampling

Submit hardboard mounted epoxy flooring samples not less than 12 inch square for each required color.

Provide panels showing nominal thickness of finished toppings, color, and texture of finished surfaces. Finished floor toppings and the approved samples are to match in color and texture.

1.6 WARRANTY

Submit a 1 year written warranty for all materials and installation work.

1.7 CERTIFICATIONS

1.7.1 Indoor Air Quality for Flooring System

Provide flooring system with VOC emissions certified in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method.

1.7.2 Building Product Declarations

Provide resinous flooring system with EPD and Material Ingredient Report, if available.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Submit installation drawings for heavy duty epoxy flooring systems clearly designating the areas of application and the installation plan. Include in the installation plan, methods to control sand and dust if sand blasting is required.

2.2 MATERIALS

2.2.1 Mixes

2.2.1.1 Epoxy-Resin Binder/Matrix

Provide a clear two-component compatible system epoxy resin binder consisting of: (1) a liquid blend of a biphenyl-based epoxy resin and an aliphatic polyglyceride ether, and (2) a liquid blend of two modified amine curing agents, which individually cures the epoxy resin at room temperature to a glossy smooth film. Ensure the two components and the cured epoxy binder have the following physical properties:

PROPERTY	TEST METHOD	REQUIREMENT
	COMPONENT A (EPOXY RESIN)	
Viscosity (kinematic), at 77 degrees F, centipoises	ASTM D445	3000 to 5000
Weight per epoxide, grams	ASTM D1652	205 to 225
Color (Gardner Color Scale), maximum	ASTM D1544	5
Weight per gallon, pounds	ASTM D1475	9.46 - 9.56
	COMPONENT B (CURING AGENT)	
Viscosity (kinematic), at 77 degrees F, centistokes	ASTM D445	75 to 125
Weight per gallon, pounds	ASTM D1475	7.50 to 7.60
Color (Gardner Color Scale), maximum	ASTM D1544	8

2.2.1.2 Cured Epoxy Binder

Provide a cured epoxy binder with the following properties.

PROPERTY	TEST METHOD	REQUIREMENT
Tensile strength, psi* at test temperature: 77 degrees F	ASTM D638	4500 to 6500
Tensile elongation, percent* at test temperature: 77 degrees F	ASTM D638	20 to 40
Water absorption, percent 24 hours at 77 degrees F, maximum	ASTM D570	0.40
Hardness, Shore D	ASTM D2240	74 to 82
Linear shrinkage, inch/inch maximum	ASTM C881/C881M	0.006
Shrinkage, glass bow, inch divergence, maximum	ASTM A990/A990M	0.016

PROPERTY	TEST METHOD	REQUIREMENT
Coefficient of linear thermal expansion, inch/inch/degree C, maximum	ASTM D696 0 degrees C to 40 degrees C	200 X 10-6
Gel time/peak exotherm at 77 degrees F, 100 gm mass in 4 ounce metal container	ASTM D2471	20 to 40 minutes at 300 degrees F, maximum
*1/8 inch thick castings		
**1/8 by 1 by 3 inch castings, aged in forced draft oven		

2.2.1.3 Aggregate

Provide aggregate recommended by the resinous flooring manufacturer and approved by the Contracting Officer. Deliver aggregate to the site in three separate package gradations for blending. Gradations are:

	PERCENT	
SIEVE SIZE	MAXIMUM	MINIMUM
GRADUATION NO. 1		
Retained on No. 6	0.0	-
Passing No. 6, retained on No. 8	5.0	0.0
Passing No. 8, retained on No. 12	100.0	74.0
Passing No. 20	1.0	-
GRADATION NO. 2		
Retained on No. 16	0.0	-
Passing No. 16, retained on No. 18	5.0	0.0
Passing No. 18, retained on No. 40	100.0	85.0
Passing No. 40, retained on No. 60	9.0	0.0
Passing No. 60	1.0	-
GRADATION NO. 3		
Retained on No. 20	0.0	-

	PERCENT	
SIEVE SIZE	MAXIMUM	MINIMUM
Passing No. 20, retained on No. 35	5.0	0.0
Passing No. 35, retained on No. 60	100.0	80.0
Passing No. 60, retained on No. 100	13.0	0.0
Passing No. 100	2.0	-

2.2.1.4 Surface Sealing Coat

Provide nonambering aliphatic or aromatic moisture-curing polyurethane surface sealer into which has been incorporated a flatting agent. Add flatting agent not more than 24 hours prior to actual application of the coating. Ensure cured coating with flatting agent yields 60-degree specular gloss of 10 to 20 when tested in accordance with ASTM D523.

PART 3 EXECUTION

3.1 PREPARATION

Prior to applying resinous flooring material, inspect substrate and immediately report any unsatisfactory conditions that exist and repair.

Verify that the concrete substrates are dry and the moisture-vapor emissions are within acceptable levels according to the manufacturer's written instructions.

Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with application of resinous flooring only after substrates have a maximum moisture-vapor-emission rate of 7 lb of water/1000 sq. ft. of slab area in 24 hours.

Relative Humidity Test: Use in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

Alkalinity and Adhesion Testing: Verify that concrete substrates have a pH within an acceptable range. Perform tests recommended by the manufacturer. Proceed with the application only after the substrates pass testing.

3.1.1 Safety Precautions

Prior to application in confined spaces of toppings and coatings containing flammable or toxic properties, institute safety precautions recommended by the manufacturer of the product.

Erect "NO SMOKING" signs, and prohibit smoking or use of spark- or flame-producing devices within 50 feet of any mixing or placing operation involving flammable materials.

Provide the personnel required to handle, mix, or apply toppings

containing toxic or flammable properties with such items of personal protective equipment and apparel for eye, skin, and respiratory protection as are recommended by the manufacturer of the product. Ensure all personnel are trained in the appropriate use and wearing of personal protection equipment.

3.1.2 Protection of Adjacent Surfaces

In addition to the protection of adjacent surfaces during installation, provide areas used to store and mix materials with a protective covering under the materials. After application of the sealer coats, protect finished flooring during the remainder of the construction period. In areas of expected minimum or moderate traffic, cover floors in accordance with manufacturer's recommendations for protective materials and method of application. Upon completion of construction, remove the protection, clean flooring and, where necessary, repair, reseal, or both, at no additional cost to the Government.

3.1.3 Concrete Subfloor

3.1.3.1 Existing Concrete Floors

Clean existing concrete floors, with hard troweled or contaminated areas in conformance with ASTM D4259. Ensure the concrete is free of all paint, sealers, curing agents, oil, grease, moisture, dirt or any other contaminants. Remove any loose or corroded segments of existing concrete. Patch with a grouting compound as recommended by the resinous flooring manufacturer. Fill all cracks with an elastomeric jointing compound compatible with the resinous flooring system used.

3.1.4 Mixing Of Materials

Select the job mix proportions on the trial batch proportions used to prepare the floor topping samples as submitted and approved.

Use mechanical equipment for mixing of materials in accordance with the manufacturer's instructions.

Use rotating paddle-type masonry mortar mixers for preblending the three sizes and color pigment, if any, of the walnut shell aggregate and addition of the mixed epoxy resin binder. Ensure mixing times are as recommended by the materials supplier(s), provided mixing times result in homogeneous mixtures. Limit quantity of material mixed at one time to that which can be applied and finished within the working life of the mixtures. Verify that the temperature of materials at the time of mixing are between 65 and 85 degrees F.

3.2 APPLICATION

3.2.1 Areas of Application

Anchor plates set with the top surface at or above the finished epoxy floor level do not require coverage with this flooring material. Extend flooring under equipment, except when the equipment base is indicated to be flush against the structural floor. Cover and/or mask surfaces not to receive the epoxy floor topping, such as equipment or cabinets installed prior to surface-preparation efforts and adjacent to the flooring installation.

3.2.2 Application of Prime Coat and Troweling

Combine the epoxy binder components A and B in the proportions specified by the manufacturer to form a clear compatible system immediately on mixing. Cure combined components to a clear film possessing a glossy, non-greasy surface at relative humidities less than 80 percent, having the following properties after curing 24 hours at 77 degrees F, followed by 24 hours at 125 degrees F:

Ensure that the prepared subfloor surface is dry and at a temperature of not less than 60 degrees F when application of the floor topping is initiated. Immediately before application of the prime/scratch coat on the prepared surface, remove dust or other loose particles by blowing with compressed air or vacuum cleaned. Use only an air compressor equipped with an efficient oil-water trap to prevent oil contamination or wetting of surface.

Apply a thin roller coat of the epoxy binder specified to the prepared subfloor as a prime coat. As an aid to placing, compacting, and finishing the floor topping, form a scratch coat by sprinkling a minimum quantity of the walnut shell aggregate on the prime coat surface immediately following the prime coat application. Prior to application of the prime/scratch coat, fill cracks in the concrete per manufacturer's instructions, and make provisions to keep control or expansion joints open.

Place the floor topping prior to final gelling of the prime/scratch coat. Immediately after the materials are mixed as specified, dump the mixture in the placement area and spread to prolong troweling life. Screed or rough trowel placed materials to the specified thickness and then compact by the use of a smooth roller prior to finish troweling to a nominal thickness of 3/16 inch plus or minus 1/16 inch. Ensure all finished surfaces are free of ridges, hollows (bird-baths), trowel marks, and smoothness varies no more than 1/8 inch when tested with an 8 foot straightedge. Make provisions to maintain the work areas in a relatively dust-free environment during curing of the topping.

3.2.3 Sealer Coat

After the floor topping has set firmly (approximately 6 to 16 hours depending on subfloor temperature) in a relatively dust-free environment, apply two thin coats of the sealer coat, by means of brush, roller, squeegee, or notched trowel to provide a pore-free, easy-to-clean surface. At the time of sealer application, ensure that the surface is dust-free. Depending on relative humidity, allow the applied sealer to cure to a tack-free condition in 2 to 4 hours. Do not apply second coat until after the initial coat has cured to a tack-free, hard film. Maintain topping areas in a relatively dust-free environment during curing of the sealer coats.

3.3 FIELD QUALITY CONTROL

3.3.1 Repairing

Remove and replace damaged or unacceptable portions of completed work with new work to match adjacent surfaces at no additional cost to the Government.

3.4 ADJUSTING AND CLEANING

Clean surfaces of the new work, and adjacent surfaces soiled as a result of the work. Remove all equipment, surplus materials, and rubbish associated with the work from the site.

-- End of Section --

SECTION 09 68 00

CARPETING
11/17

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC 16	(2004; E 2008; E 2010) Colorfastness to Light
AATCC 107	(2013) Colorfastness to Water
AATCC 134	(2016) Electrostatic Propensity of Carpets
AATCC 165	(2013) Colorfastness to Crocking: Textile Floor Coverings - Crockmeter Method
AATCC 174	(2016) Antimicrobial Activity Assessment of New Carpets

ASTM INTERNATIONAL (ASTM)

ASTM D1335	(2017; E 2018) Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings
ASTM D2859	(2016) Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials
ASTM D3278	(1996; R 2011) Flash Point of Liquids by Small Scale Closed-Cup Apparatus
ASTM D5793	(2018) Standard Test Method for Binding Sites Per Unit Length or Width of Pile Yarn Floor Coverings
ASTM D5848	(2020) Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Coverings
ASTM D6859	(2011) Standard Test Method for Pile Thickness of Finished Level Pile Yarn Floor Coverings
ASTM D7330	(2015) Standard Test Method for Assessment of Surface Appearance Change in Pile Floor Coverings Using Standard Reference Scales
ASTM E648	(2019a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems

Using a Radiant Heat Energy Source

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350 (2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

CARPET AND RUG INSTITUTE (CRI)

CRI 104 (2015) Carpet Installation Standard for Comnmercial Carpet

CRI 105 (2015) Carpet Installation Standard for Residential Carpet

CRI GLP QM (2017) Green Label Plus Quality Manual

CRI Test Method 103 (2015) Standard Test Method for the Evaluation of Texture Appearance Retention of Carpet Standards Program

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 2551 (2020) Textile Floor Coverings and Textile Floor Coverings in Tile Form-Determination of Dimensional Changes Due to the Effects of Varied Water and Heat Conditions and Distortion Out of Plane

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1113 (2016) Architectural Coatings

SCAQMD Rule 1168 (2017) Adhesive and Sealant Applications

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide (2013) USGBC LEED Reference Guide for Building Design and Construction, v4

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

16 CFR 1630 Standard for the Surface Flammability of Carpets and Rugs (FF 1-70)

UNDERWRITERS LABORATORIES (UL)

UL 2818 (2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation Drawings; G

SD-03 Product Data

Carpet; G

Recycled Content for Carpeting; S

Indoor Air Quality for Concrete Primer; S

SD-04 Samples

Carpet; G

SD-06 Test Reports

Moisture and Alkalinity Tests; G

SD-07 Certificates

Indoor Air Quality for Carpet; S

Indoor Air Quality for Adhesives; S

SD-08 Manufacturer's Instructions

Surface Preparation

SD-10 Operation and Maintenance Data

Cleaning and Protection

Maintenance Service

SD-11 Closeout Submittals

Warranty

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for carpet and adhesive that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

4. Low-Emitting Materials - Interior adhesives and sealants applied on site (including flooring adhesive):

a. Meet the VOC emissions evaluation and meet the VOC content evaluation. The adhesives and sealants product category include all interior adhesives and sealants applied on site. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

5. Low-Emitting Materials - Flooring:

a. All flooring shall comply with the 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." All flooring must meet the VOC emissions evaluation OR inherently non-emitting sources criteria, OR salvaged and reused materials criteria. The flooring product category includes all types of hard and soft surface flooring (carpet, ceramic, vinyl, rubber, engineered, solid wood, laminates), wall base, underlayment, and other floor coverings. Subflooring is excluded. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality Certifications

1.3.1.1 Floor Covering Materials

Provide carpet and cushion products certified to meet indoor air quality requirements by UL 2818 (GreenGuard) Gold, SCS Global Services Indoor Advantage Gold, CRI GLP QM. Provide current product certification documentation from certification body.

1.3.1.2 Primer, adhesives and Sealants

Provide primer, adhesives and sealants applied within the building interior with VOC emissions certified in compliance with California

Department of Public Health CDPH SECTION 01350 Standard Method and VOC content in compliance with limits of SCAQMD Rule 1168.Text

1.3.2 Building Product Declarations

Provide carpet and adhesive with EPD and Material Ingredient Report.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the site in the manufacturer's original wrappings and packages clearly labeled with the manufacturer's name, brand name, size, dye lot number, and related information. Remove materials from packaging and store them in a clean, dry, well ventilated area (100 percent outside air supply, minimum of 1.5 air changes per hour, and no recirculation), protected from damage, soiling, and moisture, and strong contaminant sources and residues, and maintain at a temperature above 60 degrees F for 2 days prior to installation. Do not store carpet or carpet tiles with materials which have high emissions of volatile organic compounds (VOCs) or other contaminants, including paints and adhesives. Do not store carpet near materials that may off gas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives.

1.5 AMBIENT CONDITIONS

Maintain areas in which carpeting is to be installed at a temperature above 60 degrees F and below 90 degrees F for 2 days before installation, during installation, and for 2 days after installation. Provide temporary ventilation during work of this section. Maintain a minimum temperature of 55 degrees F thereafter for the duration of the contract.

1.6 WARRANTY

Provide manufacturer's standard performance guarantees or warranties including minimum ten year wear warranty, two year material and workmanship and ten year tuft bind and delamination.

PART 2 PRODUCTS

2.1 CARPET

Furnish first quality carpet that is free of visual blemishes, streaks, poorly dyed areas, fuzzing of pile yarn, spots or stains, and other physical and manufacturing defects. Provide carpet materials and treatments as reasonably nonallergenic and free of other recognized health hazards. Provide a static control construction on all grade carpets which gives adequate durability and performance. Submit manufacturer's catalog data and printed documentation stating physical characteristics, durability, resistance to fading, and flame resistance characteristics for each type of carpet material and installation accessory. Submit manufacturer's Product Data for 1) Carpet, 2) Moldings, and 3) Carpet Cushion. Also, submit Samples of the following:

a. Carpet: Two "Production Quality" samples 9 by 36 inches of each carpet proposed for use, showing quality, pattern, and color specified

2.1.1 Recycled Content

Carpeting must contain a minimum of 40 percent recycled content. Provide data identifying percentage of recycled content for carpeting.

2.1.2 Indoor Air Quality Requirements

Products must meet emissions requirements of CDPH SECTION 01350. Provide certification or validation of indoor air quality for carpet.

2.1.3 Physical Characteristics for Modular Tile Carpet

2.1.3.1 Carpet Construction

Mulit-level pattern loop

2.1.3.2 Type

Modular tile 9 by 36 inch square with 0.15 percent growth/shrink rate in accordance with ISO 2551.

2.1.3.3 Pile Type

Multilevel loop.

2.1.3.4 Pile Fiber

Commercial 100 percent branded (federally registered trademark) eco solution Q nylon.

2.1.3.5 Gauge or Pitch

Minimum 1/10 and 1/12 inch in accordance with ASTM D5793

2.1.3.6 Stitches or Rows/Wires

Minimum 8.0 and 8.5 per square inch

2.1.3.7 Surface Pile Weight

Minimum 28 and 22 ounces per square yard. This does not include weight of backings. Determine weight in accordance with ASTM D5848.

2.1.3.8 Pile Thickness

Minimum .096, .122, and .123 inch in accordance with ASTM D6859

2.1.3.9 Pile Density

Minimum 10500 oz/yd3, 6492 oz/yd3, and 8195 oz/yd3,

2.1.3.10 Dye Method

Solution dyed

2.1.3.11 Backing Materials

Provide primary backing materials like synthetic material . Provide secondary backing to suit project requirements of those customarily used and accepted by the trade for each type of carpet.

2.2 PERFORMANCE REQUIREMENTS

2.2.1 Texture Appearance Retention Rating (TARR)

Provide carpet with a greater than or equal to 3.0 (Heavy) TARR traffic level classification in accordance with ASTM D7330 or CRI Test Method 103.

2.2.2 Static Control

Provide static control to permanently regulate static buildup to less than 3.5 kV when tested at 20 percent relative humidity and 70 degrees F in accordance with AATCC 134.

2.2.3 Flammability and Critical Radiant Flux Requirements

Comply with 16 CFR 1630 or ASTM D2859. Provide carpet in corridors and exits with a minimum average critical radiant flux of 0.45 watts per square centimeter when tested in accordance with ASTM E648.

2.2.4 Tuft Bind

Comply with ASTM D1335 for tuft bind force required to pull a tuft or loop free from carpet backing with a minimum 8 pound average force for modular carpet tile.

2.2.5 Colorfastness to Crocking

Comply dry and wet crocking with AATCC 165 and with a Class 4 minimum rating on the AATCC Color Transference Chart for all colors.

2.2.6 Colorfastness to Light

Comply colorfastness to light with AATCC 16, Test Option E "Water-Cooled Xenon-Arc Lamp, Continuous Light" and with a minimum 4 grey scale rating after 40 hours.

2.2.7 Colorfastness to Water

Comply colorfastness to water with AATCC 107 and with a minimum 4.0 gray scale rating and a minimum 4.0 transfer scale rating.

2.2.8 Delamination Strength

Provide delamination strength for tufted carpet with a secondary back of minimum 2.5 lbs/inch.

2.2.9 Antimicrobial

Nontoxic antimicrobial treatment in accordance with AATCC 174 Part I (qualitative), guaranteed by the carpet manufacturer to last the life of the carpet.

2.3 ADHESIVES AND CONCRETE PRIMER

Comply with applicable regulations regarding toxic and hazardous materials. Provide water resistant, mildew resistant, nonflammable, and nonstaining adhesives and concrete primers for carpet installation as required by the carpet manufacturer. Provide release adhesive for modular tile carpet as recommended by the carpet manufacturer. Provide adhesives

flashpoint of minimum 140 degrees F in accordance with ASTM D3278. A dhesive products used on the interior of the building (defined as inside of the weatherproofing system) must meet emissions requirements of CDPH SECTION 01350 (limit requirements for office space type) and VOC content requirements of SCAQMD Rule 1168. Provide validation of indoor air quality for adhesives. Concrete primer products used on the interior of the building (defined as inside of the weatherproofing system) must meet emissions requirements of CDPH SECTION 01350 (limit requirements for office space type) and VOC content requirements of SCAQMD Rule 1113. Provide validation of indoor air quality for concrete primer.

2.4 COLOR, TEXTURE, AND PATTERN

Provide color, texture, and pattern in accordance with the drawings.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Do not install carpet on surfaces that are unsuitable and will prevent a proper installation. Prepare subfloor in accordance with flooring manufacturer's recommended instructions. Repair holes, cracks, depressions, or rough areas using material recommended by the carpet or adhesive manufacturer. Free floor of any foreign materials and sweep clean. Before beginning work, test subfloor with glue and carpet to determine "open time" and bond. Submit three copies of the manufacturer's printed Installation instructions for the carpet, including Surface Preparation, seaming techniques, and recommended adhesives and tapes.

3.2 MOISTURE AND ALKALINITY TESTS

Test concrete slab for moisture content and excessive alkalinity in accordance with CRI 104/CRI 105. Submit three copies of reports of Moisture and Alkalinity Tests including content of concrete slab stating date of test, person conducting the test, and the area tested.

3.3 PREPARATION OF CONCRETE SUBFLOOR

Do not commence installation of the carpeting until concrete substrate is at least 90 days old. Prepare the concrete surfaces in accordance with the carpet manufacturer's instructions. Match carpet, when required, and adhesives to prevent off-gassing to a type of curing compounds, leveling agents, and concrete sealer.

3.4 INSTALLATION

Isolate area of installation from rest of building. Perform all work by manufacturer's approved installers. Conduct installation in accordance with the manufacturer's printed instructions and CRI 104/CRI 105. Protect edges of carpet meeting hard surface flooring with molding and install in accordance with the molding manufacturer's printed instructions. Use autofoam mothproofing system for wool carpets.Follow ventilation, personal protection, and other safety precautions recommended by the adhesive manufacturer. Continue ventilation during installation and for at least 72 hours following installation. Do not permit traffic or movement of furniture or equipment in carpeted area for 24 hours after installation. Complete other work which would damage the carpet prior to installation of carpet. Submit three copies of Installation Drawings for 1) Carpet, carpet types, patterns, direction of pile, and location of seams.

Do not install building construction materials that show visual evidence of biological growth.

3.4.1 Modular Tile Installation

Install modular tiles with adhesive and snug joints. Use monolithic installation method. Comply with manufacturer installation instructions for required drying time of releasable adhesive so it sets up properly. Provide accessibility to the subfloor where required. Carpet tile on stairs and sloped surfaces must be installed with a more permanent installation method in accordance with the manufacturer's instructions and with manufacturer recommended adhesives for this application.

3.5 CLEANING AND PROTECTION

Submit three copies of carpet manufacturer's maintenance instructions describing recommended type of cleaning equipment and material, spotting and cleaning methods, and cleaning cycles.

3.5.1 Cleaning

As specified in Section 01 78 00 CLOSEOUT SUBMITTALS. After installation of the carpet, remove debris, scraps, and other foreign matter. Remove soiled spots and adhesive from the face of the carpet with appropriate spot remover. Cut off and remove protruding face yarn. Vacuum carpet clean with a high-efficiency particulate air (HEPA) filtration vacuum.

3.5.2 Protection

Protect the installed carpet from soiling and damage with heavy, reinforced, nonstaining kraft paper, plywood, or hardboard sheets. Lap and secure edges of kraft paper protection to provide a continuous cover. Restrict traffic for at least 48 hours. Remove protective covering when directed by the Contracting Officer.

3.6 REMNANTS

Manage waste as specified in the Waste Management Plan. Provide remnants remaining from the installation, consisting of scrap pieces more than 2 feet in dimension with more than 6 square feet total to the Government . Set aside and return non-retained scraps to manufacturer for recycling into new product.

3.7 MAINTENANCE

3.7.1 Extra Materials

Provide extra material from same dye lot consisting of uncut carpet tiles for future maintenance. Provide a minimum of three percent of total square yards of each carpet type, pattern, and color. Furnish three percent extra of total adhesive tabs.

3.7.2 Maintenance Service

Collect information from the manufacturer about maintenance agreement options, and submit to Contracting Officer. Service must reclaim materials for recycling and/or reuse. Service must not landfill or burn reclaimed materials. When such a service is not available, seek local

recyclers to reclaim the materials. Submit documentation of manufacturer's take-back program for carpet. Include contact information, summary of procedures, and the limitations and conditions applicable to the project. Indicate manufacturer's commitment to reclaim materials for recycling and reuse.

-- End of Section --

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SECTION 09 72 00

WALLCOVERINGS
08/17

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

GYPSUM ASSOCIATION (GA)

GA 214	(2010) Recommended Levels of Gypsum Board Finish

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 265	(2019) Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls
NFPA 286	(2019) Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS CCC-W-408	(Rev D; Notices 1, 2) Wallcovering, Vinyl Coated

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

UNDERWRITERS LABORATORIES (UL)

UL 723	(2018) UL Standard for Safety Test for Surface Burning Characteristics of Building Materials

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Wallcoverings and Accessories; G

Primer and Adhesive

Recycled Content for vinyl wallcovering; S

Recycled Content for textile wallcovering; S

SD-04 Samples

Wallcoverings and Accessories; G

SD-07 Certificates

Indoor Air Quality; S

SD-08 Manufacturer's Instructions

Wallcoverings and Accessories

SD-10 Operation and Maintenance Data

Wallcoverings and Accessories; G

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment wallcovering, if available; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment

conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for wallcovering, if available, that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification; Facts – NSF/ANSI 336.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen

Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new construction/v4/material-%for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

4. Low-Emitting Materials - Wall panels:

a. Meet the VOC emissions evaluation. The wall panels product category includes all finish wall treatments (wall coverings, wall paneling, wall tile), surface wall structures such as gypsum or plaster, cubicle/curtain/partition walls, trim, doors, frames, windows, and window treatments. Removable/interchangeable fabric panels, built-in cabinetry, and vertical structural elements are excluded. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full emissions requirements..

5. Low-Emitting Materials - Interior primers, adhesives and sealants applied on site:

a. Meet the VOC emissions evaluation and meet the VOC content evaluation. The adhesives and sealants product category include all interior adhesives and sealants applied on site. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality Certifications

Submit required indoor air quality certifications and validations in one submittal package.

1.3.1.1 Fabrics and Wallcoverings

Provide fabrics and wallcovering with VOC emissions certified in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method. Provide current product certification documentation from certification body.

1.3.1.2 Primers and Adhesives

Provide primers and adhesives applied within the building interior with VOC emissions certified in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method and VOC content in compliance with limits of SCAQMD Rule 1168. Provide current product certification documentation from certification body.

1.3.2 Building Product Declarations

Provide wallcoverings with EPD and Material Ingredient Report, if available.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver the material to the site in manufacturer's original wrappings and packages and clearly label with the manufacturer's name, brand name, pattern and color name and number, dye lot number, size, and other related information. Store in a safe, dry, clean, and well-ventilated area at temperatures not less than 50 degrees F and within a relative humidity range of 30 to 60 percent. Store wallcovering material in a flat position and protected from damage, soiling, and moisture. Do not open containers until needed for installation, unless verification inspection is required.

1.5 ENVIRONMENTAL REQUIREMENTS

Comply with wallcovering manufacturer's printed installation instructions for minimum temperature of area to receive requirements for conditioning adhesive and wallcovering. Provide a minimum 50 degrees F area temperature, 72 hours prior to installation, during installation, and until the adhesive dries. Observe ventilation and safety procedures.

1.6 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a one-year period.

1.7 EXTRA MATERIALS

Provide one linear foot of full-width wallcovering of each pattern and color for each 50 linear feet of wallcovering installed. Provide the same manufacturer, type, pattern, color, and lot number of extra stock as the installed wallcovering. Provide full rolls, packed for storage and marked with content, manufacturer's name, pattern and color name and number and dye lot number. Leave extra stock at the site at a location as directed by the Contracting Officer.

PART 2 PRODUCTS

2.1 WALLCOVERINGS AND ACCESSORIES

Provide wall coverings and accessories material designed specifically for the specified use. Provide vinyl wallcovering with a mercury, cadmium, lead, and chromium free base. Protect wallcoverings with bactericides and mildew inhibitors against microbiological and mildew growth.

2.1.1 Product Data

a. Wallcovering: Submit manufacturer's descriptive data, documenting physical characteristics, flame resistance, mildew and germicidal characteristics for wallcovering.

b. Primer and Adhesive: Submit manufacturer's descriptive data, documenting physical characteristics, mildew and germicidal characteristics.

2.1.2 Samples

2.1.2.1 Wallcovering

Submit three samples of each indicated type, pattern, and color of wallcovering. Provide minimum 5 by 7 inch samples of wallcovering to show pattern repeat of sufficient size.

2.1.2.2 Wallcovering

Provide three samples, 3 yards long by the width specified, of each type to be installed in the work, as required to illustrate material weight, color, shade, decorative design, and embossing when required.

2.1.2.3 Wallcovering Mockup Panels

After samples are approved, and prior to starting installation, provide a minimum 8 by 8 foot wallcovering mock-up for each color and type of vinyl and fabric wallcovering, using the proposed primers and adhesives and actual substrate materials. Once approved, use the mock-up samples as a standard of workmanship for installation within the facility. Written notification to the Contracting Officer at least 48 hours prior to mock-up installation.

2.1.3 Certificates

Submit manufacturer's statement attesting that the product furnished meets or exceeds specification requirements. Date the statement after the award of the contract, state Contractor's name and address, name the project and location, and list the requirements being certified. Include these certificates:

(1) Certified laboratory test reports of the physical properties for vinyl wallcovering, as specified.

(2) Certificates of Compliance for UL fire hazard classification listing, as specified.

(3) Certificates of Compliance for contact adhesive.

2.1.4 Manufacturer's Instructions

Submit preprinted installation instructions for wallcovering and accessories, adhesives and primers. Include substrate preparation and material application in the instructions.

2.1.5 Operations and Maintenance Data

a. Submit Data Package 1 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

b. Submit three copies of manufacturer's maintenance instructions for each type of vinyl wallcovering and accessory describing recommended type of cleaning equipment and materials, spotting and cleaning methods, and cleaning cycles. Instructions to also include preventative maintenance, recommended cleaning materials and precautions in the use of cleaning materials that may be detrimental to the wallcovering surface and accessories when improperly applied.

2.2 VINYL WALLCOVERING TYPE A

Provide a digitally printed vinyl coated woven or nonwoven wallcovering fabric. Conform to FS CCC-W-408 for vinyl wallcovering, Type II (Medium Duty) with a minimum total weight of 13 ounces/square yard and 20 ounces/linear yard. Provide width of 52/54 inch. Test vinyl wallcovering in accordance with NFPA 286 or meet the requirements of Class A when tested in accordance with ASTM E84 or UL 723.

Provide Vinyl Wallcovering containing a minimum of 10 percent recycled content. Provide data identifying percentage of recycled content for vinyl wallcovering.

Provide certification of indoor air quality for vinyl wallcovering.

2.3 TEXTILE WALLCOVERING TYPE A

Provide colorfast, stain, and soil resistant textile wallcovering fabricated of woven fabric with acrylic latex backing. Meet the requirements of Class A when tested in accordance with ASTM E84 or UL 723. Comply with or exceed the following for textile wallcovering:

Face fiber content; WC-1:	61% olefin, 39% polyester; WC-3: 100% solution dyed polyethylene
Weave; WC-1:	Plain jacquard
Total Weight; WC-1:	7.73 ounces/linear yard; WC-3: 16 ounces/ linear yard
Width; WC-1:	54 inch; WC-3: 52 inch

Provide certification of indoor air quality for textile wallcovering. Provide Recycled Content for textile wallcovering.

2.4 PRIMER AND ADHESIVE

Provide a type primer and adhesive recommended by the wallcovering manufacturer, containing a non-mercury based mildewcide, and complying with local indoor air quality standards. Primer must permit removal of the wallcovering and protect the wall surface during removal. Do not damage gypsum wallboard facing paper during removal of wallcovering. Provide a strippable type adhesive. When substrate color variations show through vinyl wallcovering, provide a white pigmented primer as recommended by the wallcovering manufacturer used to conceal the variations. Provide a recommended type adhesive to install corner guards and wainscot cap by the manufacturer of the corner guards and wainscot cap.

Provide primers and adhesive products used on the interior of the building (defined as inside of the weatherproofing system) that meet emissions requirements of CDPH SECTION 01350 (limit requirements for office space type) and VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for primer; also, provide certification or validation of indoor air quality for adhesives.

2.5 COLOR, TEXTURE, AND PATTERN

Provide color, texture and pattern as indicated on the color material

legend in the drawings. . Color listed is not intended to limit the selection of equal colors from other manufacturers.

PART 3 EXECUTION

3.1 EXAMINATION

Inspect all areas and conditions under which wallcoverings are to be installed. Notify the Contracting Officer, in writing, of any conditions detrimental to the proper and timely completion of the installation. Work will proceed only when conditions have been corrected and accepted by the installer.

3.2 SURFACE PREPARATION

Do not apply wallcovering to surfaces that are rough, that contain stains which will bleed through the wallcovering, or that are otherwise unsuitable for proper installation. Fill cracks and holes; sand rough spots smooth. Finish walls to receive presentation dry erase wallcovering to a Level 4 gypsum wallboard finish in accordance with GA 214 unless Level 5 is recommended by the wallcovering manufacturer. Thoroughly dry surfaces at least 30 days prior to installation of vinyl wallcovering. Provide interior surfaces of new and existing gypsum wallboard with a wallcovering primer in accordance with the manufacturer's printed instructions. As required, use white primer when substrate color variations are visible through thin or light color wallcovering. Seal interior surfaces of exterior masonry walls to prevent moisture penetration, then prime with a wallcovering primer in accordance with the manufacturer's printed instructions. Provide masonry walls with flush joints. Test moisture content of plaster, concrete, and masonry with an electric moisture meter of a maximum five percent reading. Apply a thin coat of joint compound or cement plaster, as recommended by the wallcovering manufacturer, to the concrete and masonry walls as a substrate preparation. To promote adequate adhesion of wall lining over masonry walls, prime the walls as recommended by the wall lining manufacturer. Prime the surfaces of walls as required by the manufacturer's printed instructions to permit ultimate removal of wallcovering from the wall surfaces. Allow primer to completely dry before adhesive application.

3.3 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

3.3.1 Wallcovering

Install wallcovering in accordance with the manufacturer's printed installation instructions. Remove glue and adhesive spillage from wallcovering face and seams with a remover recommended by the manufacturer.

3.3.1.1 Textile Wallcovering

When textile wallcoverings are specified to comply with NFPA 265, NFPA 286, or ICC IBC (Section 803.5 Textile wall coverings) testing, install the wallcovering in accordance with the manufacturer's printed installation instructions for compliance with the testing using the same product mounting system, including adhesive. After the installation is complete,

vacuum the fabric with a ceiling to floor motion.

3.4 CLEAN-UP

Upon completion of the work, clean wallcovering free of dirt, soiling, stain, or residual film. Remove and clean surplus materials, rubbish, and debris resulting from the wallcovering installation.

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SECTION 09 84 20

ACOUSTICAL WALL PANELS
08/16

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC 16	(2004; E 2008; E 2010) Colorfastness to Light

ASTM INTERNATIONAL (ASTM)

ASTM C423	(2009a) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
ASTM D5034	(2009; R 2017) Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

FOREST STEWARDSHIP COUNCIL (FSC)

FSC STD 01 001	(2015) Principles and Criteria for Forest Stewardship

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When

used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Approved Detail Drawings; G

SD-03 Product Data

Installation

Acoustical Wall Panels; G

Recycled Content for Fabric Panels; S

SD-04 Samples

Acoustical Wall Panels; G

SD-07 Certificates

Acoustical Wall Panels

Certified Sustainably Harvested Wood; S

Indoor Air Quality for Wall Panels; S

SD-11 Closeout Submittals

Warranty

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment wall panels, if available; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Permanently installed, non-recycled wood and wood-based materials should be certified in accordance with Forest Stewardship Council Guidelines. This includes wood permanently installed in the project wood products. Submit all FSC product certification information including required Chain-of-Custody certificates and invoices tracking FSC purchase. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for wall panels, if available, that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification; Facts – NSF/ANSI 336.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new construction/v4/material-%for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

4. Low-Emitting Materials - Wall panels:

a. Meet the VOC emissions evaluation. The wall panels product category includes all finish wall treatments (wall coverings, wall paneling, wall tile), surface wall structures such as gypsum or plaster, cubicle/curtain/partition walls, trim, doors, frames, windows, and window treatments. Removable/interchangeable fabric panels, built-in cabinetry, and vertical structural elements are excluded. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full emissions requirements.

1.3 CERTIFICATIONS

1.3.1 Certified Sustainably Harvested Wood

Provide wood certified as sustainably harvested by FSC STD 01 001. Provide a letter of Certification of Sustainably Harvested Wood signed by the wood supplier. Identify certifying organization and their third party program name and indicate compliance with chain-of-custody program requirements. Submit sustainable wood certification data; identify each certified product on a line item basis. Submit copies of invoices bearing certification numbers.

1.3.2 Indoor Air Quality for Wall Panels

Provide wall panels with VOC emissions certified in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method.

1.3.3 Building Product Declarations

Provide wall panels with EPD and Material Ingredient Report, if available.

1.4 DELIVERY, STORAGE, AND HANDLING

Protect materials delivered and placed in storage from the weather, humidity and temperature variations, dirt, dust, or other contaminants.

1.5 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a one year period.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

2.1.1 Design

Provide fabric wrapped mineral / glass-fiber core acoustical wall panel

materials in the manufacturer's standard sizes and finishes of the type, design and configuration indicated.

2.1.1.1 Fabric Recycled Content

Fabric Panels must contain a minimum of 50 percent recycled conten. Provide data identifying percentage of recycled content for fabric panels.

2.2 FABRIC COVERED ACOUSTICAL WALL PANELS

Provide acoustical wall panels consisting of prefinished, factory assembled, seamless fabric covered, fiber glass or mineral fiber core system as described below manufactured to the dimensions and configurations shown on the approved detail drawings; submit drawings showing plan locations, elevations and details of method of anchorage, location of doors and other openings, base detail and shape and thickness of materials. Perimeter edges must be reinforced by a formulated resin edge hardener. Acoustical wall panels installed in non-sprinklered areas must comply with the requirements of ICC IBC, Standard 42-2. Submit manufacturer's descriptive data and catalog cuts; fabric swatches, minimum 18 inches wide by 24 inches long 3 samples of each color range specified; and certificates of compliance from an independent laboratory accredited by the National Laboratory Accreditation Program of the National Institute of Standards. A label or listing from the testing laboratory will be acceptable evidence of compliance. Wall panels must conform to the following:

2.2.1 Panel Width

Widths as indicated on drawings.inches

2.2.2 Panel Height

Panel height as indicated on drawings.

2.2.3 Thickness

Panel thickness: 1 inch.

2.2.4 Fabric Covering

Seamless 100 percent polyester, minimum 6 ounces/linear yard. Tear strength a minimum 25 pounds machine direction and minimum 40 pounds cross-machine direction. Tensile strength a minimum 50 pounds machine direction and minimum 75 pounds cross-machine direction in accordance with ASTM D5034. Tear strength a minimum 29 pounds. Tensile strength 150 pounds minimum in accordance with ASTM D5034. Stretch fabric covering free of wrinkles and then bond to the edges and back or bond directly to the panel face, edges, and back of panel a minimum distance standard with the manufacturer. Light fastness (fadeometer) approximately 40 hours in accordance with AATCC 16.

2.2.5 Fire Rating for the Complete Composite System

Class A, 200 or less smoke density and flame spread less than 25, when tested in accordance with ASTM E84.

2.2.6 Substrate

Fiber glass or mineral fiber

2.2.7 Noise Reduction Coefficient (NRC) Range

0.55-0.70 ASTM C423

2.2.8 Edge Detail

Bevel and Square edge with fabric wrapped on all four sides.

2.2.9 Core Type

Standard acoustical and Acoustical/tackable core

2.2.10 Mounting Acoustical Panels

Mount acoustical panels by manufacturer's standard mounting: Adhesive, impaling clips, two-part Z-clips.

2.3 COLOR

As indicated on the color material legend in the construction documents. Color listed is not intended to limit the selection of equal colors from other manufacturers.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

mustshall be clean, smooth, oil free and prepared in accordance with panel manufacturer's instructions. Do not begin installation until all wet work, such as, plastering, painting, and concrete are completely dry.

3.2 INSTALLATION

Panel installation must be by personnel familiar with and normally engaged in installation of acoustical wall panels. Apply panels in accordance with the manufacturer's installation instructions. Submit manufacturer's installation instructions and recommended cleaning instructions.

3.3 CLEANING

Following installation, clean dirty or stained panel surfaces in accordance with manufacturer's instructions and leave free from defects. Remove and replace panels that are damaged, discolored, or improperly installed.

-- End of Section --

SECTION 09 90 00

PAINTS AND COATINGS
05/11

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH 0100	(2015; Suppl 2002-2016) Documentation of the Threshold Limit Values and Biological Exposure Indices

ASTM INTERNATIONAL (ASTM)

ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM D235	(2002; R 2012) Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)
ASTM D523	(2014; R 2018) Standard Test Method for Specular Gloss
ASTM D4214	(2007; R 2015) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D4263	(1983; R 2018) Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
ASTM D4444	(2013; R 2018) Standard Test Method for Laboratory Standardization and Calibration of Hand-Held Moisture Meters
ASTM D6386	(2016) Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
ASTM F1869	(2016) Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

CALIFORNIA AIR RESOURCES BOARD (CARB)

CARB 93120	(2007) Airborne Toxic Control Measure (ATCM) to Reduce Formaldehyde Emissions from Composite Wood Products

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

MASTER PAINTERS INSTITUTE (MPI)

MPI 2	(2012) Aluminum Heat Resistant Enamel (up to 427 C and 800 F
MPI 4	(2012) Interior/Exterior Latex Block Filler
MPI 5	(2012) Primer, Exterior Alkyd Wood
MPI 6	(2012) Primer, Exterior Latex Wood
MPI 8	(2012) Alkyd, Exterior Flat (MPI Gloss Level I)
MPI 9	(2012) Alkyd, Exterior Gloss (MPI Gloss Level 6)
MPI 10	(2012) Latex, Exterior Flat (MPI Gloss Level 1)
MPI 11	(2012) Latex, Exterior Semi-Gloss, MPI Gloss Level 5
MPI 19	(2012) Primer, Zinc Rich, Inorganic
MPI 21	(2012) Heat Resistant Coating, (Up to 205°C/402°F), MPI Gloss Level 6
MPI 22	(2012) Aluminum Paint, High Heat (up to 590° C/1100° F)
MPI 23	(2012) Primer, Metal, Surface Tolerant
MPI 27	(2012) Floor Enamel, Alkyd, Gloss (MPI Gloss Level 6)
MPI 39	(2012) Primer, Latex, for Interior Wood
MPI 42	(2012) Textured Coating, Latex, Flat
MPI 45	(2012) Primer Sealer, Interior Alkyd
MPI 46	(2012) Undercoat, Enamel, Interior
MPI 47	(2012) Alkyd, Interior, Semi-Gloss (MPI Gloss Level 5)
MPI 48	(2012) Alkyd, Interior, Gloss (MPI Gloss Level 6-7)
MPI 50	(2012) Primer Sealer, Latex, Interior

MPI 51	(2012) Alkyd, Interior, (MPI Gloss Level 3)2
MPI 56	(2012) Varnish, Interior, Polyurethane, Oil Modified, Gloss
MPI 57	(2012) Varnish, Interior, Polyurethane, Oil Modified, Satin
MPI 60	(2012) Floor Paint, Latex, Low Gloss
MPI 68	(2012) Floor Paint, Latex, Gloss
MPI 79	(2012) Primer, Alkyd, Anti-Corrosive for Metal
MPI 90	(2012) Stain, Semi-Transparent, for Interior Wood
MPI 94	(2012) Alkyd, Exterior, Semi-Gloss (MPI Gloss Level 5)
MPI 95	(2012) Primer, Quick Dry, for Aluminum
MPI 101	(2012) Primer, Epoxy, Anti-Corrosive, for Metal
MPI 107	(2012) Primer, Rust-Inhibitive, Water Based
MPI 108	(2012) Epoxy, High Build, Low Gloss
MPI 119	(2012) Latex, Exterior, Gloss (MPI Gloss Level 6)
MPI 134	(2012) Primer, Galvanized, Water Based
MPI 138	(2012) Latex, Interior, High Performance Architectural, (MPI Gloss Level 2)
MPI 139	(2012) Latex, Interior, High Performance Architectural, (MPI Gloss Level 3)
MPI 140	(2012) Latex, Interior, High Performance Architectural, (MPI Gloss Level 4)
MPI 141	(2012) Latex, Interior, High Performance Architectural, Semi-Gloss (MPI Gloss Level 5)
MPI 144	(2012) Latex, Interior, Institutional Low Odor/VOC, (MPI Gloss Level 2)
MPI 145	(2012) Latex, Interior, Institutional Low Odor/VOC, (MPI Gloss Level 3)
MPI 146	(2012) Latex, Interior, Institutional Low Odor/VOC, (MPI Gloss Level 4)
MPI 147	(May 2016) Latex, Interior, Institutional

	Low Odor/VOC, Semi-Gloss (MPI Gloss Level 5)
MPI 151	(2012) Light Industrial Coating, Interior, Water Based (MPI Gloss Level 3)
MPI 153	(2012) Light Industrial Coating, Interior, Water Based, Semi-Gloss (MPI Gloss Level 5)
MPI 154	(2012) Light Industrial Coating, Interior, Water Based, Gloss (MPI Gloss Level 6)
MPI 161	(2012) Light Industrial Coating, Exterior, Water Based (MPI Gloss Level 3)
MPI 163	(2012) Light Industrial Coating, Exterior, Water Based, Semi-Gloss (MPI Gloss Level 5)
MPI 164	(2012) Light Industrial Coating, Exterior, Water Based, Gloss (MPI Gloss Level 6)

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC 7/NACE No.4	(2007; E 2004) Brush-Off Blast Cleaning
SSPC PA 1	(2016) Shop, Field, and Maintenance Coating of Metals
SSPC PA Guide 3	(1982; E 1995) A Guide to Safety in Paint Application
SSPC SP 1	(2015) Solvent Cleaning
SSPC SP 2	(2018) Hand Tool Cleaning
SSPC SP 3	(2018) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning
SSPC SP 10/NACE No. 2	(2007) Near-White Blast Cleaning
SSPC SP 12/NACE No.5	(2002) Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating
SSPC VIS 1	(2002; E 2004) Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
SSPC VIS 3	(2004) Guide and Reference Photographs for Steel Surfaces Prepared by Hand and Power Tool Cleaning
SSPC VIS 4/NACE VIS 7	(1998; E 2000; E 2004) Guide and Reference Photographs for Steel Surfaces Prepared by Waterjetting

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1113	(2016) Architectural Coatings

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2014) Safety and Health Requirements Manual

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-101	(2014; Rev C) Color Code for Pipelines and for Compressed Gas Cylinders

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA Method 24	(2000) Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

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

29 CFR 1910.1000	Air Contaminants

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

The current MPI, "Approved Product List" which lists paint by brand, label, product name and product code as of the date of contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use a subsequent MPI "Approved Product List", however, only one list may be used for the entire contract and each coating system is to be from a single manufacturer. Provide all coats on a particular substrate from a single manufacturer. No variation from the MPI Approved Products List is acceptable.

Samples of specified materials may be taken and tested for compliance with specification requirements.

SD-02 Shop Drawings

Piping Identification

SD-03 Product Data

Coating; G, AE

Sealant

Manufacturer's Technical Data Sheets

SD-04 Samples

Color; (each level of sheen specified) G, AE

SD-07 Certificates

Applicator's Qualifications

Qualification Testing laboratory for coatings; G, RO

Indoor Air Quality for Paints and Primers; S

Indoor Air Quality for Consolidated Latex Paints; S

SD-08 Manufacturer's Instructions

Application Instructions

Mixing

Manufacturer's Safety Data Sheets

SD-10 Operation and Maintenance Data

Coatings; G, RO

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC

approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for paints and coatings that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

3. Low-Emitting Materials - Interior paints and coatings applied on site:

a. Meet the VOC emissions evaluation and the VOC content evaluation. The paints and coatings product category include all interior paints and coatings applied on site. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

1. For CDPH version compliance information, refer to LEED interpretation #ID 10495 “LEM for v4 projects”: https://www.usgbc.org/leedaddenda/10495

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.3 CERTIFICATES

1.3.1 Indoor Air Quality

Submit required indoor air quality certifications in one submittal package.

1.3.1.1 Paints and Coatings

Provide paints and coatings applied within the building interior with VOC emissions in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method and VOC content limits of California Air Resource Board CARB 93120 2007 Suggested Control Measure (SCM) for Architectural Coatings or South Coast Air Quality Management District SCAQMD Rule 1113. Provide current product certification documentation from certification body.

1.3.2 Building Product Declarations

Provide paints and coatings with EPD and Material Ingredient Report, if available.

1.4 APPLICATOR'S QUALIFICATIONS

1.4.1 Contractor Qualification

Submit the name, address, telephone number, FAX number, and e-mail address of the Contractor that will be performing all surface preparation and coating application. Submit evidence that key personnel have successfully performed surface preparation and application of coatings on a minimum of three similar projects within the past three years. List information by individual and include the following:

a. Name of individual and proposed position for this work.

b. Information about each previous assignment including:

Position or responsibility

Employer (if other than the Contractor)

Name of facility owner

Mailing address, telephone number, and telex number (if non-US) of facility owner

Name of individual in facility owner's organization who can be contacted as a reference

Location, size and description of structure

Dates work was carried out

Description of work carried out on structure

1.5 QUALITY ASSURANCE

1.5.1 Field Samples and Tests

The Contracting Officer may choose up to two coatings that have been delivered to the site to be tested at no cost to the Government. Take samples of each chosen product as specified in the paragraph SAMPLING PROCEDURES. Test each chosen product as specified in the paragraph TESTING PROCEDURE. Remove products from the job site which do not conform, and replace with new products that conform to the referenced specification. Test replacement products that failed initial testing at no cost to the Government.

Another required testing is Batch Quality Conformance Testing to prove conformance of the manufacturer's paint to the specified MPI standard. This testing is accomplished before the materials are delivered to the job site. Provide testing for each paint products. Test paint products as specified in the paragraph "Testing Procedure".

1.5.1.1 Sampling Procedure

The Contracting Officer will select paint at random from the products that have been delivered to the job site for sample testing. The Contractor will provide one quart samples of the selected paint materials. Take samples in the presence of the Contracting Officer, and label, and identify each sample. Provide labels in accordance with the paragraph PACKAGING, LABELING, AND STORAGE of this specification.

1.5.1.2 Testing Procedure

Provide Batch Quality Conformance Testing for specified products, as defined by and performed by MPI. As an alternative to Batch Quality Conformance Testing, the Contractor may provide Qualification Testing for specified products above to the appropriate MPI product specification, using the third-party laboratory approved under the paragraph "Qualification Testing" laboratory for coatings. Include the backup data and summary of the test results within the qualification testing lab report. Provide a summary listing of all the reference specification requirements and the result of each test. Clearly indicate in the summary whether the tested paint meets each test requirement. Note that Qualification Testing may take 4 to 6 weeks to perform, due to the extent of testing required.

Submit name, address, telephone number, FAX number, and e-mail address of the independent third party laboratory selected to perform testing of coating samples for compliance with specification requirements. Submit documentation that laboratory is regularly engaged in testing of paint samples for conformance with specifications, and that employees performing testing are qualified. If MPI is chosen to perform the Batch Quality Conformance testing, the above submittal information is not required, only a letter is required from the Contractor stating that MPI will perform the testing.

1.6 REGULATORY REQUIREMENTS

1.6.1 Environmental Protection

In addition to requirements specified elsewhere for environmental protection, provide coating materials that conform to the restrictions of

the local Air Pollution Control District and regional jurisdiction. Notify Contracting Officer of any paint specified herein which fails to conform.

1.6.2 Lead Content

Do not use coatings having a lead content over 0.06 percent by weight of nonvolatile content.

1.6.3 Chromate Content

Do not use coatings containing zinc-chromate or strontium-chromate.

1.6.4 Asbestos Content

Provide asbestos-free materials.

1.6.5 Mercury Content

Provide materials free of mercury or mercury compounds.

1.6.6 Silica

Provide abrasive blast media containing no free crystalline silica.

1.6.7 Human Carcinogens

Provide materials that do not contain ACGIH 0100 confirmed human carcinogens (A1) or suspected human carcinogens (A2).

1.7 PACKAGING, LABELING, AND STORAGE

Provide paints in sealed containers that legibly show the contract specification number, designation name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name and address of manufacturer. Furnish pigmented paints in containers not larger than 5 gallons. Store paints and thinners in accordance with the manufacturer's written directions, and as a minimum, stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors, and at temperatures between 40 to 95 degrees F.

1.8 SAFETY AND HEALTH

Apply coating materials using safety methods and equipment in accordance with the following:

Comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis as specified in Section 01 35 26 GOVERNMENT SAFETY REQUIREMENTS and in Appendix A of EM 385-1-1. Include in the Activity Hazard Analysis the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.

1.8.1 Safety Methods Used During Coating Application

Comply with the requirements of SSPC PA Guide 3.

1.8.2 Toxic Materials

To protect personnel from overexposure to toxic materials, conform to the most stringent guidance of:

a. The applicable manufacturer's Safety Data Sheets (SDS) or local regulation.

b. 29 CFR 1910.1000.

c. ACGIH 0100, threshold limit values.

1.9 ENVIRONMENTAL CONDITIONS

Comply, at minimum, with manufacturer recommendations for space ventilation during and after installation. Isolate area of application from rest of building when applying high-emission paints or coatings.

1.9.1 Coatings

Do not apply coating when air or substrate conditions are:

a. Less than 5 degrees F above dew point;

b. Below 50 degrees F or over 95 degrees F, unless specifically pre-approved by the Contracting Officer and the product manufacturer. Do not, under any circumstances, violate the manufacturer's application recommendations.

1.9.2 Post-Application

Vacate space for as long as possible after application. Wait a minimum of 48 hours before occupying freshly painted rooms. Maintain one of the following ventilation conditions during the curing period, or for 72 hours after application:

a. Supply 100 percent outside air 24 hours a day.

b. Supply airflow at a rate of 6 air changes per hour, when outside temperatures are between 55 degrees F and 85 degrees F and humidity is between 30 percent and 60 percent.

c. Supply airflow at a rate of 1.5 air changes per hour, when outside air conditions are not within the range stipulated above.

1.10 SCHEDULING

Allow paint, polyurethane, varnish, and wood stain installations to cure prior to the installation of materials that adsorb VOCs.

1.11 COLOR SELECTION

Provide colors of finish coats as indicated or specified. Allow Contracting Officer to select colors not indicated or specified. Manufacturers' names and color identification are used for the purpose of color identification only. Named products are acceptable for use only if they conform to specified requirements. Products of other manufacturers are acceptable if the colors approximate colors indicated and the product

conforms to specified requirements.

Tint each coat progressively darker to enable confirmation of the number of coats.

Provide color, texture, and pattern of wall coating systems as indicated on drawings.

Submit manufacturer's samples of paint colors. Cross reference color samples to color scheme as indicated. Submit color finish codes as noted on drawings.

1.12 LOCATION AND SURFACE TYPE TO BE PAINTED

1.12.1 Painting Included

Where a space or surface is indicated to be painted, include the following unless indicated otherwise.

a. Surfaces behind portable objects and surface mounted articles readily detachable by removal of fasteners, such as screws and bolts.

b. New factory finished surfaces that require identification or color coding and factory finished surfaces that are damaged during performance of the work.

c. Existing coated surfaces that are damaged during performance of the work.

1.12.1.1 Exterior Painting

Includes new surfaces of the building and appurtenances. Also included are existing coated surfaces made bare by cleaning operations.

1.12.1.2 Interior Painting

Includes new surfaces, existing uncoated surfaces, and existing coated surfaces of the building and appurtenances as indicated and existing coated surfaces made bare by cleaning operations. Where a space or surface is indicated to be painted, include the following items, unless indicated otherwise.

a. Exposed columns, girders, beams, joists, and metal deck; and

b. Other contiguous surfaces.

1.12.2 Painting Excluded

Do not paint the following unless indicated otherwise.

a. Surfaces concealed and made inaccessible by panelboards, fixed ductwork, machinery, and equipment fixed in place.

b. Surfaces in concealed spaces. Concealed spaces are defined as enclosed spaces above suspended ceilings, furred spaces, attic spaces, crawl spaces, elevator shafts and chases.

c. Steel to be embedded in concrete.

d. Copper, stainless steel, aluminum, brass, and lead except existing coated surfaces.

e. Hardware, fittings, and other factory finished items.

f. Do not paint surfaces in the following areas: identified on drawings.

1.12.3 Mechanical and Electrical Painting

Includes field coating of interior and exterior, new and existing surfaces.

a. Where a space or surface is indicated to be painted, include the following items unless indicated otherwise.

(1) Exposed piping, conduit, and ductwork;

(2) Supports, hangers, air grilles, and registers;

(3) Miscellaneous metalwork and insulation coverings.

b. Do not paint the following, unless indicated otherwise:

(1) New zinc-coated, aluminum, and copper surfaces under insulation

(2) New aluminum jacket on piping

(3) New interior ferrous piping under insulation.

1.12.3.1 Fire Extinguishing Sprinkler Systems

Clean, pretreat, prime, and paint new fire extinguishing sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories. Apply coatings to clean, dry surfaces, using clean brushes. Clean the surfaces to remove dust, dirt, rust, and loose mill scale. Immediately after cleaning, provide the metal surfaces with one coat primer per schedules. Shield sprinkler heads with protective covering while painting is in progress. Upon completion of painting, remove protective covering from sprinkler heads. Remove sprinkler heads which have been painted and replace with new sprinkler heads. Provide primed surfaces with the following:

a. Piping in Unfinished Areas: Provide primed surfaces with one coat of red alkyd gloss enamel applied to a minimum dry film thickness of 1.0 mil in attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and spaces where walls or ceiling are not painted or not constructed of a prefinished material.

b. Piping in Finished Areas: Provide primed surfaces with two coats of paint to match adjacent surfaces, except provide valves and operating accessories with one coat of red alkyd gloss enamel applied to a minimum dry film thickness of 1.0 mil. Provide piping with 2 inch wide red enamel bands or self-adhering red plastic bands spaced at maximum of 20 foot intervals throughout the piping systems.

1.12.4 Definitions and Abbreviations

1.12.4.1 Qualification Testing

Qualification testing is the performance of all test requirements listed

in the product specification. This testing is accomplished by MPI to qualify each product for the MPI Approved Product List, and may also be accomplished by Contractor's third party testing lab if an alternative to Batch Quality Conformance Testing by MPI is desired.

1.12.4.2 Batch Quality Conformance Testing

Batch quality conformance testing determines that the product provided is the same as the product qualified to the appropriate product specification. This testing must be accomplished by an MPI testing lab.

1.12.4.3 Coating

A film or thin layer applied to a base material called a substrate. A coating may be a metal, alloy, paint, or solid/liquid suspensions on various substrates (such as metals, plastics, wood, paper, leather, cloth). They may be applied by electrolysis, vapor deposition, vacuum, or mechanical means such as brushing, spraying, calendaring, and roller coating. A coating may be applied for aesthetic or protective purposes or both. The term "coating" as used herein includes emulsions, enamels, stains, varnishes, sealers, epoxies, and other coatings, whether used as primer, intermediate, or finish coat. The terms paint and coating are used interchangeably.

1.12.4.4 DFT or dft

Dry film thickness, the film thickness of the fully cured, dry paint or coating.

1.12.4.5 DSD

Degree of Surface Degradation, the MPI system of defining degree of surface degradation. Five (5) levels are generically defined under the Assessment sections in the MPI Maintenance Repainting Manual.

1.12.4.6 EPP

Environmentally Preferred Products, a standard for determining environmental preferability in support of Executive Order 13101.

1.12.4.7 EXT

MPI short term designation for an exterior coating system.

1.12.4.8 INT

MPI short term designation for an interior coating system.

1.12.4.9 micron / microns

The metric measurement for 0.001 mm or one/one-thousandth of a millimeter.

1.12.4.10 mil / mils

The English measurement for 0.001 in or one/one-thousandth of an inch, equal to 25.4 microns or 0.0254 mm.

1.12.4.11 mm

The metric measurement for millimeter, 0.001 meter or one/one-thousandth of a meter.

1.12.4.12 MPI Gloss Levels

MPI system of defining gloss. Seven (7) gloss levels (G1 to G7) are generically defined under the Evaluation sections of the MPI Manuals. Traditionally, Flat refers to G1/G2, Eggshell refers to G3, Semigloss refers to G5, and Gloss refers to G6.

Gloss levels are defined by MPI as follows:

Gloss Level	Description	Units at 60 degrees	Units at 85 degrees
G1	Matte or Flat	0 to 5	10 max
G2	Velvet	0 to 10	10 to 35
G3	Eggshell	10 to 25	10 to 35
G4	Satin	20 to 35	35 min
G5	Semi-Gloss	35 to 70	
G6	Gloss	70 to 85	
G7	High Gloss		

Gloss is tested in accordance with ASTM D523. Historically, the Government has used Flat (G1 / G2), Eggshell (G3), Semi-Gloss (G5), and Gloss (G6).

1.12.4.13 MPI System Number

The MPI coating system number in each Division found in either the MPI Architectural Painting Specification Manual or the Maintenance Repainting Manual and defined as an exterior (EXT/REX) or interior system (INT/RIN). The Division number follows the CSI Master Format.

1.12.4.14 Paint

See Coating definition.

1.12.4.15 REX

MPI short term designation for an exterior coating system used in repainting projects or over existing coating systems.

1.12.4.16 RIN

MPI short term designation for an interior coating system used in repainting projects or over existing coating systems.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to the coating specifications and standards referenced in PART 3. Submit product manufacturer's technical data sheets for specified coatings and solvents. Provide preprinted cleaning and maintenance instructions for all coating systems.

Submit Manufacturer's Instructions on Mixing: Detailed mixing instructions, minimum and maximum application temperature and humidity, potlife, and curing and drying times between coats.

Provide certification of Indoor Air Quality for paints and primers.

Provide certification of Indoor Air Quality for consolidated latex paints.

PART 3 EXECUTION

3.1 PROTECTION OF AREAS AND SPACES NOT TO BE PAINTED

Prior to surface preparation and coating applications, remove, mask, or otherwise protect hardware, hardware accessories, machined surfaces, radiator covers, plates, lighting fixtures, public and private property, and other such items not to be coated that are in contact with surfaces to be coated. Following completion of painting, reinstall removed items by workmen skilled in the trades. Restore surfaces contaminated by coating materials, to original condition and repair damaged items.

3.2 REPUTTYING AND REGLAZING

Remove cracked, loose, and defective putty or glazing compound on glazed sash and provide new putty or glazing compound. Where defective putty or glazing compound constitutes 30 percent or more of the putty at any one light, remove the glass and putty or glazing compound and reset the glass. Remove putty or glazing compound without damaging sash or glass. Clean rabbets to bare wood or metal and prime prior to reglazing. Provide linseed oil putty for wood sash. Patch surfaces to provide smooth transition between existing and new surfaces. Finish putty or glazing compound to a neat and true bead. Allow glazing compound time to cure, in accordance with manufacturer's recommendation, prior to coating application. Allow putty to set one week prior to coating application.

3.3 RESEALING OF EXISTING EXTERIOR JOINTS

3.3.1 Surface Condition

Begin with surfaces that are clean, dry to the touch, and free from frost and moisture; remove grease, oil, wax, lacquer, paint, defective backstop, or other foreign matter that would prevent or impair adhesion. Where adequate grooves have not been provided, clean out to a depth of 1/2 inch and grind to a minimum width of 1/4 inch without damage to adjoining work. Grinding is not required on metal surfaces.

3.3.2 Backstops

In joints more than 1/2 inch deep, install glass fiber roving or neoprene, butyl, polyurethane, or polyethylene foams free of oil or other staining elements as recommended by sealant manufacturer. Provide backstop material compatible with sealant. Do not use oakum and other types of absorptive materials as backstops.

3.3.3 Primer and Bond Breaker

Install the type recommended by the sealant manufacturer.

3.3.4 Ambient Temperature

Between 38 degrees F and 95 degrees F when applying sealant.

3.3.5 Exterior Sealant

For joints in vertical surfaces, provide ASTM C920, Type S or M, Grade NS, Class 25, Use NT. For joints in horizontal surfaces, provide ASTM C920, Type S or M, Grade P, Class 25, Use T. Color(s) will be selected by the Contracting Officer. Apply the sealant in accordance with the manufacturer's printed instructions. Force sealant into joints with sufficient pressure to fill the joints solidly. Apply sealant uniformly smooth and free of wrinkles.

3.3.6 Cleaning

Immediately remove fresh sealant from adjacent areas using a solvent recommended by the sealant manufacturer. Upon completion of sealant application, remove remaining smears and stains and leave the work in a clean condition. Allow sealant time to cure, in accordance with manufacturer's recommendations, prior to coating.

3.4 SURFACE PREPARATION

Remove dirt, splinters, loose particles, grease, oil, and other foreign matter and substances deleterious to coating performance as specified for each substrate before application of paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Schedule cleaning so that dust and other contaminants will not fall on wet, newly painted surfaces. Spot-prime exposed ferrous metals such as nail heads on or in contact with surfaces to be painted with water-thinned paints, with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas.

3.4.1 Additional Requirements for Preparation of Surfaces With Existing Coatings

Before application of coatings, perform the following on surfaces covered by soundly-adhered coatings, defined as those which cannot be removed with a putty knife:

a. Test existing finishes for lead before sanding, scraping, or removing. If lead is present, refer to paragraph Toxic Materials.

b. Wipe previously painted surfaces to receive solvent-based coatings, except stucco and similarly rough surfaces clean with a clean, dry cloth saturated with mineral spirits, ASTM D235. Allow surface to dry. Wipe immediately preceding the application of the first coat of any coating, unless specified otherwise.

c. Sand existing glossy surfaces to be painted to reduce gloss. Brush, and wipe clean with a damp cloth to remove dust.

d. The requirements specified are minimum. Comply also with the application instructions of the paint manufacturer.

e. Thoroughly clean previously painted surfaces specified to be repainted and damaged during construction of all grease, dirt, dust or other foreign matter.

f. Remove blistering, cracking, flaking and peeling or otherwise deteriorated coatings.

g. Remove chalk so that when tested in accordance with ASTM D4214, the chalk resistance rating is no less than 8.

h. Roughen slick surfaces. Repair damaged areas such as, but not limited to, nail holes, cracks, chips, and spalls with suitable material to match adjacent undamaged areas.

i. Feather and sand smooth edges of chipped paint.

j. Clean rusty metal surfaces as per SSPC requirements. Use solvent, mechanical, or chemical cleaning methods to provide surfaces suitable for painting.

k. Provide new, proposed coatings that are compatible with existing coatings.

3.4.2 Existing Coated Surfaces with Minor Defects

Sand, spackle, and treat minor defects to render them smooth. Minor defects are defined as scratches, nicks, cracks, gouges, spalls, alligatoring, chalking, and irregularities due to partial peeling of previous coatings. Remove chalking by sanding or blasting so that when tested in accordance with ASTM D4214, the chalk rating is not less than 8.

3.5 PREPARATION OF METAL SURFACES

3.5.1 Existing and New Ferrous Surfaces

a. Ferrous Surfaces including Shop-coated Surfaces and Small Areas That Contain Rust, Mill Scale and Other Foreign Substances: Solvent clean or detergent wash in accordance with SSPC SP 1 to remove oil and grease. Where shop coat is missing or damaged, clean according to SSPC SP 2, SSPC SP 3, SSPC SP 6/NACE No.3, or SSPC SP 10/NACE No. 2. Brush-off blast remaining surface in accordance with SSPC 7/NACE No.4. Protect shop-coated ferrous surfaces from corrosion by treating and touching up corroded areas immediately upon detection.

b. Surfaces With More Than 20 Percent Rust, Mill Scale, and Other Foreign Substances: Clean entire surface in accordance with SSPC SP 6/NACE No.3/SSPC SP 12/NACE No.5 WJ-3 or SSPC SP 10/NACE No. 2/ SSPC SP 12/NACE No.5 WJ-2.

3.5.2 Final Ferrous Surface Condition:

For tool cleaned surfaces, the requirements are stated in SSPC SP 2 and SSPC SP 3. Use as a visual reference, photographs in SSPC VIS 3 for the appearance of cleaned surfaces.

For abrasive blast cleaned surfaces, the requirements are stated in SSPC 7/NACE No.4, SSPC SP 6/NACE No.3, and SSPC SP 10/NACE No. 2. Use as a visual reference, photographs in SSPC VIS 1 for the appearance of cleaned surfaces.

For waterjet cleaned surfaces, the requirements are stated in SSPC SP 12/NACE No.5. Use as a visual reference, photographs in SSPC VIS 4/NACE VIS 7 for the appearance of cleaned surfaces.

3.5.3 Galvanized Surfaces

a. New or Existing Galvanized Surfaces With Only Dirt and Zinc Oxidation Products: Clean with solvent, steam, or non-alkaline detergent solution in accordance with SSPC SP 1. Completely remove coating by brush-off abrasive blast if the galvanized metal has been passivated or stabilized. Do not "passivate" or "stabilize" new galvanized steel to be coated. If the absence of hexavalent stain inhibitors is not documented, test as described in ASTM D6386, Appendix X2, and remove by one of the methods described therein.

b. Galvanized with Slight Coating Deterioration or with Little or No Rusting: Water jetting to SSPC SP 12/NACE No.5 WJ3 to remove loose coating from surfaces with less than 20 percent coating deterioration and no blistering, peeling, or cracking. Use inhibitor as recommended by the coating manufacturer to prevent rusting.

c. Galvanized With Severe Deteriorated Coating or Severe Rusting: Spot abrasive blast rusted areas as described for steel in SSPC SP 6/NACE No.3, and waterjet to SSPC SP 12/NACE No.5, WJ3 to remove existing coating.

3.5.4 Non-Ferrous Metallic Surfaces

Aluminum and aluminum-alloy, lead, copper, and other nonferrous metal surfaces.

Surface Cleaning: Solvent clean in accordance with SSPC SP 1 and wash with mild non-alkaline detergent to remove dirt and water soluble contaminants.

3.5.5 Terne-Coated Metal Surfaces

Solvent clean surfaces with mineral spirits, ASTM D235. Wipe dry with clean, dry cloths.

3.5.6 Existing Surfaces with a Bituminous or Mastic-Type Coating

Remove chalk, mildew, and other loose material by washing with a solution of 1/2 cup trisodium phosphate, 1/4 cup household detergent, one quart 5 percent sodium hypochlorite solution, and 3 quarts of warm water.

3.6 PREPARATION OF CONCRETE AND CEMENTITIOUS SURFACE

3.6.1 Concrete and Masonry

a. Curing: Allow concrete, stucco and masonry surfaces to cure at least 30 days before painting, and concrete slab on grade to cure at least 90 days before painting.

b. Surface Cleaning: Remove the following deleterious substances.

(1) Dirt, Chalking, Grease, and Oil: Wash new and existing uncoated surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, and 1 gallon of warm water. Then rinse thoroughly with fresh water. Wash existing coated surfaces with a suitable detergent and rinse thoroughly. For large areas, water blasting may be used.

(2) Fungus and Mold: Wash new, existing coated, and existing uncoated surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, one quart 5 percent sodium hypochlorite solution, and 3 quarts of warm water. Rinse thoroughly with fresh water.

(3) Paint and Loose Particles: Remove by wire brushing.

(4) Efflorescence: Remove by scraping or wire brushing followed by washing with a 5 to 10 percent by weight aqueous solution of hydrochloric (muriatic) acid. Do not allow acid to remain on the surface for more than five minutes before rinsing with fresh water. Do not acid clean more than 4 square feet of surface, per workman, at one time.

(5) Removal of Existing Coatings: For surfaces to receive textured coating MPI 42, remove existing coatings including soundly adhered coatings if recommended by textured coating manufacturer.

c. Cosmetic Repair of Minor Defects: Repair or fill mortar joints and minor defects, including but not limited to spalls, in accordance with manufacturer's recommendations and prior to coating application.

d. Allowable Moisture Content: Latex coatings may be applied to damp surfaces, but not to surfaces with droplets of water. Do not apply epoxies to damp vertical surfaces as determined by ASTM D4263 or horizontal surfaces that exceed 3 lbs of moisture per 1000 square feet in 24 hours as determined by ASTM F1869. In all cases follow manufacturers recommendations. Allow surfaces to cure a minimum of 30 days before painting.

3.6.2 Gypsum Board, Plaster, and Stucco

a. Surface Cleaning: Verify that plaster and stucco surfaces are free from loose matter and that gypsum board is dry. Remove loose dirt and dust by brushing with a soft brush, rubbing with a dry cloth, or vacuum-cleaning prior to application of the first coat material. A damp cloth or sponge may be used if paint will be water-based.

b. Repair of Minor Defects: Prior to painting, repair joints, cracks, holes, surface irregularities, and other minor defects with patching plaster or spackling compound and sand smooth.

c. Allowable Moisture Content: Latex coatings may be applied to damp surfaces, but not surfaces with droplets of water. Do not apply epoxies to damp surfaces as determined by ASTM D4263. Verify that new plaster to be coated has a maximum moisture content of 8 percent, when measured in accordance with ASTM D4444, Method A, unless otherwise authorized. In addition to moisture content requirements, allow new plaster to age a minimum of 30 days before preparation for painting.

3.7 PREPARATION OF WOOD AND PLYWOOD SURFACES

3.7.1 New, Existing Uncoated, and Existing Coated Plywood and Wood Surfaces, Except Floors:

a. Clean wood surfaces of foreign matter.

Surface Cleaning: Verify that surfaces are free from dust and other deleterious substances and in a condition approved by the Contracting Officer prior to receiving paint or other finish. Do not use water to clean uncoated wood. Scrape to remove loose coatings. Lightly sand to roughen the entire area of previously enamel-coated wood surfaces.

b. Removal of Fungus and Mold: Wash existing coated surfaces with a solution composed of 3 ounces trisodium phosphate, one ounce household detergent, one quart 5 percent sodium hypochlorite solution, and 3 quarts of warm water. Rinse thoroughly with fresh water.

c. Do not exceed 12 percent moisture content of the wood as measured by a moisture meter in accordance with ASTM D4444, Method A, unless otherwise authorized.

d. Prime or touch up wood surfaces adjacent to surfaces to receive water-thinned paints before applying water-thinned paints.

e. Cracks and Nailheads: Set and putty stop nailheads and putty cracks after the prime coat has dried.

f. Cosmetic Repair of Minor Defects:

(1) Knots and Resinous Wood and Fire, Smoke, Water, and Color Marker Stained Existing Coated Surface: Prior to application of coating, cover knots and stains with two or more coats of 3-pound-cut shellac varnish, plasticized with 5 ounces of castor oil per gallon. Scrape away existing coatings from knotty areas, and sand before treating. Prime before applying any putty over shellacked area.

(2) Open Joints and Other Openings: Fill with whiting putty, linseed oil putty. Sand smooth after putty has dried.

(3) Checking: Where checking of the wood is present, sand the surface, wipe and apply a coat of pigmented orange shellac. Allow to dry before paint is applied.

g. Prime Coat For New Exterior Surfaces: Prime coat before wood becomes dirty, warped, or weathered.

3.7.2 Interior Wood Surfaces, Stain Finish

Sand interior wood surfaces to receive stain. Fill oak and other open-grain wood to receive stain with a coat of wood filler not less than 8 hours before the application of stain; remove excess filler and sand the surface smooth.

3.7.3 Water Blasting of Existing Coated Wood Surfaces:

Provide water blasting for the following surfaces:

a. Sample Panel: Prior to the initial surface cleaning, water blast a representative surface designated by the Contracting Officer. Provide surface cleaning of the remaining work to match the sample panel approved by the Contracting Officer.

b. Initial Surface Cleaning: Water blast surfaces to receive paint with a high pressure spray, to remove loose paint, dirt, and other foreign or deleterious materials. Provide working pressure between 400 and

700 pounds per square inch gage (psig) at a nozzle operating rate of a minimum 20 gallons per minute (g/min.). Do not flood vents or damage windows and floors. If the pressure specified will cause damage to existing wood, advise the Contracting Officer and obtain permission to vary the pressure. Direct the wash nozzle at the surface at an angle of approximately 75 degrees with the surface and at a distance not greater than 5 feet to apply water pressure required to remove loose paint, dirt, chalking, and other foreign matter.

c. Final Surface Cleaning: After allowing the surfaces to dry for a minimum of 24 hours, remove remaining dirt, splinters, loose particles, disintegrated and loose paint, grease, oil, and other foreign matter from the surface.

3.8 APPLICATION

3.8.1 Coating Application

Comply with applicable federal, state and local laws enacted to insure compliance with Federal Clean Air Standards. Apply coating materials in accordance with SSPC PA 1. SSPC PA 1 methods are applicable to all substrates, except as modified herein.

At the time of application, paint must show no signs of deterioration. Maintain uniform suspension of pigments during application.

Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. Use trigger operated spray nozzles for water hoses. Use rollers for applying paints and enamels of a type designed for the coating to be applied and the surface to be coated. Wear protective clothing and respirators when applying oil-based paints or using spray equipment with any paints.

Only apply paints, except water-thinned types to surfaces that are completely free of moisture as determined by sight or touch.

Thoroughly work coating materials into joints, crevices, and open spaces. Pay special attention to ensure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces.

Apply each coat of paint so that dry film is of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Completely hide all blemishes.

Touch up damaged coatings before applying subsequent coats. Broom clean and clear dust from interior areas before and during the application of coating material.

Apply paint to new fire extinguishing sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metal work, and accessories. Shield sprinkler heads with protective coverings while painting is in progress. Remove sprinkler heads which have been painted and replace with new sprinkler heads. For piping in unfinished spaces, provide primed surfaces with one coat of red alkyd gloss enamel to a minimum dry film thickness of 1.0 mil. Unfinished spaces include attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and space where walls or ceiling are not

painted or not constructed of a prefinished material. For piping in finished areas, provide prime surfaces with two coats of paint to match adjacent surfaces, except provide valves and operating accessories with one coat of red alkyd gloss enamel. Upon completion of painting, remove protective covering from sprinkler heads.

a. Drying Time: Allow time between coats, as recommended by the coating manufacturer, to permit thorough drying, but not to present topcoat adhesion problems. Provide each coat in specified condition to receive next coat.

b. Primers, and Intermediate Coats: Do not allow primers or intermediate coats to dry more than 30 days, or longer than recommended by manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if primers or intermediate coats are allowed to dry longer than recommended by manufacturers of subsequent coatings. Cover each preceding coat or surface completely by ensuring visually perceptible difference in shades of successive coats.

c. Finished Surfaces: Provide finished surfaces free from runs, drops, ridges, waves, laps, brush marks, and variations in colors.

d. Thermosetting Paints: Topcoats over thermosetting paints (epoxies and urethanes) should be applied within the overcoating window recommended by the manufacturer.

3.8.2 Mixing and Thinning of Paints

Reduce paints to proper consistency by adding fresh paint, except when thinning is mandatory to suit surface, temperature, weather conditions, application methods, or for the type of paint being used. Obtain written permission from the Contracting Officer to use thinners. Verify that the written permission includes quantities and types of thinners to use.

When thinning is allowed, thin paints immediately prior to application with not more than 1 pint of suitable thinner per gallon. The use of thinner does not relieve the Contractor from obtaining complete hiding, full film thickness, or required gloss. Thinning cannot cause the paint to exceed limits on volatile organic compounds. Do not mix paints of different manufacturers.

3.8.3 Two-Component Systems

Mix two-component systems in accordance with manufacturer's instructions. Follow recommendation by the manufacturer for any thinning of the first coat to ensure proper penetration and sealing for each type of substrate.

3.8.4 Coating Systems

a. Systems by Substrates: Apply coatings that conform to the respective specifications listed in the following Tables:

Table

Division 3. Exterior Concrete Paint Table
Division 4. Exterior Concrete Masonry Units Paint Table
Division 5. Exterior Metal, Ferrous and Non-Ferrous Paint Table
Division 6. Exterior Wood; Dressed Lumber, Paneling, Decking,

Table
Shingles Paint Table
Division 9: Exterior Stucco Paint Table
Division 10. Exterior Cloth Coverings and Bituminous Coated Surfaces Paint Table

Division 3. Interior Concrete Paint Table
Division 4. Interior Concrete Masonry Units Paint Table
Division 5. Interior Metal, Ferrous and Non-Ferrous Paint Table
Division 6. Interior Wood Paint Table
Division 9: Interior Plaster, Gypsum Board, Textured Surfaces Paint Table

b. Minimum Dry Film Thickness (DFT): Apply paints, primers, varnishes, enamels, undercoats, and other coatings to a minimum dry film thickness of 1.5 mil each coat unless specified otherwise in the Tables. Coating thickness where specified, refers to the minimum dry film thickness.

c. Coatings for Surfaces Not Specified Otherwise: Coat surfaces which have not been specified, the same as surfaces having similar conditions of exposure.

d. Existing Surfaces Damaged During Performance of the Work, Including New Patches In Existing Surfaces: Coat surfaces with the following:

(1) One coat of primer.

(2) One coat of undercoat or intermediate coat.

(3) One topcoat to match adjacent surfaces.

e. Existing Coated Surfaces To Be Painted: Apply coatings conforming to the respective specifications listed in the Tables herein, except that pretreatments, sealers and fillers need not be provided on surfaces where existing coatings are soundly adhered and in good condition. Do not omit undercoats or primers.

3.9 COATING SYSTEMS FOR METAL

Apply coatings of Tables in Division 5 for Exterior and Interior.

a. Apply specified ferrous metal primer on the same day that surface is cleaned, to surfaces that meet all specified surface preparation requirements at time of application.

b. Inaccessible Surfaces: Prior to erection, use one coat of specified primer on metal surfaces that will be inaccessible after erection.

c. Shop-primed Surfaces: Touch up exposed substrates and damaged coatings to protect from rusting prior to applying field primer.

d. Surface Previously Coated with Epoxy or Urethane: Apply MPI 101, 1.5 mils DFT immediately prior to application of epoxy or urethane coatings.

e. Pipes and Tubing: The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat. Overcoat these items with the specified ferrous-metal primer prior to

application of finish coats.

f. Exposed Nails, Screws, Fasteners, and Miscellaneous Ferrous Surfaces. On surfaces to be coated with water thinned coatings, spot prime exposed nails and other ferrous metal with latex primer MPI 107.

3.10 COATING SYSTEMS FOR CONCRETE AND CEMENTITIOUS SUBSTRATES

Apply coatings of Tables in Division 3, 4 and 9 for Exterior and Interior.

3.11 COATING SYSTEMS FOR WOOD AND PLYWOOD

a. Apply coatings of Tables in Division 6 for Exterior and Interior.

b. Prior to erection, apply two coats of specified primer to treat and prime wood and plywood surfaces which will be inaccessible after erection.

c. Apply stains in accordance with manufacturer's printed instructions.

3.12 PIPING IDENTIFICATION

Piping Identification, Including Surfaces In Concealed Spaces: Provide in accordance with MIL-STD-101. Place stenciling in clearly visible locations. On piping not covered by MIL-STD-101, stencil approved names or code letters, in letters a minimum of 1/2 inch high for piping and a minimum of 2 inches high elsewhere. Stencil arrow-shaped markings on piping to indicate direction of flow using black stencil paint.

3.13 INSPECTION AND ACCEPTANCE

In addition to meeting previously specified requirements, demonstrate mobility of moving components, including swinging and sliding doors, cabinets, and windows with operable sash, for inspection by the Contracting Officer. Perform this demonstration after appropriate curing and drying times of coatings have elapsed and prior to invoicing for final payment.

3.14 WASTE MANAGEMENT

As specified in the Waste Management Plan and as follows. Do not use kerosene or any such organic solvents to clean up water based paints. Properly dispose of paints or solvents in designated containers. Close and seal partially used containers of paint to maintain quality as necessary for reuse. Store in protected, well-ventilated, fire-safe area at moderate temperature. Place materials defined as hazardous or toxic waste in designated containers. Coordinate with manufacturer for take-back program. Set aside scrap to be returned to manufacturer for recycling into new product. When such a service is not available, contact local recyclers to reclaim the materials. Set aside extra paint for future color matches or reuse by the Government. Where local options exist for leftover paint recycling, collect all waste paint by type and provide for delivery to recycling or collection facility for reuse by local organizations.

3.15 PAINT TABLES

All DFT's are minimum values. Use only materials with a GPS green check mark having a minimum MPI "Environmentally Friendly" E2 rating based on

VOC (EPA Method 24) content levels. Acceptable products are listed in the MPI Green Approved Products List, available at http://www.specifygreen.com/APL/ProductIdxByMPInum.asp.

3.15.1 Exterior Paint Tables

DIVISION 3: EXTERIOR CONCRETE PAINT TABLE

A. New and uncoated existing, previously painted concrete; vertical surfaces, including undersides of balconies and soffits but excluding tops of slabs:

1. Latex
   New; MPI EXT 3.1A-G2 (Flat) / Existing; MPI REX 3.1A-G2 (Flat)
   Primer: Intermediate: Topcoat:
   MPI 10 MPI 10 MPI 10
   System DFT: 3.5 mils

   New; MPI EXT 3.1A-G5 (Semigloss) / Existing; MPI EXT 3.1A-G5 (Semigloss)
   Primer: Intermediate: Topcoat:
   MPI 11 MPI 11 MPI 11
   System DFT: 3.5 mils

   New; MPI EXT 3.1A-G6 (Gloss) / Existing; MPI REX 3.1A-G6 (Gloss)
   Primer: Intermediate: Topcoat:
   MPI 119 MPI 119 MPI 119
   System DFT: 3.5 mils

Primer as recommended by manufacturer. Topcoat: Coating to match adjacent surfaces.

DIVISION 4: EXTERIOR CONCRETE MASONRY UNITS PAINT TABLE

A. New and Existing concrete masonry on uncoated surface:

1. Latex
   New; MPI EXT 4.2A-G1 (Flat) / Existing; MPI REX 4.2A-G1 (Flat)
   Block Filler: Primer: Intermediate: Topcoat:
   MPI 4 N/A MPI 10 MPI 10
   System DFT: 11 mils

   New; MPI EXT 4.2A-G5 (Semigloss) / Existing; MPI REX 4.2A-G5 (Semigloss)
   Block Filler: Primer: Intermediate: Topcoat:
   MPI 4 N/A MPI 11 MPI 11
   System DFT: 11 mils

   New; MPI EXT 4.2A-G6 (Gloss) / Existing; MPI REX 4.2A-G6 (Gloss)
   Block Filler: Primer: Intermediate: Topcoat:
   MPI 4 N/A MPI 119 MPI 119
   System DFT: 11 mils

   Topcoat: Coating to match adjacent surfaces.

DIVISION 5: EXTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE

STEEL / FERROUS SURFACES

STEEL / FERROUS SURFACES

A. New Steel that has been hand or power tool cleaned to SSPC SP 2 or SSPC SP 3

1. Alkyd
New; MPI EXT 5.1Q-G5 (Semigloss) Existing; MPI REX 5.1D-G5
Primer: Intermediate: Topcoat:
MPI 23 MPI 94 MPI 94
System DFT: 5.25 mils

New; MPI EXT 5.1Q-G6 (Gloss) / Existing; MPI REX 5.1D-G6
Primer: Intermediate: Topcoat:
MPI 23 MPI 9 MPI 9
System DFT: 5.25 mils

B. New Steel that has been blast-cleaned to SSPC SP 6/NACE No.3:

2. Alkyd
New; MPI EXT 5.1D-G5 (Semigloss) / Existing; MPI REX 5.1D-G5
Primer: Intermediate: Topcoat:
MPI 79 MPI 94 MPI 94
System DFT: 5.25 mils
New; MPI EXT 5.1D-G6 (Gloss) / Existing; MPI REX 5.1D-G6
Primer: Intermediate: Topcoat:
MPI 79 MPI 9 MPI 9
System DFT: 5.25 mils

C. Existing steel that has been spot-blasted to SSPC SP 6/NACE No.3:

1. Surface previously coated with alkyd or latex:

Waterborne Light Industrial Coating
MPI REX 5.1C-G5 (Semigloss)
Spot Primer: Intermediate: Topcoat:
MPI 79 MPI 163 MPI 163
System DFT: 5 mils

MPI REX 5.1C-G6 (Gloss)
Spot Primer: Intermediate: Topcoat:
MPI 79 MPI 164 MPI 164
System DFT: 5 mils

2. Surface previously coated with epoxy:

Waterborne Light Industrial
a. MPI REX 5.1L-G5 (Semigloss)
Spot Primer: Intermediate: Topcoat:
MPI 101 MPI 163 MPI 163
System DFT: 5 mils

MPI REX 5.1L-G6 (Gloss)
Spot Primer: Intermediate: Topcoat:
MPI 101 MPI 164 MPI 164
System DFT: 5 mils

D. New and existing steel blast cleaned to SSPC SP 10/NACE No. 2:

1. Waterborne Light Industrial

STEEL / FERROUS SURFACES

MPI EXT 5.1R-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 101	MPI 108	MPI 163

System DFT: 8.5 mils

MPI EXT 5.1R-G6 (Gloss)

Primer:	Intermediate:	Topcoat:
MPI 101	MPI 108	MPI 164

System DFT: 8.5 mils

EXTERIOR GALVANIZED SURFACES

F. New Galvanized surfaces:

1. Waterborne Primer / Waterborne Light Industrial Coating

MPI EXT 5.3J-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 134	MPI 163	MPI 163

System DFT: 4.5 mils

G. Galvanized surfaces with slight coating deterioration; little and not rusting or located in corrosive waterfront facilities or environments:

1. Waterborne Light Industrial Coating

MPI REX 5.3J-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 134	N/A	MPI 163

System DFT: 4.5 mils

H. Galvanized surfaces with severely deteriorated coating or rusting or located in corrosive waterfront facilities or environments:

1. Waterborne Light Industrial Coating

MPI REX 5.3L-G5(Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 101	MPI 108	MPI 163

System DFT: 8.5 mils

EXTERIOR SURFACES, OTHER METALS (NON-FERROUS)

I. Aluminum, aluminum alloy and other miscellaneous non-ferrous metal items not otherwise specified except hot metal surfaces, roof surfaces, and new prefinished equipment. Match surrounding finish:

1. Alkyd

MPI EXT 5.4F-G1 (Flat)

Primer:	Intermediate:	Topcoat:
MPI 95	MPI 8	MPI 8

System DFT: 5 mils

MPI EXT 5.4F-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 95	MPI 94	MPI 94

System DFT: 5 mils

EXTERIOR SURFACES, OTHER METALS (NON-FERROUS)
MPI EXT 5.4F-G6 (Gloss)
Primer: Intermediate: Topcoat:
MPI 95 MPI 9 MPI 9
System DFT: 5 mils

J. Surfaces adjacent to painted surfaces; Mechanical, Electrical, Fire extinguishing sprinkler systems including valves, conduit, hangers, supports, exposed copper piping, and miscellaneous metal items not otherwise specified except floors, hot metal surfaces, and new prefinished equipment. Match surrounding finish:

1. Waterborne Light Industrial Coating
MPI EXT 5.1C-G3(Eggshell)
Primer: Intermediate: Topcoat:
MPI 79 MPI 161 MPI 161
System DFT: 5 mils

MPI EXT 5.1C-G5(Semigloss)
Primer: Intermediate: Topcoat:
MPI 79 MPI 163 MPI 163
System DFT: 5 mils

MPI EXT 5.1C-G6(Gloss)
Primer: Intermediate: Topcoat:
MPI 79 MPI 164 MPI 164
System DFT: 5 mils

K. Hot metal surfaces including smokestacks subject to temperatures up to 400 degrees F:

1. Heat Resistant Enamel
MPI EXT 5.2A
Primer: Intermediate: Topcoat:
MPI 21 Surface preparation and number of coats per manufacturer's instructions.
System DFT: Per Manufacturer

DIVISION 6: EXTERIOR WOOD; DRESSED LUMBER, PANELING, DECKING, SHINGLES PAINT TABLE

A. New and Existing, uncoated Dressed lumber, Wood and plywood, trim, including top, bottom and edges of doors not otherwise specified:

1. Latex
MPI EXT 6.3A-G1 (Flat)
Primer: Intermediate: Topcoat:
MPI 6 MPI 10 MPI 10
System DFT: 5 mils

MPI EXT 6.3A-G5 (Semigloss)
Primer: Intermediate: Topcoat:
MPI 6 MPI 11 MPI 11
System DFT: 5 mils

DIVISION 6: EXTERIOR WOOD; DRESSED LUMBER, PANELING, DECKING, SHINGLES PAINT TABLE

MPI EXT 6.3A-G6 (Gloss)

Primer:	Intermediate:	Topcoat:
MPI 6	MPI 119	MPI 119

System DFT: 5 mils

B. Existing, dressed lumber, Wood and plywood, trim, including top, bottom and edges of doors previously coated with an alkyd / oil based finish coat not otherwise specified:

1. Latex

MPI REX 6.3A-G1 (Flat)

Primer:	Intermediate:	Topcoat:
MPI 5	MPI 10	MPI 10

System DFT: 5 mils

MPI REX 6.3A-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 5	MPI 11	MPI 11

System DFT: 5 mils

MPI REX 6.3A-G6 (Gloss)

Primer:	Intermediate:	Topcoat:
MPI 5	MPI 119	MPI 119

System DFT: 5 mils

C. Existing, dressed lumber, Wood and plywood, trim, including top, bottom and edges of doors previously coated with a latex / waterborne finish coat not otherwise specified:

1. Latex

MPI REX 6.3L-G1 (Flat)

Spot Primer:	Intermediate:	Topcoat:
MPI 6	MPI 10	MPI 10

System DFT: 4.5 mils

MPI REX 6.3L-G5 (Semigloss)

Spot Primer:	Intermediate:	Topcoat:
MPI 6	MPI 11	MPI 11

System DFT: 4.5 mils

MPI REX 6.3L-G6 (Gloss)

Spot Primer:	Intermediate:	Topcoat:
MPI 6	MPI 119	MPI 119

System DFT: 4.5 mils

3.15.2 Interior Paint Tables

DIVISION 3: INTERIOR CONCRETE PAINT TABLE

A. New and uncoated existing and Existing, previously painted Concrete, vertical surfaces, not specified otherwise:

DIVISION 3: INTERIOR CONCRETE PAINT TABLE

1. High Performance Architectural Latex

New; MPI INT 3.1C-G2 (Flat) / Existing; MPI RIN 3.1J-G2 (Flat)

Primer:	Intermediate:	Topcoat:
MPI 50	MPI 138	MPI 138

System DFT: 4 mils

New; MPI INT 3.1C-G3 (Eggshell) / Existing; MPI RIN 3.1J-G3 (Eggshell)

Primer:	Intermediate:	Topcoat:
MPI 50	MPI 139	MPI 139

System DFT: 4 mils

New; MPI INT 3.1C-G4 (satin)/ Existing; MPI RIN 3.1J-G4

Primer:	Intermediate:	Topcoat:
MPI 50	MPI 140	MPI 140

System DFT: 4 mils

New; MPI INT 3.1C-G5 (Semigloss) / Existing; MPI RIN 3.1J-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 50	MPI 141	MPI 141

System DFT: 4 mils

B. New and uncoated existing and Existing, previously painted Concrete in areas requiring a high degree of sanitation, and other high-humidity areas not otherwise specified except floors:

1. Waterborne Light Industrial Coating

New; MPI INT 3.1L-G3(Eggshell) / Existing; MPI RIN 3.1C-G3(Eggshell)

Primer:	Intermediate:	Topcoat:
MPI 151	MPI 151	MPI 151

System DFT: 4.8 mils

New; MPI INT 3.1L-G5(Semigloss) / Existing; MPI RIN 3.1C-G5(Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 153	MPI 153	MPI 153

System DFT: 4.8 mils

DIVISION 4: INTERIOR CONCRETE MASONRY UNITS PAINT TABLE

A. New and uncoated Existing Concrete masonry:

1. High Performance Architectural Latex

MPI INT 4.2D-G2 (Flat)

Filler	Primer:	Intermediate:	Topcoat:
MPI 4	N/A	MPI 138	MPI 138

System DFT: 11 mils

MPI INT 4.2D-G3 (Eggshell)

Filler	Primer:	Intermediate:	Topcoat:
MPI 4	N/A	MPI 139	MPI 139

System DFT: 11 mils

MPI INT 4.2D-G4 (Satin)

Filler	Primer:	Intermediate:	Topcoat:
MPI 4	N/A	MPI 140	MPI 140

System DFT: 11 mils

MPI INT 4.2D-G5 (Semigloss)

DIVISION 4: INTERIOR CONCRETE MASONRY UNITS PAINT TABLE

Filler	Primer:	Intermediate:	Topcoat:
MPI 4	N/A	MPI 141	MPI 141

System DFT: 11 mils

Fill all holes in masonry surface

B. Existing, previously painted Concrete masonry:

1. High Performance Architectural Latex

MPI RIN 4.2K-G2 (Flat)

Spot Primer:	Intermediate:	Topcoat:
MPI 50	MPI 138	MPI 138

System DFT: 4.5 mils

MPI RIN 4.2K-G3 (Eggshell)

Spot Primer:	Intermediate:	Topcoat:
MPI 50	MPI 139	MPI 139

System DFT: 4.5 mils

MPI RIN 4.2K-G4

Spot Primer:	Intermediate:	Topcoat:
MPI 50	MPI 140	MPI 140

System DFT: 4.5 mils

MPI RIN 4.2K-G5 (Semigloss)

Spot Primer:	Intermediate:	Topcoat:
MPI 50	MPI 141	MPI 141

System DFT: 4.5 mils

C. New and uncoated Existing Concrete masonry units in toilets, food-preparation, food-serving, restrooms, laundry areas, shower areas, areas requiring a high degree of sanitation, and other high humidity areas unless otherwise specified:

1. Waterborne Light Industrial Coating

MPI INT 4.2K-G3(Eggshell)

Filler:	Primer:	Intermediate:	Topcoat:
MPI 4	N/A	MPI 151	MPI 151

System DFT: 11 mils

MPI INT 4.2K-G5(Semigloss)

Filler:	Primer:	Intermediate:	Topcoat:
MPI 4	N/A	MPI 153	MPI 153

System DFT: 11 mils

MPI INT 4.2K-G6(Gloss)

Filler:	Primer:	Intermediate:	Topcoat:
MPI 4	N/A	MPI 154	MPI 154

System DFT: 11 mils

Fill all holes in masonry surface

D. Existing, previously painted, concrete masonry units in toilets, food-preparation, food-serving, restrooms, laundry areas, shower areas, areas requiring a high degree of sanitation, and other high humidity areas unless otherwise specified:

1. Waterborne Light Industrial Coating

DIVISION 4: INTERIOR CONCRETE MASONRY UNITS PAINT TABLE

MPI RIN 4.2G-G3(Eggshell)

Spot Primer:	Intermediate:	Topcoat:
MPI 151	MPI 151	MPI 151

System DFT: 4.5 mils

MPI RIN 4.2G-G5(Semigloss)

Spot Primer:	Intermediate:	Topcoat:
MPI 153	MPI 153	MPI 153

System DFT: 4.5 mils

MPI RIN 4.2G-G6(Gloss)

Spot Primer:	Intermediate:	Topcoat:
MPI 154	MPI 154	MPI 154

System DFT: 4.5 mils

DIVISION 5: INTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE

INTERIOR STEEL / FERROUS SURFACES

A. Metal, Mechanical, Electrical, Fire extinguishing sprinkler systems including valves, conduit, hangers, supports, Surfaces adjacent to painted surfaces (Match surrounding finish), exposed copper piping, and miscellaneous metal items not otherwise specified except floors, hot metal surfaces, and new prefinished equipment:

1. High Performance Architectural Latex

MPI INT 5.1R-G2 (Flat)

Primer:	Intermediate:	Topcoat:
MPI 79	MPI 138	MPI 138

System DFT: 5 mils

MPI INT 5.1R-G3 (Eggshell)

Primer:	Intermediate:	Topcoat:
MPI 79	MPI 139	MPI 139

System DFT: 5 mils

MPI INT 5.1R-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 79	MPI 141	MPI 141

System DFT: 5 mils

B. Metal floors (non-shop-primed surfaces or non-slip deck surfaces) with non-skid additive (NSA), load at manufacturer's recommendations.:

1. Alkyd Floor Paint

MPI INT 5.1U-G6 (Gloss)

Primer:	Intermediate:	Topcoat:
MPI 79	MPI 27	MPI 27 (plus NSA)

System DFT: 5.25 mils

C. Metal in high-humidity areas not otherwise specified except floors, hot metal surfaces, and new prefinished equipment:

1. Alkyd

MPI INT 5.1E-G3 (Eggshell)

Primer:	Intermediate:	Topcoat:
MPI 79	MPI 51	MPI 51

INTERIOR STEEL / FERROUS SURFACES
System DFT: 5.25 mils

MPI INT 5.1E-G5 (Semigloss)
Primer: Intermediate: Topcoat:
MPI 79 MPI 47 MPI 47
System DFT: 5.25 mils

MPI INT 5.1E-G6 (Gloss)
Primer: Intermediate: Topcoat:
MPI 79 MPI 48 MPI 48
System DFT: 5.25 mils

D. Miscellaneous non-ferrous metal items not otherwise specified except floors, hot metal surfaces, and new prefinished equipment. Match surrounding finish:

1. High Performance Architectural Latex
MPI INT 5.4F-G2 (Flat)
Primer: Intermediate: Topcoat:
MPI 95 MPI 138 MPI 138
System DFT: 5 mils

MPI INT 5.4F-G3 (Eggshell)
Primer: Intermediate: Topcoat:
MPI 95 MPI 139 MPI 139
System DFT: 5 mils

MPI INT 5.4F-G4 (Satin)
Primer: Intermediate: Topcoat:
MPI 95 MPI 140 MPI 140
System DFT: 5 mils

MPI INT 5.4F-G5 (Semigloss)
Primer: Intermediate: Topcoat:
MPI 95 MPI 141 MPI 141
System DFT: 5 mils

E. Hot metal surfaces including smokestacks subject to temperatures up to 400 degrees F:

1. Heat Resistant Enamel
MPI INT 5.2A
Primer: Intermediate: Topcoat:
MPI 21 Surface preparation and number of coats per manufacturer's instructions.
System DFT: Per Manufacturer

F. Ferrous metal subject to high temperature, up to 750 degrees F:

1. Inorganic Zinc Rich Coating
MPI INT 5.2C
Primer: Intermediate: Topcoat:
MPI 19 Surface preparation and number of coats per manufacturer's instructions.
System DFT: Per Manufacturer

INTERIOR STEEL / FERROUS SURFACES
2. Heat Resistant Aluminum Paint
MPI INT 5.2B (Aluminum Finish)
Primer: Intermediate: Topcoat:
MPI 2 Surface preparation and number of coats per manufacturer's instructions.
System DFT: Per Manufacturer

G. New surfaces and Existing surfaces made bare cleaning to SSPC SP 10/NACE No. 2
subject to temperatures up to 593 degrees C (1100 degrees F):

1. High Heat Resistant Coating
MPI INT 5.2D
Primer: Intermediate: Topcoat:
MPI 22 Surface preparation and number of coats per manufacturer's instructions.
System DFT: Per Manufacturer

DIVISION 6: INTERIOR WOOD PAINT TABLE

A. New and Existing, uncoated Wood and plywood not otherwise specified:

1. High Performance Architectural Latex
MPI INT 6.4S-G3 (Eggshell)
Primer: Intermediate: Topcoat:
MPI 39 MPI 139 MPI 139
System DFT: 4.5 mils

MPI INT 6.4S-G4 (Satin)
Primer: Intermediate: Topcoat:
MPI 39 MPI 140 MPI 140
System DFT: 4.5 mils

MPI INT 6.4S-G5 (Semigloss)
Primer: Intermediate: Topcoat:
MPI 39 MPI 141 MPI 141
System DFT: 4.5 mils

B. Existing, previously painted Wood and plywood not otherwise specified:

1. High Performance Architectural Latex
MPI RIN 6.4B-G3 (Eggshell)
Primer: Intermediate: Topcoat:
MPI 46 MPI 139 MPI 139
System DFT: 4.5 mils

MPI RIN 6.4B-G4 (Satin)
Primer: Intermediate: Topcoat:
MPI 46 MPI 140 MPI 140
System DFT: 4.5 mils

MPI RIN 6.4B-G5 (Semigloss)
Primer: Intermediate: Topcoat:
MPI 46 MPI 141 MPI 141
System DFT: 4.5 mils

C. New and Existing, previously finished or stained Wood and Plywood,

DIVISION 6: INTERIOR WOOD PAINT TABLE
except floors; natural finish or stained:

1. Natural finish, oil-modified polyurethane
New; MPI INT 6.4J-G4 / Existing; MPI RIN 6.4L-G4

Primer:	Intermediate:	Topcoat:
MPI 57	MPI 57	MPI 57

System DFT: 4 mils

New; MPI INT 6.4J-G6 (Gloss) / Existing; MPI RIN 6.4L-G6 (Gloss)

Primer:	Intermediate:	Topcoat:
MPI 56	MPI 56	MPI 56

System DFT: 4 mils

2. Stained, oil-modified polyurethane
New; MPI INT 6.4E-G4 / Existing; MPI RIN 6.4G-G4

Stain:	Primer:	Intermediate:	Topcoat:
MPI 90	MPI 57	MPI 57	MPI 57

System DFT: 4 mils

New; MPI INT 6.4E-G6 (Gloss) / Existing; MPI RIN 6.4G-G6 (Gloss)

Stain:	Primer:	Intermediate:	Topcoat:
MPI 90	MPI 56	MPI 56	MPI 56

System DFT: 4 mils

D. New and Existing, previously finished or stained Wood Floors; Natural finish or stained:

1. Natural finish, oil-modified polyurethane
New; MPI INT 6.5C-G6 (Gloss) / Existing; MPI RIN 6.5C-G6 (Gloss)

Primer:	Intermediate:	Topcoat:
MPI 56	MPI 56	MPI 56

System DFT: 4 mils

2. Stained, oil-modified polyurethane
New; MPI INT 6.5B-G6 (Gloss) / Existing; MPI RIN 6.5B-G6 (Gloss)

Stain:	Primer:	Intermediate:	Topcoat:
MPI 90	MPI 56	MPI 56	MPI 56

System DFT: 4 mils

E. New and Existing, previously coated Wood floors; pigmented finish:

1. Latex Floor Paint
New; MPI INT 6.5G-G2 (Flat) / Existing; MPI RIN 6.5J-G2 (Flat)

Primer:	Intermediate:	Topcoat:
MPI 45	MPI 60	MPI 60

System DFT: 4.5 mils

New; MPI INT 6.5G-G6 (Gloss) / Existing; MPI RIN 6.5J-G6 (Gloss)

Primer:	Intermediate:	Topcoat:
MPI 45	MPI 68	MPI 68

System DFT: 4.5 mils

F. New and Existing, uncoated wood surfaces in toilets, food-preparation, food-serving, restrooms, laundry areas, shower areas, areas requiring a high degree of sanitation, and other high humidity areas not otherwise specified.:

1. Waterborne Light Industrial

DIVISION 6: INTERIOR WOOD PAINT TABLE

MPI INT 6.3P-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 45	MPI 153	MPI 153

System DFT: 4.5 mils

MPI INT 6.3P-G6 (Gloss)

Primer:	Intermediate:	Topcoat:
MPI 45	MPI 154	MPI 154

System DFT: 4.5 mils

G. Existing, previously painted wood surfaces in toilets, food-preparation, food-serving, restrooms, laundry areas, shower areas, areas requiring a high degree of sanitation, and other high humidity areas not otherwise specified:

1. Waterborne Light Industrial Coating

MPI RIN 6.3P-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 46	MPI 153	MPI 153

System DFT: 4.5 mils

MPI RIN 6.3P-G6 (Gloss)

Primer:	Intermediate:	Topcoat:
MPI 46	MPI 154	MPI 154

System DFT: 4.5 mils

H. New and Existing, previously finished or stained Wood Doors; Natural Finish or Stained:

1. Natural finish, oil-modified polyurethane

New; MPI INT 6.3K-G4 / Existing; MPI RIN 6.3K-G4

Primer:	Intermediate:	Topcoat:
MPI 57	MPI 57	MPI 57

System DFT: 4 mils

New; MPI INT 6.3K-G6 (Gloss) / Existing; MPI RIN 6.3K-G6 (Gloss)

Primer:	Intermediate:	Topcoat:
MPI 56	MPI 56	MPI 56

System DFT: 4 mils

Note: Sand between all coats per manufacturers recommendations.

2. Stained, oil-modified polyurethane

New; MPI INT 6.3E-G4 / Existing; MPI RIN 6.3E-G4

Stain:	Primer:	Intermediate:	Topcoat:
MPI 90	MPI 57	MPI 57	MPI 57

System DFT: 4 mils

New; MPI INT 6.3E-G6 (Gloss) / Existing; MPI RIN 6.3E-G6 (Gloss)

Stain:	Primer:	Intermediate:	Topcoat:
MPI 90	MPI 56	MPI 56	MPI 56

System DFT: 4 mils

Note: Sand between all coats per manufacturers recommendations.

I. New and Existing, uncoated Wood Doors; Pigmented finish:

1. Alkyd

DIVISION 6: INTERIOR WOOD PAINT TABLE

New; MPI INT 6.3B-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 45	MPI 47	MPI 47

System DFT: 4.5 mils

New; MPI INT 6.3B-G6 (Gloss)

Primer:	Intermediate:	Topcoat:
MPI 45	MPI 48	MPI 48

System DFT: 4.5 mils

Note: Sand between all coats per manufacturers recommendations.

J. Existing, previously painted Wood Doors; Pigmented finish:

1. Alkyd

New; MPI RIN 6.3B-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 46	MPI 47	MPI 47

System DFT: 4.5 mils

New; MPI RIN 6.3B-G6 (Gloss)

Primer:	Intermediate:	Topcoat:
MPI 46	MPI 48	MPI 48

System DFT: 4.5 mils

Note: Sand between all coats per manufacturers recommendations.

DIVISION 9: INTERIOR PLASTER, GYPSUM BOARD, TEXTURED SURFACES PAINT TABLE

A. New and Existing, previously painted Plaster and Wallboard not otherwise specified:

1. Institutional Low Odor / Low VOC Latex

New; MPI INT 9.2M-G2 (Flat) / Existing; MPI RIN 9.2M-G2 (Flat)

Primer:	Intermediate:	Topcoat:
MPI 50	MPI 144	MPI 144

System DFT: 4 mils

New; MPI INT 9.2M-G3 (Eggshell) / Existing; MPI RIN 9.2M-G3 (Eggshell)

Primer:	Intermediate:	Topcoat:
MPI 50	MPI 145	MPI 145

System DFT: 4 mils

New; MPI INT 9.2M-G4 (Satin) / Existing; MPI RIN 9.2M-G4 (Satin)

Primer:	Intermediate:	Topcoat:
MPI 50	MPI 146	MPI 146

System DFT: 4 mils

New; MPI INT 9.2M-G5 (Semigloss) / Existing; MPI RIN 9.2M-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 50	MPI 147	MPI 147

System DFT: 4 mils

B. New and Existing, previously painted Plaster and Wallboard in toilets, food-preparation, food-serving, restrooms, laundry areas, shower areas, areas requiring a high degree of sanitation, and other high humidity areas

DIVISION 9: INTERIOR PLASTER, GYPSUM BOARD, TEXTURED SURFACES PAINT TABLE not otherwise specified.:

1. Waterborne Light Industrial Coating
   New; MPI INT 9.2L-G5(Semigloss) / Existing; MPI RIN 9.2L-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 50	MPI 153	MPI 153

   System DFT: 4 mils

-- End of Section --

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SECTION 09 96 00

HIGH-PERFORMANCE COATINGS
11/14

PART 1 GENERAL

1.1 REFERENCES

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

MASTER PAINTERS INSTITUTE (MPI)

MPI ASM	(2012) Architectural Painting Specification Manual

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC 7/NACE No.4	(2007; E 2004) Brush-Off Blast Cleaning

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Equipment List; G, RO

SD-03 Product Data

Epoxy Coatings; G, AE

SD-04 Samples

Color Chips; G, AE

SD-07 Certificates

Epoxy Coatings; G, RO

Indoor Air Quality for Paints and Coatings; S

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product

Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

    1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

    2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

    3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

    1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for paints and coatings that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

    1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

    2. Manufacturer Inventory.

    3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

    4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

    5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

3. Low-Emitting Materials - Interior paints and coatings applied on site:

a. Meet the VOC emissions evaluation and the VOC content evaluation. The paints and coatings product category include all interior paints and coatings applied on site. Refer to Division 01 33 29 and the LEED BD+C v4.1 Reference Guide for full VOC content and emissions requirements.

1. For CDPH version compliance information, refer to LEED interpretation #ID 10495 “LEM for v4 projects”: https://www.usgbc.org/leedaddenda/10495

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.3 QUALITY CONTROL

Comply with Master Painters Institute (MPI) Standards indicated and listed in "MPI Approved Products List." Comply with the requirements in "MPI Architectural Painting Specification Manual" before any project is started.

Submit an equipment list consisting of a list of proposed equipment to be used in performance of construction work.

Submit three color chips 3-inch by 4-inch or manufacture's pull-down of each finish color and gloss as scheduled.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver special coating materials to the project in their original containers bearing manufacturer's name, descriptive label, and coating formulations. Provide new and unopened containers.

Store special coating materials in tightly closed containers in a covered, well-ventilated area where they are not exposed to excessive heat, fumes, sparks, flame, or direct sunlight. Protect water-based coatings against freezing.

Store solvents, thinners, and equipment cleaners with the same care as the coating materials with ambient temperatures continuously maintained at a minimum 45 degrees F.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

Submit manufacturer's catalog data including manufacturer's name and

identification. Include detailed data analysis of each special coating material required for the project, with all the coating constituents measured as percentages of the total weight of the coating. Also provide manufacturer's data concerning application, thinning, and average coverage per gallon

2.2 MATERIALS

Provide validation of Indoor Air Quality for Paints and Coatings.

2.2.1 Epoxy Coatings

Conform to MPI ASM, No. 116 for epoxy coatings and epoxy block filler, as modified.

Resins for finish coats are based on a polyamide-cured, epoxy-resin material. Apply finish coats with a dry-film thickness of not less than 4 mils per coat. Finish color and gloss are as indicated.

2.2.1.1 Ferrous and Galvanized Metal Surface Coatings

Coatings on ferrous and galvanized metal surfaces consist of a prime coat and not less than two finish coats. Comply with MPI ASM, No. 101 for an epoxy zinc primer with a metallic-zinc pigment for the substrate to be coated and the end use of the coated surface. Ensure resin solids and zinc pigment are not less than 80 percent of the total weight of the coating material. Apply prime coat with a total dry-film thickness of not less than 4 mils. Provide an epoxy-based finished coat as specified.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Surface Preparation

Protect adjacent materials and equipment against damage from spillage, dripping, and spatter of coating materials. Leave clean building materials and equipment with all damaged surfaces corrected. Provide "WET PAINT" signs to indicate newly painted surfaces.

Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by the Contracting Officer, and leave in an undamaged condition. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

Provide forced ventilation for interior spaces during application and drying of coatings to prevent the buildup of toxic or explosive concentrations of solvent vapors.

Provide fire extinguishers of the required quantity and correct type to combat flammable liquid fires.

Dispose of rags that are used to wipe up coating materials, solvents, and thinners by drenching with water and placing them in a covered metal container

3.1.2 Cleaning

At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

Clean application equipment promptly and thoroughly with a suitable solvent after each use and stored in a clean, covered, well-ventilated container.

3.1.3 Concrete Surfaces

3.1.3.1 Steel Substrates

Remove rust and loose mill scale. Clean using methods recommended in writing by coating manufacturer. Conform to SSPC 7/NACE No.4 for blast cleaning.

3.1.3.2 Galvanized-Metal Substrates

Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

3.1.4 Coating Material Preparation

Mix and prepare coating materials in accordance with the coating manufacturer's printed instructions for applying the particular material and coat. Keep materials which are not in actual use in closed containers.

Coating materials that have been mixed with an automatic shaker are allowed to stand to let air bubbles escape, then given a final hand mixing before application. Stir materials so as to produce a mixture of uniform density. Stir at frequent intervals during application to prevent skinning. Do not stir film which may form on the surface of the material. Remove film and strain, if necessary.

3.1.4.1 Thinning

Thinning is done in accordance with coating manufacturer's printed directions for the particular material and coat.

3.1.4.2 Tinting

Ensure prime and intermediate coats of paint are slightly different tints from the finish coat to facilitate identification of each coat. Tinting is done by the coating manufacturer and clearly identified as to color and coat.

3.2 APPLICATION

Do not perform exterior painting in damp or rainy weather. Interior painting is not allowed until the building is enclosed and has thoroughly dried out. Painting is not allowed below 50 degrees F or above 95 degrees F. Apply paint in accordance with the coating manufacturer's recommendations, and as specified.

Ensure coating application is done by skilled applicators. Apply coatings to clean and properly prepared surfaces. Apply coatings with clean, high-quality application equipment. Allow sufficient time between coats to ensure complete drying and curing. Sand and dust surfaces between coatings, as required, to produce a surface free of visible defects. Lightly sand high gloss coatings and clear finishes between coats to ensure bond of following coats.

Apply coats to the surfaces in an even film. Cloudiness, spotting, holidays, laps, application marks, runs, sags, and other similar surface imperfections are not acceptable. Remove defective coating applications and re-coat as directed.

Ensure coating lines such as wainscots are sharp, true, and well-defined. Tape may be used to establish coating lines, providing tape is removed before ragging or sawtooth edges form.

Ensure surfaces, including edges, corners, crevices, welds, and other similar changes in surface plane, meet the dry-film thickness not less than specified.

3.2.1 Brush Application

Use clean, proper size brushes for high-quality application of the specified coating materials. Brush out slow-dry coatings. Brush out quick-dry coatings only enough to spread out evenly.

3.2.2 Roller Application

Use clean roller covers of the proper nap length, nap texture, and material for high-quality application of the specified coating materials.

Ensure roller application is equivalent in all respects to the same coats applied by high-quality brush application.

3.2.3 Spray Application

Spray application of coatings is limited to finish coats on metal frame works, siding, decking, wire mesh, and other surfaces where hand work would be inferior. Apply spray coatings as equivalent in all respects to the same coats applied by high quality brush application. Permit each spray coat to cure before the succeeding coat is applied. Do not double back with application equipment, for the purpose of building up film thickness of two coats in one operation.

Cover surfaces adjacent to sprayed areas to prevent damage from overspray, coating rebound, and spray drift.

3.3 FIELD QUALITY CONTROL

3.3.1 Field Test

Government may take dry-film tests from time to time on finished surfaces. Apply additional coatings to surfaces where there is less than the minimum specified dry-film thickness.

3.3.2 Repairing

Remove damaged and unacceptable portions of completed work and replace with new work to match adjacent surfaces at no additional cost to the Government.

-- End of Section --

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SECTION 10 11 00

VISUAL DISPLAY UNITS
08/20

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM F148	(2013) Binder Durability of Cork Composition Gasket Materials

BIFMA INTERNATIONAL (BIFMA)

ANSI/BIFMA M7.1	(2011; R 2016) Test Method for Determining VOC Emissions from Office Furniture Systems, Components and Seating

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

1.2 DEFINITIONS

The term visual display unit when used herein includes presentation boards, markerboards, tackboards, board cases, display track systems, horizontal sliding units, copyboards, interactive whiteboards, and projection screens; submit manufacturer's descriptive data and catalog cuts plus manufacturer's installation instructions, and cleaning and maintenance instructions. Provide visual display units from manufacturer's standard product line. Submit certificate of compliance signed by Contractor attesting that visual display units conform to the requirements specified.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Placement Schedule; G

SD-03 Product Data

Visual Display Unit; G

SD-04 Samples

Aluminum; G

Cork; G

Glass; G

SD-07 Certificates

Indoor air quality for markerboards; S

Indoor air quality for tackboards; S

Certificate of Compliance

SD-08 Manufacturer's Instructions

Manufacturer's Cleaning Instructions

Manufacturer's Printed Installation Instructions

SD-10 Operation and Maintenance Data

Visual Display Units, Data Package 1; G

1.3.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment, if available; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and

external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Permanently installed, non-recycled wood and wood-based materials should be certified in accordance with Forest Stewardship Council Guidelines. This includes wood permanently installed in the project wood products. Submit all FSC product certification information including required Chain-of-Custody certificates and invoices tracking FSC purchase. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for markerboards and tackboards, if available, that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

1.4 CERTIFICATIONS

1.4.1 Indoor Air Quality

1.4.1.1 Indoor Air Quality for Visual Display Products

Provide markerboards and tackboards installed within building interior with VOC emissions in compliance with ANSI/BIFMA M7.1–2011 Standard Method (R2016).

a. Provide compliance with ANSI/BIFMA e3-2014e or e3-2019e Furniture Sustainability Standard, Sections 7.6.1, 7.6.2, 7.6.3 if applicable.

1.4.2 Building Product Declarations

Provide markerboards and tackboards with EPD and Material Ingredient Report, if available.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the building site in the manufacturer's original unopened containers and store them in a clean dry area with temperature maintained above 50 degrees F. Stack materials according to manufacturer's recommendations. Allow visual display units to acclimate to the building temperature for 24 hours prior to installation.

1.6 WARRANTY

Provide manufacturer's warranty to repair or replace defective materials and workmanship for period of one year from date of final acceptance of the work.

PART 2 PRODUCTS

2.1 MATERIALS

For each type, submit a section of core material and backing showing the cork. Submit a sample of glass type. Provide minimum 4 by 4 inch samples, or larger, showing range of color.

Submit manufacturers' descriptive product data for each type of visual display unit indicated. Include manufacturers' literature, finishes, profiles and thicknesses of materials.

Submit manufacturers' operations and maintenance data for each type of visual display unit in accordance with Section 01 78 23 OPERATIONS AND MAINTENANCE DATA.

2.1.1 Cork

Provide a continuous resilient sheet made from soft, clean, granulated cork relatively free from hardback and dust and bonded with a binder

suitable for the purpose intended; wearing surface to be free from streaks, spots, cracks or other imperfections that would impair its usefulness or appearance. Provide seasoned material and a clean cut made not less than 1/2 inch from the edge and must show no evidence of soft sticky binder.

2.1.1.1 Colored Cork

Provide colored cork composed of pure cork and natural color pigments that are combined under heat and pressure with linseed oil. Colored cork must be colored throughout and be washable. The burlap backing must be deeply imbedded and keyed to the work sheet being partially concealed in it and meeting the requirements of ASTM F148.

2.1.2 Aluminum

Provide a minimum 0.06 inch thick, 6063-T5 or 6063-T6 aluminum alloy frame extrusion conforming to ASTM B221. Exposed aluminum must be clear anodized. Use straight, single lengths wherever possible and keep joints to a minimum. Provide mitered corners with a hairline closure. Submit sections of frame.

2.1.3 Glass

2.1.3.1 Magnetic Glass

Provide magnetic glass markerboard writing surface composed of tempered, low-iron, extra clear, safety writing glass with polished edges and steel backing permanently adhered to the back of the glass.

2.2 MARKERBOARD

2.2.1 Glass Markerboard

Provide a factory assembled markerboard with a 1/4" tempered safety glass, magnetic writing surface and eased corners for safety. Unit to be comprised of one piece, without joints whenever possible. When markerboard dimensions require delivery in separate sections, components must be prefit at the factory, disassembled for delivery and jointed at the site. Provide frameless, mounted on stainless steel, standoff hardware. The markerboard does not include a map rail. Dry erase markings must be removable with a felt eraser or dry cloth without ghosting. Supply each unit with an eraser and four different color compatible dry erase markers. Provide markerboards that meet the emissions requirements of ANSI/BIFMA M7.1–2011 Standard Method (R2016) and ANSI/BIFMA e3-2014e or e3-2019e. Provide certification of indoor air quality for markerboards.

2.3 TACKBOARDS

Provide tackboards that meet the emissions requirements of ANSI/BIFMA M7.1 –2011 Standard Method (R2016) and ANSI/BIFMA e3-2014e or e3-2019e. Provide certification or validation of indoor air quality for tackboards.

2.3.1 Cork

Provide tackboard consisting of a minimum 1/4 inch thick colored cork with burlap backing laminated to a minimum 1/4 inch thick hardboard , and an aluminum frame.

2.4 COLOR

Provide finish colors for required items as indicated on the color material legend on the drawings.

PART 3 EXECUTION

3.1 PLACEMENT SCHEDULE

Location, size and mounting height of visual display units as shown on the drawings.

3.2 INSTALLATION

Do not install items that show visual evidence of biological growth. Perform installation and assembly in accordance with manufacturer's printed installation instructions. Use concealed fasteners. Attach visual display units to the walls with suitable devices to anchor each unit. Furnish and install trim items, accessories and miscellaneous items in total, including but not limited to hardware, grounds, clips, backing materials, adhesives, brackets, and anchorages incidental to or necessary for a sound, secure, complete and finished installation. Do not initiate installation until completion of room painting and finishing operations. Install visual display units in locations and at mounting heights indicated. Install visual display units level and plumb, and if applicable align doors and adjust hardware. Repair or replace damaged units as directed by the Contracting Officer.

3.3 CLEANING

Clean writing surfaces in accordance with manufacturer's cleaning instructions.

-- End of Section --

SECTION 10 14 00.10

EXTERIOR SIGNAGE
08/17

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

All exterior signage must be provided by a single manufacturer. Exterior signage must be of the design, detail, sizes, types, and message content shown on the drawings, must conform to the requirements specified, and must be provided at the locations indicated. Submit exterior signage schedule in electronic media with spread sheet format. Spread sheet must include sign location, sign type, and message. Signs must be complete with lettering, framing as detailed, and related components for a complete installation. Each sample must consist of a complete sign panel with letters and symbols. Samples may be installed in the work, provided each sample is identified and location recorded. Submit three color samples for each material requiring color and 12 inch square sample of sign face color sample.

1.1.1 Wind Load Requirements

Exterior signage must be designed to withstand 130 mph windload. Submit design analysis and supporting calculations performed in support of specified signage.

1.1.2 Character Proportions and Heights

Letters and numbers on indicated signs for handicapped-accessible buildings must have a width-to-height ratio between 3:5 and 1:1 and a stroke-width-to-height ratio between 1:5 and 1:10. Characters and numbers on indicated signs must be sized according to the viewing distance from which they are to be read. The minimum height is measured using an upper case letter "X". Lower case characters are permitted.

1.2 SUBMITTALS

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SD-02 Shop Drawings

Approved Detail Drawings; G

SD-03 Product Data

Installation

Exterior Signage; G

Submit manufacturer's descriptive data and catalog cuts.

Wind Load Requirements

SD-04 Samples

Exterior Signage; G

SD-10 Operation and Maintenance Data

Protection and Cleaning; G

1.3 QUALIFICATIONS

Signs, plaques, and dimensional letters must be the standard product of a manufacturer regularly engaged in the manufacture of the products. Items of equipment must essentially duplicate equipment that has been in satisfactory use at least 2 years prior to bid opening.

1.4 DELIVERY AND STORAGE

Materials must be wrapped for shipment and storage, delivered to the jobsite in manufacturer's original packaging, and stored in a clean, dry area in accordance with manufacturer's instructions.

1.5 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period must be provided.

PART 2 PRODUCTS

2.1 MODULAR EXTERIOR SIGNAGE SYSTEM

Exterior signage must consist of a system of coordinated directional, identification, and regulatory type signs located where shown. Dimensions, details, materials, message content, and design of signage must be as shown. Submit manufacturer's descriptive data and catalog cuts.

2.1.1 Panel And Post/Panel Type Signs

2.1.1.1 Posts

One-piece galvanized steel posts must be provided with minimum 0.125 inch wall thickness. Posts must be designed to accept panel framing system described. The post must be designed to permit attachment of panel framing system without exposed fasteners. Caps must be provided for each post.

2.1.1.2 Panel Framing System

Panel framing consisting of aluminum sections and interlocking track components must be designed to interlock with posts with concealed fasteners.

2.1.1.3 Panels

Modular message panels must be provided in sizes shown on drawings. Panels must be fabricated a minimum of 0.125 inch aluminum. Panels must

be heliarc welded to framing system.

2.1.1.4 Finishes

Post finish must be semi-gloss baked enamel. Metal panel system finish must be baked enamel as shown.

2.1.1.5 Mounting

Provide removable mounting by a steel sleeve embedded in concrete as indicated.

2.2 GRAPHICS FOR EXTERIOR SIGNAGE SYSTEMS

2.2.1 Graphics

Signage graphics must conform to the following:

2.2.1.1 Sign Type BID (Building ID Sign)

a. Mandrel bent tube frame painted black to match existing.

b. Porcelain pan with army gold yellow letterings and white arrow, background to match mp 11490 vanadium gray.

2.2.1.2 Sign Type RD (Roadway Directional)

a. Mandrel bent tube frame painted black to match existing.

b. Porcelain pan with army gold yellow letterings and white arrow, background to match mp 11490 vanadium gray.

2.2.1.3 Sign Type PD (Pedestrian Directional)

a. Mandrel bent tube frame painted black to match existing.
.
b. Porcelain pan with army gold yellow letterings and white arrow, background to match mp 11490 vanadium gray.

2.2.1.4 Sign Type LA (Loading Area Sign)

a. Digitally reversed printed engineering grade vinyl sheet with army gold yellow letterings and background to match mp 11490 vanadium gray.

b. Applied to the interior of window

2.2.1.5 Sign Type CB (Clearance Bar)

a. 4 inch 3M Scotchlite Reflective Graphic Film Series 680-85 black vinyl cut out copy typeface: Helvetica Neue 67 Medium Condensed.
b. Product 680-85 has a black daytime appearance but reflects white at night.
c. 7 inch painted “I-bar” extruded aluminum beam with end caps.

2.2.2 Messages

See for message content. Typeface: as indicated. Type size as indicated.

PART 3 EXECUTION

3.1 INSTALLATION

Signs, plaques, or dimensional letters must be installed in accordance with approved manufacturer's instructions at locations shown on the approved detail drawings; submit drawings showing elevations of each type of sign; dimensions, details, and methods of mounting or anchoring; shape and thickness of materials; and details of construction. A schedule showing the location, each sign type, and message must be included. Signs must be installed plumb and true at mounting heights indicated, and by method shown or specified. Signs mounted on other surfaces must not be installed until finishes on such surfaces have been completed. Submit manufacturer's installation instructions and cleaning instructions.

3.1.1 Anchorage

Anchorage and fastener materials must be in accordance with approved manufacturer's instructions for the indicated substrate. Anchorage not otherwise specified or indicated must include slotted inserts, expansion shields, and powder-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; lag bolts and screws for wood.

3.1.2 Protection and Cleaning

The work must be protected against damage during construction. Hardware and electrical equipment must be adjusted for proper operation. Glass, frames, and other sign surfaces must be cleaned in accordance with manufacturer's instructions. After signs are completed and inspected, cover all project identification, directional, and other signs which may mislead the public. Covering must be maintained until instructed to be removed by the Contracting Officer or until the facility is to be opened for business. Submit copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. The instructions must include simplified diagrams for the equipment as installed. Signs must be cleaned, as required, at time of cover removal.

3.2 FIELD PAINTED FINISH

Miscellaneous metals and frames must be field painted in accordance with Section 09 90 00 PAINTS AND COATINGS. Anodized metals, masonry, and glass must be protected from paint. Finish must be free of scratches or other blemishes.

-- End of Section --

SECTION 10 14 00.20

INTERIOR SIGNAGE
08/20

PART 1 GENERAL

1.1 REFERENCES

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

ALUMINUM ASSOCIATION (AA)

AA DAF45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes
AA PK-1	(2015) Pink Sheets: Designations and Chemical Composition Limits for Aluminum Alloys in the Form of Castings & Ingot

AMERICAN WELDING SOCIETY (AWS)

AWS D1.2/D1.2M	(2014; Errata 1 2014; Errata 2 2020) Structural Welding Code - Aluminum

ASTM INTERNATIONAL (ASTM)

ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

INTERNATIONAL CODE COUNCIL (ICC)

ICC A117.1 COMM	(2017) Standard And Commentary Accessible and Usable Buildings and Facilities
ICC/ANSI A117.1	(2009) Accessible and Usable Buildings and Facilities

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2018; ERTA 18-1; ERTA 18-2; ERTA 18-3; ERTA 18-4; TIA 18-1; TIA 18-2; TIA 18-3; TIA 18-4) Life Safety Code

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

36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G, AE

Signage Schedule; G, AE

SD-03 Product Data

Room Identification And Directional Signage System; G, RO

Stair Signage; G, RO

Exit Door Tactile Sign; G, RO

Building Directories; G, RO

SD-04 Samples

Interior Signage; G, AE

Software; G, AE

Room Identification And Directional Signage System; G, AE

Stair Signage; G, AE

Exit Door Tactile Sign; G, AE

Building Directories; G, AE

SD-10 Operation and Maintenance Data

Approved Manufacturer's Instructions; G, RO

Protection and Cleaning; G, RO

1.3 EXTRA MATERIALS

Provide 5 percent extra stock of all sign types inserts and interchangeable parts included in project as required by the Government. Provide paper inserts and laser print templates to support end-user printing copy, two copies of the software for user produced signs and inserts after project completion and equipment necessary for removal of signage parts and pieces.

1.4 QUALITY ASSURANCE

1.4.1 Samples

Submit interior signage samples of each of the following sign types showing typical quality, workmanship and color: all sign types included in project. Approved samples may be installed in the work, provided each sample is identified and location recorded.

1.4.2 Detail Drawings and Signage Schedule

Submit detail drawings showing elevations of each type of sign, materials, dimensions, details and methods of mounting or anchoring, mounting height, shape and thickness of materials, and details of construction. Include a schedule showing the location, each sign type, and message.

1.4.3 Sign Fabricator

Sign Fabricator to follow room number strategies identified in drawings. The room numbering system to be reviewed and approved by the Contracting Officer and command end users during the shop drawing phase, and prior to fabrication.

1.5 DELIVERY, STORAGE, AND HANDLING

Package materials to prevent damage and deterioration during shipment, handling, storage and installation. Deliver products to the jobsite in manufacturer's original packaging and store in a clean, dry area in accordance with manufacturer's instructions.

1.6 WARRANTY

Provide manufacturer's warranty to repair or replace defective interior signage materials and workmanship for a period of 2 years from date of final acceptance of the work.

PART 2 PRODUCTS

2.1 ROOM IDENTIFICATION AND DIRECTIONAL SIGNAGE SYSTEM

Provide signs, plaques, directories, and dimensional building letters that are standard products of manufacturers regularly engaged in the manufacture of such products that essentially duplicate signs that have been in satisfactory use at least 2 years prior to bid opening. Obtain signage from a single manufacturer with edges and corners of finished letter forms and graphics true and clean. Cut edges and exposed hardware are unacceptable.

2.1.1 Modular Sign Systems

Provide manufactured pre-engineered component-based sign system, consisting of a combination of aluminum extrusions and injection molded parts, pre-engineered and designed to create an updatable sign system that allows for easy and inexpensive updates and changes. Provide system with incremental widths and heights as noted on drawings that permit the assembly of multiple inserts of variable size to create a single sign. Provide a tamper-resistant sign which requires a special tool to change inserts composed of extruded aluminum with slots for secondary inserts. Provide continuous extruded aluminum endcaps in square 1/2 inch depth by

1/4 inch width max profile.

2.1.2 Standard Room Signs

Provide signs that include tactile photopolymer letters, symbols and Braille for interior rooms or spaces where the sign is not likely to change over time. Tactile text descriptions are required for pictograms that are provided to identify a permanent room. Examples include interior signs that label restrooms, stairs, room numbers or letters, and room names. These permanent room signs can include paper inserts for updatable information.

2.1.2.1 Tactile Letters, Symbols and Braille

Provide ADA compliant material per 36 CFR 1191 which is raised 1/32 inch from the first surface, has a minimum 5/8 inch in height and is an ADA acceptable font. The color of the tactile letters is required to contrast with the sign face color per ADA standards. The ADA required Braille has a minimum durometer reading of 90. All raised letters, numbers and symbols are to comply.

2.1.3 Directional Signs

Directional signs provide arrows with messages which point to critical destinations such as departments, offices, or other pertinent destinations. These can be a panel sign system with a series of permanently attached messages or a modular system with updatable inserts. Directional signs have header panels with applied or direct print messages.

2.1.4 Message Inserts

Provide updatable message inserts covered with a clear 1/8" thick non-glare acrylic lens or a 1/16" acrylic flexible lens where indicated. The initial insert is a digital print on HP photo gloss paper that is laminated 3 mil Low Temp Matte applied on front and back. Provide paper and software with message template for creating text and symbols for computers identified for Government production of paper inserts after project completion. Manufacturer is required to offer online ordering capabilities to facilitate and expedite ordering packages of replacement, color-coated paper inserts. Furnish four compatible devices to assist in removing face sheet. Provide matching acrylic sliding inserts as identified on the drawings.

2.1.5 Type of Mounting for Signs

All anchorage must be noncorrosive and compatible with each material joined. Where noted on drawings, provide surface mounted signs mounted with concealed mechanical fastening through the holders. Secure inserts in holders when captured by side profiles of extruded aluminum holders.

Mount framed plaques with manufacturer's standard (1/6 inch) 1.59 mm thick closed cell vinyl foam with adhesive backing. Adhesive must be transparent, long aging, high tech formulation on two sides of the vinyl foam. Double-faced tape consisting of acrylic adhesive on polyurethane foam used in conjunction with silicone adhesive .

Provide signs with aluminum ceiling/projecting mount attachment extrusion to secure to ceiling or wall surface, along with mounting ceiling/projecting mount track extrusion for hanging, projecting, and

double-sided signs. Provide mounting for ceiling/projecting mount attachment extrusion by mechanical fasteners, selected based on wall or ceiling conditions.

2.1.6 Character Proportions and Heights

Letters and numbers on signs conform to 36 CFR 1191.

2.2 STAIR SIGNAGE

Provide signs on stairs serving three or more stories with special signage within the enclosure at each floor landing conforming to NFPA 101. Indicate the floor level, the terminus of the top and bottom of the stair enclosure, and the identification of the stair enclosure. Also, state the floor level of, and the direction to, exit discharge. Locate the signage inside the enclosure in a position that is visible when the door is in the open or closed position and install in conformance with 36 CFR 1191. Provide tactile for floor level designation in accordance with ICC A117.1 COMM.

2.3 EXIT DOOR TACTILE SIGN

Provide tactile sign with the message EXIT at each exit door that requires an exit sign to conform with NFPA 101. Sign tactile message is to comply with ICC/ANSI A117.1.

2.4 BUILDING DIRECTORIES

Provide building directories as lobby directories or floor directories, with a changeable directory listing consisting of the areas, which can include departments, offices, personnel and other destinations located within the facility as well as a map with "you are here" locations. Provide dimensions, details, and materials of sign and message content as indicated on the drawings.

2.4.1 Header Panel

Header panel has acrylic with raised acrylic letters.

2.4.2 Directory Graphics

Provide graphics and text that are first generation from camera ready art.

2.4.2.1 Orientation Map

Provide a color-coded floor plan graphic outline for each building level. Individual building functions and public accessible departments are identified using a unique color and numerical "address" number. Building and department names are tied to the floor plan's numerical address.

2.4.2.2 Monitor Graphic Displan

The orientation map for each level of the building is displayed at all times, along with the Department listing of names. The Government will verify their preference to list the names in alphabetical order, followed by the plan "address", or an alternate sequence.

2.4.2.3 Other Graphics

Graphic artwork is used to indicate the location of elevators, stairways, public restrooms, and information stations. Graphic artwork includes the macro-wayfinding terminology and locations, i.e. 1A, 1B, 2A, & 2B, or alternate language developed by the Government for wayfinding destinations.

2.4.3 Fabrication

Provide extruded aluminum frames and trim with hairline fit, with no exposed fasteners.

2.4.4 Non-Illuminated Unit

Directory consists of a non-illuminated unit with screen printed or vinyl copy applied to acrylic, metal, or high-pressure plastic laminate strips. Design of unit as indicated on the drawings.

2.4.4.1 Construction

The directory is 1 inch deep frame constructed of aluminum with natural satin anodized finish. Unit is fully surface mounted. Unit has a header size and lettering as shown.

2.4.4.2 Message Strips

Message strips are updatable by user sized as indicated on the drawings. Provide letters and numbers in accordance with the drawings.

2.5 DIMENSIONAL BUILDING LETTERS

2.5.1 Fabrication

Letters are cast aluminum. Cast Characters: Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free of pits, scale, sand holes, and other defects. Cast lugs into back of characters and tap to receive threaded mounting studs. Alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated. Comply with the following requirements. Package letters for protection until installation.

2.5.2 Size

Letter size is as indicated. Provide letter thickness that is manufacturer's standard for the size of letter or as indicated on drawings.

2.5.3 Finish

Provide clear anodized satin finish.

2.6 PRESSURE SENSITIVE LETTERS

2.6.1 Fabrication

Ensure that vinyl letter edges and corners of finished letterforms and graphics are true and clean. Do not use letterforms and graphics with rounded positive or negative corners, nicked, cut, or ragged edges.

2.6.2 Size

Letter size: as indicated.

2.7 MATERIALS

2.7.1 Aluminum Alloy Products

Aluminum extrusions are at least 1/8 inch thick, and aluminum plate or sheet are at least 0.0508 inch thick. Extrusions conform to ASTM B221; plate and sheet conforms to ASTM B209. Where anodic coatings are specified, alloy conforms to AA PK-1 alloy designation 514.0. Exposed anodized aluminum finishes are as shown. Welding for aluminum products conforms to AWS D1.2/D1.2M.

2.7.2 Anodic Coating

Anodized finish conforms to AA DAF45 as follows:

a. Clear (natural) designation AA-M10-C22-A31, Architectural Class II 0.4 mil or thicker, natural satin anodized finish.

2.7.3 Fabrication and Manufacture

2.7.3.1 Factory Workmanship

Holes for bolts and screws are drilled or punched. Drilling and punching produces clean, true lines and surfaces. Exposed surfaces of work have a smooth finish; exposed riveting is flush. Conceal fastenings where practicable.

2.7.3.2 Dissimilar Materials

Where dissimilar metals are in contact, protect surfaces prevent galvanic or corrosive action.

2.7.4 Typeface

ADA-ABA compliant font for Room Signs Neue Helvetica or as indicated in the drawings.

2.8 GRAPHICS

Provide signage graphics for modular signs to the following:

2.8.1 First Surface Copy Direct Print (Non-Tactile)

Message may be applied to panel using a direct print process. Original art is defined as artwork that is a first generation reproduction of the specified art. Provide clean edges and corners.

2.8.2 Photopolymer

Integral graphics and Braille achieved by photomechanical stratification processes. Provide photopolymer used for ADA compliant graphics of the type that has a minimum durometer reading of 90. Tactile graphics are raised 1/32 inch from the first surface of plaque by photomechanical stratification process.

2.8.3 Cast Solid Aluminum Letters

Provide and fasten to the message panel with concealed fasteners.

2.9 COLOR, FINISH, AND CONTRAST

Provide color as indicated. Finish of eggshell, matte, or other non-glare finish for all signs as required in handicapped-accessible buildings.

PART 3 EXECUTION

3.1 INSTALLATION

Install signs plumb and true and in accordance with approved manufacturer's instructions at locations shown on the detail drawings. Submit operating instructions outlining the step-by-step procedures required for system operation. The instructions include simplified diagrams for the system as installed, the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Provide each set permanently bound with a hard cover. The following identification must be inscribed on the covers: "OPERATING AND MAINTENANCE INSTRUCTIONS", name and location of the facility, name of the Contractor, and contract number. Submit in accordance with Section 01 78 23 OPERATING AND MAINTENANCE DATA. Mounting height and mounting location complies with 36 CFR 1191. Install required blocking. Do not install signs on doors or other surfaces until finishes on such surfaces have been installed. Signs installed on glass surfaces are installed with matching blank back-up plates in accordance with manufacturer's instructions. Provide illuminated signage in conformance with the requirements of Section 26 51 00 INTERIOR LIGHTING.

Do not install items that show visual evidence of biological growth.

3.1.1 Anchorage

Provide anchorage in accordance with approved manufacturer's instructions. Anchorage not otherwise specified or shown includes slotted inserts, expansion shields, and powder-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; lag bolts and screws for wood. Provide exposed anchor and fastener materials compatible with metal to which applied with matching color and finish.

a. Signs mounted to painted gypsum board surfaces must be removable for painting maintenance.

b. Mount signs to lay-in ceiling grids with clip connections to ceiling tees.

c. Install signs mounted on metal surfaces with magnetic tape.

3.1.2 Protection and Cleaning

Protect the work against damage during construction. Adjust hardware and electrical equipment for proper operation. Clean glass, frames, and other sign surfaces at completion of signage installation in accordance with the manufacturer's written instructions.

3.2 SIGN PROGRAM MAINTENANCE PLAN

Manufacturer shall provide details of software and system of color coated paper sign inserts allowing client to update and maintain signage graphics in-house. Manufacturer shall provide details of an Online Reordering and Maintenance Application whereby the client can submit sign reorders online and store relevant project information such as sign type drawings, message schedules and product instructions.

3.3 CONTRACT CLOSE-OUT

Furnish appropriate checklist for aiding in reordering after Date of Substantial Completion. Maintain computer schedule program for five years for ordering new signage required by Owner. Provide Maintenance data and cleaning requirements for exposed surfaces.Furnish one complete software package compatible with Windows XP or newer.

-- End of Section --

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SECTION 10 21 13

TOILET COMPARTMENTS
08/20

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A167	(2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A336/A336M	(2018) Standard Specification for Alloy Steel Forgings for Pressure and High-Temperature Parts
ASTM A385/A385M	(2020) Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)
ASTM A666	(2015) Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar
ASTM B36/B36M	(2018) Standard Specification for Brass Plate, Sheet, Strip, and Rolled Bar
ASTM B86	(2018) Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B456	(2017) Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium

INTERNATIONAL CODE COUNCIL (ICC)

ICC A117.1 COMM	(2017) Standard And Commentary Accessible and Usable Buildings and Facilities

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-60003	(Basic) Partitions, Toilet, Complete

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

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

36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication Drawings

Installation Drawings; G, RO

SD-03 Product Data

Cleaning and Maintenance Instructions

Sound-Deadening Cores

Anchoring Devices and Fasteners

Hardware and Fittings

Brackets

Door Hardware

Toilet Enclosures; G, AE

Urinal Screens; G, AE

Finishes; G

Recycled content for stainless steel partitions and screens; S

SD-04 Samples

Hardware and Fittings

Anchoring Devices and Fasteners

SD-07 Certificates

Warranty

Indoor air quality for partitions; S

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

3. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for manufacturers that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following

disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality for Partitions/Wall Panels

Provide partitions with VOC emissions certified in compliance with California Department of Public Health (CDPH) Standard Method.

1.3.2 Building Product Declarations

Provide partitions with EPD and Material Ingredient Report, if available.

1.4 REGULATORY REQUIREMENTS

Comply with to ICC A117.1 COMM code for access for the handicapped operation of toilet compartment door and hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver materials in the manufacturer's original unopened packages with the brand, item identification, and project reference clearly marked. Store components in a dry location that is adequately ventilated; free from dust, water, other contaminants, and damage during delivery, storage, and construction.

1.6 WARRANTY

Provide manufacturer's warranty to repair or replace defective materials and workmanship for a period of one year from date of final acceptance of the work.

PART 2 PRODUCTS

2.1 SYSTEM REQUIREMENTS

Provide a complete and usable toilet partition system, including toilet enclosures, room entrance screens, urinal screens, system of panels, hardware, and support components. Furnish the partition system from a single manufacturer, with a standard product as shown in the most recent catalog data. Submit Fabrication Drawings for toilet partitions and urinal screens consisting of fabrication and assembly details to be performed in the factory. Submit manufacturer's Cleaning and Maintenance Instructions in accordance with Section 01 78 23 OPERATIONS AND MAINTENANCE DATA.

2.2 MATERIALS

2.2.1 Stainless Steel Sheet (Finish 4)

Provide stainless steel sheet conforming to ASTM A666, 300 series commercial stainless steel sheet suitable for exposed applications with a Flame Spread Index of 0 and a Smoke Developed Index of 0. Provide smooth material, without creases or ripples. Provide face sheet of minimum of 0.048 inch ((18 gauge) thickness. Provide with No. 4 finish .

2.2.2 Sound-Deadening Cores

Provide sound deadening consisting of treated kraft paper honeycomb cores with a cell size of not more than 1 inch. Provide resin-material content weighing not less than 11 percent of the finished core weight. Face expanded cores on both sides with kraft paper.

2.2.3 Anchoring Devices and Fasteners

Provide steel anchoring devices and fasteners hot-dipped galvanized after fabrication, in conformance with ASTM A385/A385M and ASTM A123/A123M. Conceal all galvanized anchoring devices.

2.2.4 Brackets

Provide two-ear panel wall brackets, T-style, 1 inch stock. Provide stirrup style panel-to-pilaster brackets.

2.2.5 Hardware and Fittings

2.2.5.1 General Requirements

Provide hardware for the toilet partition system that complies with CID A-A-60003 for the specified type and style of partitions. Provide hardware finish highly resistant to alkalis, urine, and other common toilet room acids. Comply with 36 CFR 1191 of latching devices and hinges for handicap compartments; provide chrome-plated steel or stainless steel devices and hinges with door latches that operate without either tight grasping or twisting of the wrist of the operator. Submit three samples

of each item, including anchoring devices and fasteners. Approved hardware samples may be installed in the work if properly identified.

Material	Conformance Standard
Cold-rolled sheet steel	ASTM A336/A336M, commercial quality
Zinc-base alloy	ASTM B86, Alloy AC41-A
Brass	ASTM B36/B36M, Alloy C26800
Aluminum	ASTM B221
Corrosion-resistant steel	ASTM A167, Type 304

2.2.5.2 Finishes

a. Provide chrome plating that complies with ASTM B456.e. Provide stainless steel with a No. 4 finish.

f. Provide exposed fasteners that match the hardware and fittings.

2.2.6 Door Hardware

2.2.6.1 Hinges

Provide adjustable hinges to hold in-swinging doors open at any angle up to 90 degrees and outswinging doors up to 10 degrees. Provide self-lubricating hinges with the indicated swing. Provide hinges that are wraparound thru-bolted type and have the following type of return movement:

a. Gravity return movement

2.2.6.2 Latch and Pull

Provide latch and pull that is a combination rubber-faced door strike and keeper equipped with emergency access. .

2.2.6.3 Coat Hooks

Provide coat hooks that are combination units with hooks and rubber tipped pins.

2.3 PARTITION PANELS AND DOORS

Fabricate partition panels, and pilasters of materials and construction listed:

Provide stainless steel partition panels and doors in finished thickness of no less than 1 inch and pilasters no less than 1-1/4 inches, both with face sheets no less than 0.031 inch.
Provide stainless steel toilet partitions and screens with recycled content of 50 percent minimum. Provide data identifying percentage of recycled content for stainless steel partitions and screens.

2.3.1 Toilet Enclosures

Provide toilet enclosures that comply with CID A-A-60003, Type I, Style B, ceiling hung . Furnish width, length, and height of toilet enclosures as shown. Finish surface of panels are stainless steel (Finish 4); water resistant; graffiti resistant; non-absorbent radius beveled edges. Reinforce panels indicated to receive toilet paper holders or grab bars for mounting of the items required, and provide cut outs for through partition toilet accessories. Provide grab bars to withstand a bending stress, shear stress, shear force, and a tensile force induced by 250 lbf. Grab bars cannot rotate within their fittings.

2.3.2 Urinal Screens

Provide urinal screens that comply with CID A-A-60003, Type III, Style F, wall hung. Provide finish for surface of screens as stainless steel (Finish 4) ; water resistant; graffiti resistant; non-absorbent with radius beveled edges; with manufacturer's standard post design of materials matching the thickness and construction of pilasters. Furnish width and height of urinal screens as shown. Provide thickness to match toilet compartment panel construction. Secure wall hung urinal screens with 42 inches long, continuous flanges. Fabricate screens from the same types of panels and pilasters as the toilet partitions. Use corrosion-resistant steel fittings and fasteners.

2.4 CEILING-HUNG PARTITIONS

Provide pilasters in size indicated that are manufacturer's standard corrosion resistant anchoring assemblies complete with leveling adjustment nuts at pilasters for connection to structural support above finished ceiling. Design anchoring device to transmit the strain and loading on the pilaster directly to the structural support above without putting strain or loading on the finished ceiling. Provide sleeves or caps at tops of pilasters to conceal anchorage.

2.5 HARDWARE

Provide hardware for the toilet partition system that complies with CID A-A-60003 for the specified type and style of partitions. Provide hardware pre-drilled by manufacturer. Use a hardware finish that is highly resistant to alkalis, urine, and other common toilet room acids. Hardware includes: chrome plated nonferrous cast pivot hinges, gravity type, adjustable for door close positioning; nylon bearings; chrome plated aluminum door latch; door strike and keeper with rubber bumper; and cast alloy chrome plated coat hook and bumper. Provide latching devices and hinges for handicap compartments complying with 36 CFR 1191 and stainless steel door latches that operate without either tight grasping or twisting of the wrist of the operator. Use stainless steel, tamper proof type screws and bolts. Wall mounting brackets are continuous, full height, stainless steel , in accordance with toilet compartment manufacturer's instructions. Provide floor-mounted anchorage consisting of corrosion-resistant anchoring assemblies with threaded rods, lock washers, and leveling adjustment nuts at pilasters for structural connection to floor.

PART 3 EXECUTION

3.1 PREPARATION

Take field measurements prior to the preparation of drawing and fabrication to ensure proper fits. Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive work. Verify correct spacing of plumbing fixtures. Verify correct location of built in framing, anchorage, and bracing. Report in writing to Contracting Officer prevailing conditions that adversely affect satisfactory execution of the work of this section. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 METAL PARTITION FABRICATION

a. Fabricate metal partition panels, doors, screens, and pilasters required for the project from galvanized-steel face sheets with formed edges. Laminate face sheets via pressure to the sound-deadening core with edges sealed with a continuous locking strip and corners mitered and welded. Ground all welds smooth. Provide concealed reinforcement for installation of hardware, fittings, and accessories. Surface of face sheets must be , free from wave, warp, or buckle.

b. Before application of an enamel coating system, solvent-clean galvanized-steel surfaces to remove processing compounds, oils, and other contaminants harmful to coating-system adhesion. After cleaning,coat the surfaces with a metal-pretreatment phosphate coating. After pretreatment, finish exposed galvanized-steel surfaces with a baked-enamel coating system as specified.

c. Provide an enamel coating system consisting of a factory-applied baked acrylic enamel coating system. Provide a coating system that is a durable, washable, stain-resistant, and mar-resistant finish.

3.3 INSTALLATION

Do not install items that show visual evidence of biological growth. Install partitions rigid, straight, plumb, and level, with the panels centered between the fixtures. Provide a panel clearance of not more than 1/2 inch and secure the panels to walls and pilasters with continuous full height wall brackets. Locate wall brackets so that holes for wall bolts occur in masonry or tile joints. Secure panels to pilasters with brackets matching the wall brackets. Provide for adjustment due to minor floor variations. Locate head rail joints at pilaster center lines. Install adjacent components for consistency of line and plane. Equip each door with hinges, one door latch, and one coat hook and bumper. Align hardware to uniform clearance at vertical edges of doors.

a. Secure panels to hollow plastered walls with toggle bolts using not less than 1/4-20 screws of the length required for the wall thickness. Provide toggle bolts with a load-carrying strength of not less than 600 pounds per anchor.

b. Secure panels to ceramic tile on hollow plastered walls or hollow concrete-masonry walls with toggle bolts using not less than 1/4-20 screws of the length required for the wall thickness. Provide toggle bolts with a load-carrying strength of not less than 600 pounds per anchor.

c. Secure panels to solid masonry or concrete with lead or brass expansion shields designed for use with not less than 1/4-20 screws, with a shield length of not less than 1-1/2 inches. Provide expansion shields with a load-carrying strength of not less than 600 pounds per anchor.

d. Submit Installation Drawings for toilet partitions, room entrance screens, and urinal screens showing plans, elevations, details of construction, hardware, reinforcing and blocking, fittings, mountings and escutcheons. Indicate on drawings the type of partition, location, mounting height, cutouts, and reinforcement required for toilet-room accessories.

3.4 CEILING-HUNG PARTITIONS

Secure pilasters to the structural support above with the anchorage device specified. Make all leveling devices readily accessible for leveling, plumbing, and tightening the installation. Level the bottoms of doors with bottoms of pilasters when doors are in a closed position.

3.5 FINAL ADJUSTMENT

After completion of the installation, make final adjustments to the pilaster-leveling devices, door hardware, and other working parts of the partition assembly. Doors have a uniform vertical edge clearance of approximately 3/16 inch and rest open at approximately 30 degrees when unlatched.

3.6 CLEANING

Touch up baked enamel and powder coat finish with the same color of paint that was used for the finish. Clean all surfaces and adjacent surfaces soiled as a result of the work, in an approved manner compliant with the manufacturer's recommended cleaning and protection from damage procedures until accepted. Remove all equipment, tools, surplus materials, and work debris from the site.

-- End of Section --

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SECTION 10 21 23.16

CUBICLE TRACK AND HARDWARE
04/06

PART 1 GENERAL

1.1 REFERENCES

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

ALUMINUM ASSOCIATION (AA)

AA DAF45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes

ASTM INTERNATIONAL (ASTM)

ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B456	(2017) Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Cubicle track layout

SD-08 Manufacturer's Instructions

Cubicle track installation

SD-10 Operation and Maintenance Data

Cubicle track system, Data Package 1; ; G

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.3 DRAWING REQUIREMENTS

Submit cubicle track layout drawings. Include surface-mounted installation details and overlay drawing showing other trades installation

within area.

1.4 DELIVERY AND STORAGE

Deliver cubicle tracks to site in unopened containers clearly labeled with manufacturer's name and contents. Store in safe, dry, and clean location. Do not open containers until contents are to be installed.

1.5 QUALITY CONTROL

Allow smooth, rapid, and complete screening with no gaps at corners or ends of track. The track of a standard 8 by 8 foot cubicle shall have no joints. Form corner bends in a single continuous piece on a 12 inch radius to exactly 90 degrees. Other track lengths to 16 feet shall have no joints.

PART 2 PRODUCTS

2.1 CUBICLE TRACK SYSTEM

Heavy-duty type, ceiling surface mounted. Bends shall be minimum 18 inches radius.

2.1.1 Extruded Aluminum Tracks

ASTM B221 and ASTM B456; alloy 6063-TS, channel shape minimum, 1 1/4 inch wide by 1 1/8 inch deep, 0.050 inch minimum wall thickness. Inside raceway to be smooth for interior carriers and must be able to receive a double coated wheel carrier with hook. Finish as designated for aluminum finishes in AA DAF45.

2.2 CARRIER UNIT

Silent type with double canted wheel carrier. Wheels shall have nylon on stainless steel chromium plated steel hooks with swivel to support the curtain. Carriers shall be removable only through access aperture or through end-cap that provides room for insertion or removal of carrier. Provide 2.2 carriers for every foot of track length, plus one additional carrier. Provide a safety loading unit at one end of the channel track consisting of a section of channel track equipped with a hinge and end latch to permit lowering for installation of or removal of curtains from hooks without the use of a step-ladder and without removing carriers from track. Rivet moveable end of safety loading unit to be riveted to the hinge. Latching end of safety loading unit with a double locking fail-proof locking device for safety. Safety loading unit to be four feet in length of an 8 foot ceiling installation so latch end lowers to four feet from floor, for installation or removal of curtain without the use of a step-ladder. Increase length of safety loading unit to be increased according to ceiling height. Provide a key wand for every 20 units.

2.3 END STOP AND PULL-OUT

Fabricate from aluminum or nylon with an anodized finish matching the track finish.

2.4 FASTENERS

Stainless steel.

2.5 FINISH

Satin, clear anodized.

PART 3 EXECUTION

3.1 INSTALLATION

Verify dimensions prior to installation. Install cubicle track after painting and finishing operations are complete. Provide labor and all materials indicated, specified or necessary for a complete finished installation. Install track plumb, level and true, and securely anchored to the ceiling to form a neat, rigid installation. Remove damaged or defective components and replace with new components.

3.1.1 Installation Details

Install heavy-duty cubicle tracks ceiling surface mounted. Install cubicle tracks where indicated. Install carrier units at 6 inches on center maximum. Install end cap at each end of the track and pull-out at the end where curtains are stacked to permit insertion and removal of carrier units. Securely fasten end stops to prevent their being forced out by striking weight of carrier units.

-- End of Section --

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SECTION 10 26 00

WALL AND DOOR PROTECTION
08/20

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM A167	(2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM D256	(2010; R 2018) Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics
ASTM D543	(2020) Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
ASTM D635	(2018) Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM G21	(2015) Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE J1545	(2005; R 2014) Instrumental Color Difference Measurement for Exterior Finishes, Textiles and Colored Trim

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(2017) Adhesive and Sealant Applications

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Corner Guards; G, AE

Wall Covering and Panels; G, AE

SD-03 Product Data

Corner Guards; G, AE

Wall Covering and Panels; G, AE

Recycled content for aluminum component of corner guards; S

Recycled content for steel component of corner guards; S

SD-04 Samples

Corner Guards; G

Wall Covering and Panels; G

SD-06 Test Reports

Fire Resistance Rating

SD-07 Certificates

Indoor air quality for wall covering/panels; S

Indoor air quality for adhesives; S

SD-10 Operation and Maintenance Data

Corner Guards, Data Package 1; G

Wall Covering and Panels, Data Package 1; G

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization Material Ingredients - Option 1, Material Ingredient Reporting:

a. Submit Material Ingredient Reports for corner guards, if available, that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare productlabels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification; Facts – NSF/ANSI 336.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/material-%for current list of USGBC-approved compliance programs.

a) Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

b) Provide LEED Materials Content Form in accordance with Section 01 33 29.

2. Low-Emitting Materials - Wall panels:

a. Meet the VOC emissions evaluation, or inherently nonemitting sources criteria, or salvaged and reused materials criteria. The wall panels product category includes all finish wall treatments (wall coverings, wall paneling, wall tile), surface wall structures such as gypsum or plaster, cubicle/curtain/partition walls, trim, doors, frames, windows, and window treatments. Removable/interchangeable fabric panels, built-in cabinetry, and vertical structural elements are excluded. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full emissions requirements.

b. Product is considered an inherently non-emitting source of VOCs if it is one of the following, and has no integral organic-based surface coatings, binders, or sealants: powder-coated metals, plated or anodized metal, and unfinished or untreated solid wood.

3. Low-Emitting Materials - Interior adhesives and sealants applied on site:

a. Meet the VOC emissions evaluation and meet the VOC content evaluation. The adhesives and sealants product category include all interior adhesives and sealants applied on site. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality

1.3.1.1 Wall Covering and Panels

Provide sheet and high impact resistant resilient materials certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold. Provide current product certification documentation from certification body.

1.3.1.2 Adhesives and Sealants

Provide adhesives and sealants applied within the building interior with VOC emissions certified in compliance with California Department of Public Health CDPH SECTION 01350 Standard Method and VOC content in compliance with limits of SCAQMD Rule 1168. Provide current product certification documentation from certification body.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the project site in manufacturer's original unopened containers with seals unbroken and labels and trademarks intact. Keep materials dry, protected from weather and damage, and stored under cover. Store materials at approximately 70 degrees F for at least 48 hours prior to installation.

1.5 WARRANTY

Provide manufacturer's warranty to repair or replace defective materials and workmanship for a 1 year period of one year from date of final acceptance of the work.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

To the maximum extent possible, provide wall and door protection items that are standard products of a single manufacturer and furnished as detailed. Drawings show general configuration of products required, and items differing in minor details from those shown are acceptable.

Submit detailed shop drawings of each wall and door protection item indicated. Include elevations, dimensions, clearances, details of construction and anchorage, and details of joints and connections.

Submit manufacturers' descriptive product data for each wall and door protection item indicated. Include manufacturers' literature, finishes, profiles and thicknesses of materials.

Submit manufacturers' operations and maintenance data for each wall and door protection item indicated in accordance with Section 01 78 23 OPERATIONS AND MAINTENANCE DATA.

2.1.1 Resilient Material

Provide resilient material consisting of high impact resistant extruded PVC freeacrylic vinyl or injection molded thermal plastic conforming to the following:

2.1.1.1 Minimum Impact Resistance

Minimum impact resistance must be 18 ft-lbs/sq. inch when tested in accordance with ASTM D256, (Izod impact, ft-lbs per sq inch notched).

2.1.1.2 Fire Resistance Rating

Provide the following surface burning characteristics when tested and labeled in accordance with ASTM E84 by a qualified testing agency: maximum flame spread of 25 and a smoke developed rating of 450 or less. Provide material rated as self extinguishing when tested in accordance with ASTM D635.

2.1.1.3 Integral Color

Provide colored components having integral color and matched in accordance with SAE J1545 to within plus or minus 1.0 on the CIE-LCH scales.

2.1.1.4 Chemical and Stain Resistance

Provide materials resistant to chemicals and stains reagents in accordance with ASTM D543.

2.1.1.5 Fungal and Bacterial Resistance

Provide materials resistant to fungi and bacteria in accordance with ASTM G21, as applicable.

2.2 CORNER GUARDS

2.2.1 Resilient Corner Guards

Provide surface mounted corner guards, radius formed to profile shown. Provide corner guards that are 4 feet high. Furnish mounting hardware, cushions, and base plates. Provide assembly consisting of a snap-on corner guard formed from high impact resistant resilient material, mounted on a continuous aluminum retainer. Extruded aluminum retainer conforms to ASTM B221, alloy 6063, temper T5 or T6. Provide aluminum components that contain a minimum of 35 percent recycled content. Provide data identifying percentage of recycled content for aluminum component of corner guards. Flush mounted type guards act as a stop for adjacent wall

finish material. Furnish factory fabricated end closure caps for top and bottom of surface mounted corner guards. Provide flush mounted corner guards installed in fire rated wall that maintain the rating of the wall. Manufacturer to provide insulating materials that are an integral part of the corner guard system. Provide exposed metal portions of fire rated assemblies with a paintable surface.

2.2.2 Stainless Steel Corner Guards

Provide stainless steel base material that contains a minimum of 60 percent recycled content. Provide data identifying percentage of recycled content for steel component of corner guards. Fabricate stainless steel base material of 16 gauge thick material conforming to ASTM A167, type 304. Provide corner guards that .are 8 feet high. Form corner guard to dimensions shown.

2.3 WALL COVERING AND PANELS

Provide wall covering and panels consisting of high impact rigid acrylic vinyl material. Provide certification of indoor air quality for wall covering/panels.

2.3.1 Rigid Vinyl Acrylic Wall Covering

Provide 0.040 inch thick wall covering.

2.4 TRIM, FASTENERS AND ANCHORS

Provide vinyl trim, fasteners and anchors for each specific installation as indicated.

2.5 FINISH

Submit three samples indicating color and texture of materials requiring color and finish.

2.5.1 Resilient Material Finish

Provide resilient material finish of stipple texture with colors in accordance with SAE J1545.

2.6 ADHESIVES

Provide adhesive for resilient material in accordance with manufacturers recommendations. Provide sealants and non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) that meet emissions requirements of CDPH SECTION 01350 (limit requirements for office space type) the VOC content requirements of SCAQMD Rule 1168. Provide certification of indoor air quality for adhesives.

2.7 COLOR

Provide color as indicated on the color material legend in the construction documents; colors listed are not intended to limit the selection of equal colors from other manufacturers.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install items that show visual evidence of biological growth. Install items on surfaces that are clean, smooth, and free of obstructions.

3.1.1 Corner Guards

a. Mount guards as indicated and in accordance with manufacturer's written installation instructions.

3.1.1.1 Stainless Steel Guards

a. Mount guards on external corners of interior walls, partitions and columns and in accordance with manufacturer's recommendations.

b. Where corner guards are installed on walls, partitions or columns finished with plaster or ceramic tile, provide continuous 16 gauge thick, perforated, galvanized z-shape steel anchors welded to back edges of corner guards and expansion bolted to concrete or masonry with four 3/8 inch diameter bolts, spaced 16 inches on centers. Coat back surfaces of corner guards, where shown, with a non-flammable, sound deadening material. Overlap corner guards on finish plaster surfaces.

c. Where corner guards are installed on exposed structural glazed facing tile units or masonry wall, partitions or columns, anchor corner guards to existing walls with 1/4 inch oval head stainless steel countersunk expansion or toggle bolts. Grout spaces solid between guards and backing with portland cement and sand mortar.

d. Where corner guards are installed on gypsum board, clean surfaces and anchor guards with a neoprene solvent-type contact adhesive specifically manufactured for use on gypsum board construction. Remove excess adhesive from the guard edges and allow to cure undisturbed for 24 hours.

-- End of Section --

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SECTION 10 28 13

TOILET ACCESSORIES
08/20

PART 1 GENERAL

1.1 REFERENCES

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

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-1691	(1994; Rev F) Construction and Material Schedule for Military Medical and Dental Facilities

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Product Schedule; G

Submit product Schedule indicating types, quantities, sizes, and installation locations by room for each toilet accessory item required. Identify locations using room designations indicated on the drawings.

SD-03 Product Data

Recycled content for stainless steel toilet accessories; S

Combination Paper Towel Dispenser/Waste Receptacle; G

C

Item A5090 Disposal, Sanitary Napkin, SS, Surface Mounted; G

Item A5109 Grab Bar, 1-1/4 inch Dia., SS, 2 Wall, W/C Accessible; G

Item A5135 Shelf, Utility W/ Mop/Broom Holders, SS, Surf Mntd; G

Item A5150 Hook, Garment, Triple, Surface Mounted; G

Soap Dispenser; G

Item A5200 Dispenser, Toilet Tissue, SS, 2-Roll, Surface Mntd; G

Toilet Seat Cover Dispenser; G

Submit catalog numbers, literature, data sheets, construction details, profiles, anchoring and mounting requirements ,including cutouts in other work and substrate preparation,,electrical characteristics, and other pertinent data for each toilet accessory item to evaluate function, materials, dimensions and appearance.

SD-07 Certificates

SD-10 Operation and Maintenance Data

Combination Paper Towel Dispenser/Waste Receptacle; G

Item A5090 Disposal, Sanitary Napkin, SS, Surface Mounted; G

Item A5109 Grab Bar, 1-1/4 inch Dia., SS, 2 Wall, W/C Accessible; G

Item A5135 Shelf, Utility W/ Mop/Broom Holders, SS, Surf Mntd; G

Item A5150 Hook, Garment, Triple, Surface Mounted; G

Soap Dispenser; G

Item A5200 Dispenser, Toilet Tissue, SS, 2-Roll, Surface Mntd; G

Toilet Seat Cover Dispenser; G

Submit Data Package 1 for each toilet accessory item , and Data Package 2 for each electrical toilet accessory item, in accordance with Section 01 78 23 OPERATIONS AND MAINTENANCE DATA.

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization, Sourcing of Raw Materials:

a. Submit manufacturer’s data sheet or statement of pre-consumer and post-consumer recycled content. Indicate the percentage of the dollar value of the recycled content compared to the total dollar value of the product or assembly containing the product.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Low-Emitting Materials - Interior adhesives and sealants applied on site:

a. Meet the VOC emissions evaluation and the VOC content evaluation. The adhesives and sealants product category include all interior adhesives and sealants applied on site. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full VOC content and emissions requirements.

1. For CDPH version compliance information, refer to LEED

interpretation #ID 10495 “LEM for v4 projects”:
https://www.usgbc.org/leedaddenda/10495

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.3 CERTIFICATIONS

1.4 DELIVERY, STORAGE, AND HANDLING

Wrap toilet accessories for shipment and storage, then deliver to the jobsite in manufacturer's original packaging, and store in a clean, dry area protected from construction damage and vandalism.

1.5 WARRANTY

Provide manufacturer's warranty to repair or replace defective materials and workmanship for a period of one year from date of final acceptance of the work.

PART 2 PRODUCTS

2.1 ACCESSORY ITEMS

Provide toilet accessories where indicated in accordance with Contractor-provided product schedule. Conform to the requirements for accessory items specified herein which are based on MIL-STD-1691 Joint Schedule Numbers (JSN). Porcelain type, tile-wall accessories are specified in Section 09 30 10 CERAMIC, QUARRY, AND GLASS TILING. Provide each accessory item complete with the necessary mounting plates of sturdy construction with corrosion resistant surface.

Provide stainless steel products listed herein manufactured from materials containing a minimum of 50 percent recycled content. Provide data identifying percentage of recycled content for stainless steel toilet accessories.

2.1.1 Anchors and Fasteners

Provide corrosion-resistant anchors and fasteners capable of developing a restraining force commensurate with the strength of the accessory to be mounted and suited for use with the supporting construction. Provide tamperproof design exposed fasteners with finish to match the accessory. Provide fasteners proposed for use for each type of wall construction and mounting.

2.1.2 Finishes

Except where noted otherwise, provide the following finishes on metal:

Metal	Finish
Stainless steel	No. 4 satin finish
Carbon steel, copper alloy, and brass	Chromium plated, bright

2.1.3 Accessory Type F Combination Paper Towel Dispenser/Waste Receptacle, Recessed

Recess mounted paper towel dispenser/waste receptacle. Unit constructed of heavy gauge stainless steel with satin finish, all welded construction, have full length piano hinge, tumbler lock, and be removable for service. Provide waste receptacle capacity of 12 gallons. Provide waste receptacle that accepts reusable liner standard for unit manufacturer. Unit dispenses 600 C-fold, single-fold or 400 multi-fold paper towels and be self-feeding until supply is depleted. Towel dispensing slot is snag-free. Unit is ADA compliant.

Approximate size: 12 inches wide by 17 inches high by 4 inches deep.

2.1.4 Accessory Type C Item A5090 Disposal, Sanitary Napkin, SS, Surface Mounted

Surface mounted sanitary napkin receptacle. Unit made of stainless steel with satin finish and all welded construction. Unit has piano hinge attached at the top and an integral finger depression for opening. For use with disposable paper liners, available separately. Unit may be attached to wall or toilet partition.

Approximate size: 7 inches wide by 4 inches deep by 10 inches high.

2.1.5 Accessory Type A Item A5109 Grab Bar, 1-1/4 Inch Diameter, SS, 2 Wall, W/C Accessible

Grab bar of 1-1/4 inch diameter satin finish stainless steel with peened gripping surface for use in toilet stall/room. Snap-on flange covers for concealed mounting are stainless steel and equipped with two screw holes for attachment to wall. Grab bars designed to meet and exceed ADA requirements for structural strength. Grab bars designed to withstand loads of 900 pounds when properly installed. Clearance from wall to grab bar is 1-1/2 inches to meet ADA and ANSI codes.

2.1.6 Janitor's Closets TypicalItem A5135 Shelf, Utility W/ Mop/Broom Holders, SS, Surf Mounted

Surface mounted mop/broom holder with shelf made of 18 gauge stainless steel with all exposed surfaces in satin finish. Unit has shelf 8 inches deep with shelf support brackets of satin finish stainless steel welded to mounting base, and 4 holders to secure mop or broom handles. Mop holders have spring-loaded rubber cams and hold mop or broom handle with a diameter between 5/8 inch and 1 inch.

Approximate size: 36 inches wide by 8 inches deep.

2.1.7 Accessory Type G Item A5150 Hook, Garment, Triple, Surface Mounted

Surface mounted garment hook. Unit has four metal hooks with a backplate made of anodized or polished aluminum finished panel. For mounting directly on wall or to panel.

Approximate maximum weight capacity: 35 pounds.

Approximate size: 36 inches wide by 4 inches high by 3/4 inch deep.

2.1.8 Accessory Type D Soap Dispenser

Provide vanity-mounted, hands-free soap dispenser in a black translucent finish, liquid type consisting of a vertical tank with holding capacity of 1200 mL with a corrosion-resistant, all purpose valve that dispenses liquid soap, lotions, detergents and antiseptic soaps.

Approximate size: 7 inches wide by 5 inches high by 2-3/4 inches deep.

2.1.9 Accessory Type F Item A5200 Dispenser, Toilet Tissue, SS, 2-Roll, Surface Mounted

Concealed surface mounted, double roll, toilet tissue dispenser of stainless steel. Unit holds and dispenses two standard 5-1/4 inch diameter rolls of toilet tissue. Spindles are free-spinning for non-controlled delivery, chrome-plated plastic equipped with heavy-duty internal springs.

Approximate size: 7 inches diameter by 4 inches deep.

2.1.10 Accessory Type B Toilet Seat Cover Dispenser

Provide Type 304 stainless steel with surface mounted toilet seat cover dispensers. Provide dispenser with a minimum capacity of 500 seat covers.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install items that show visual evidence of biological growth. Provide the same finish for the surfaces of fastening devices exposed after installation as the attached accessory. Provide oval exposed screw heads. Install accessories at the location and height indicated. Protect exposed surfaces of accessories with strippable plastic or by other means until the installation is accepted. After acceptance of accessories, remove and dispose of strippable plastic protection. Coordinate accessory manufacturer's mounting details with other trades as their work progresses. Use sealants for brackets, plates, anchoring devices and similar items in showers (a silicone sealantsealant specified in Section 07 92 00 JOINT SEALANTS) as they are set to provide a watertight installation. After installation, thoroughly clean exposed surfaces and restore damaged work to its original condition or replace with new work.

3.1.1 Recessed Accessories

Fasten accessories with wood screws to studs, blocking or rough frame in wood construction. Set anchors in mortar in masonry construction. Fasten to metal studs or framing with sheet metal screws in metal construction.

3.1.2 Surface Mounted Accessories

Mount on concealed backplates, unless specified otherwise. Conceal fasteners on accessories without backplates. Install accessories with corrosion-resistant fasteners as required by the construction. Install backplates in the same manner, or provide with lugs or anchors set in mortar, as required by the construction. Fasten accessories mounted on gypsum board and plaster walls without solid backing into the metal or wood studs, or to backplates secured to metal studs.

3.2 CLEANING

Clean material in accordance with manufacturer's recommendations. Do not use alkaline or abrasive agents. Take precautions to avoid scratching or marring exposed surfaces.

-- End of Section --

SECTION 10 44 16

FIRE EXTINGUISHERS
11/19

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM E814	(2013a; R 2017) Standard Test Method for Fire Tests of Penetration Firestop Systems

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 1	(2018) Fire Code
NFPA 10	(2018; ERTA 1-2 2018) Standard for Portable Fire Extinguishers
NFPA 101	(2018; ERTA 18-1; ERTA 18-2; ERTA 18-3; ERTA 18-4; TIA 18-1; TIA 18-2; TIA 18-3; TIA 18-4) Life Safety Code

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-600-01	(2016; with Change 3, 2019) Fire Protection Engineering for Facilities

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

29 CFR 1910.157	(2003) Portable Fire Extinguishers

UNDERWRITERS LABORATORIES (UL)

UL 299	(2012) Dry Chemical Fire Extinguishers

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fire Extinguishers; G, AE

Accessories; G, RO

Cabinets; G, AE

Wall Brackets; G, RO

Schedule; G, RO

SD-03 Product Data

Fire Extinguishers; G, AE

Accessories; G, AE

Cabinets; G, AE

Wall Brackets; G, RO

Replacement Parts List; G, RO

SD-04 Samples

Equipment Samples; G, RO

One full-sized sample of each type of Cabinet to be installed; three samples of wall brackets and accessories of each type being installed.

Approved samples may be used for installation, with proper identification and storage.

SD-07 Certificates

Fire Extinguishers Certifications; G, RO

Manufacturer's Warranty with Inspection Tag; G, RO

1.3 DELIVERY, STORAGE, AND HANDLING

Protect materials from weather, soil, and damage during delivery, storage, and construction.

Deliver materials in their original packages, containers, or bundles bearing the brand name and the name and type of the material.

1.3.1 Samples

Provide the following equipment samples: One of each type of fire extinguisher being installed; one full-sized sample of each type of cabinet being installed; three samples of wall brackets and accessories of each type being used.

Use approved samples for installation, with proper identification and storage.

1.4 WARRANTY

Guarantee that Fire Extinguishers are free of defects in materials, fabrication, finish, and installation and that they will remain so for a period of not less than one year after completion.

Submit the manufacturer's warranty with inspection tag.

1.5 PROJECT SCHEDULE

For fire extinguishers. Coordinate final fire extinguisher schedule with fire protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

PART 2 PRODUCTS

Submit fabrication drawings consisting of fabrication and assembly details performed in the factory and product data for the following items: Fire Extinguishers; Accessories, cabinets, Wall Brackets.

2.1 SYSTEM DESCRIPTION

2.1.1 Types

Submit fire extinguishers certifications showing compliance with local codes and regulations.

Provide fire extinguishers conforming to NFPA 10. Provide quantity and placement in compliance with the applicable sections of NFPA 1, NFPA 101, , , , , , , 29 CFR 1910.157, and UFC 3-600-01.

Provide dry chemical type fire extinguishers compliant with UL 299.

2.1.2 Material

Provide enameled steel extinguisher shell.

2.1.3 Size

10 pounds extinguishers.

2.1.4 Accessories

Pressure gage

2.2 EQUIPMENT

2.2.1 Cabinets

a. Mounting: Semi-recessed

b. Door Style: Vertical Duo Clear Acrylic Door

c. Finish: Baked Enamel Steel

d. Color: Selected by AE from standard colors

2.2.1.1 Material

Provide enameled steel cabinets.

2.2.1.2 Type

Provide semi-recessed bubble-type cabinet.

Provide a fire rated cabinet, listed and labeled to comply with ASTM E814 for fire resistance wall rating.

2.2.1.3 Size

Dimension cabinets to accommodate the specified fire extinguishers.

2.2.2 Wall Brackets

Provide spring-clip fire extinguisher wall brackets.

Provide wall bracket and accessories as approved.

2.2.2.1 Identification

Provide lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by the drawings.

Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

Orientation: Vertical.

PART 3 EXECUTION

3.1 INSTALLATION

Install Fire Extinguishers where indicated on the drawings. Verify exact locations prior to installation.

Provide extinguishers which are fully charged and ready for operation upon installation. Provide extinguishers complete with Manufacturer's Warranty with Inspection Tag attached.

Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

Comply with the manufacturer's recommendations for all installations.

3.2 PROTECTION

3.2.1 Repairing

Remove and replace damaged and unacceptable portions of completed work with new work at no additional cost to the Government.

Submit replacement parts list indicating specified items replacement part, replacement cost, and name, address and contact for replacement parts distributor.

3.2.2 Cleaning

Clean all surfaces of the work, and adjacent surfaces which are soiled as a result of the work. Remove from the site all construction equipment, tools, surplus materials and rubbish resulting from the work.

-- End of Section --

SECTION 11 05 40

COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT
08/17, CHG 1: 02/18

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ANSI/ASHRAE 15 & 34	(2016) ANSI/ASHRAE Standard 15-Safety Standard for Refrigeration Systems and ANSI/ASHRAE Standard 34-Designation and Safety Classification of Refrigerants

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2020) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ICS 2	(2000; R 2020) Industrial Control and Systems Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 6	(1993; R 2016) Industrial Control and Systems: Enclosures
NEMA MG 1	(2018) Motors and Generators
NEMA MG 2	(2014) Safety Standard for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code

NSF INTERNATIONAL (NSF)

NSF/ANSI 6	(2021) Dispensing Freezers
NSF/ANSI 7	(2021) Commercial Refrigerators and Freezers
NSF/ANSI 14	(2020) Plastics Piping System Components and Related Materials
NSF/ANSI 37	(2021) Air Curtains for Entranceways in Food and Food Service Establishments

NSF/ANSI 51	(2012) Food Equipment Materials

UNDERWRITERS LABORATORIES (UL)

UL 197	(2010; Reprint Jul 2020) UL Standard for Safety Commercial Electric Cooking Appliances
UL 207	(2009; Reprint Jan 2020) Refrigerant-Containing Components and Accessories, Nonelectrical
UL 471	(2010; Reprint Sep 2019) UL Standard for Safety Commercial Refrigerators and Freezers
UL 763	(2018) UL Standard for Safety Motor-Operated Commercial Food Preparing Machines

1.2 GENERAL REQUIREMENTS

1.2.1 Mechanical General Requirements

Section 22 00 00 PLUMBING, GENERAL PURPOSE applies to this section. Coordinate the location of drainage receptacles with food preparation equipment requiring plumbing connections. All plastics and piping system components must conform to NSF/ANSI 14. Materials must conform to NSF/ANSI 51. Refrigeration equipment must conform to ANSI/ASHRAE 15 & 34, NSF/ANSI 37, NSF/ANSI 6, NSF/ANSI 7, UL 207, and UL 471.

1.2.2 Electrical General Requirements

All electrical work must conform to NFPA 70, and NEMA 250. Motors and controllers must conform to the requirements of NEMA ICS 2, NEMA ICS 6, NEMA MG 1, NEMA MG 2 and UL 763.

1.3 DESCRIPTION OF WORK

The work includes installing food service preparation equipment and related work. Verify all existing dimensions, contract drawings, product data and all related conditions prior to commencing rough-in work. Advise the Contracting Officer of all discrepancies prior to the equipment being ordered. Submit Contractor's Field Verification Data prior to the preconstruction meeting addressing the following:

a. Field verify all horizontal and vertical dimensions.

b. Review contract drawings and submittal data for accuracy and completeness.

c. Field check installed utility capacity and location.

d. Coordinate and verify delivery for access through finished openings and vertical handling limitation within the building.

Provide rough-in and connect utilities to equipment in accordance with requirements specified in other sections of this specification and in accord with the physical dimensions, capacities, manufacturer's

instructions, and other requirements of the equipment furnished.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for information only. When used, a designation following the "G" classification identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contractor's Field Verification Data; G

SD-02 Shop Drawings

Installation Instructions and Diagrams; G

SD-11 Closeout Submittals

Contractor's Warranty for Installation; G

1.5 QUALITY ASSURANCE

1.5.1 Pre-Installation Conference

Thirty days prior to the commencement of work, notify the Contracting Officer that the following items are prepared and ready for review:

a. Preconstruction Submittals:

(1) Contractor's Field Verification Data

b. Shop Drawings, product data and installation instructions

(1) Installation Instructions and Diagrams

c. Manufacturer's Instructions

Manufacturer's Instructions for shipping, handling, storage, installation, and start-up.

1.6 DELIVERY, STORAGE, AND HANDLING

Unless otherwise directed, the following procedures apply:

1.6.1 Delivery

a. Deliver minor appliances and loose items to the jobsite when the Contracting Officer is prepared to receive and inventory such items.

1.6.2 Storage of Equipment and Accessories

Store delivered items with protection from weather, humidity, and temperature variation, dirt and dust, or other contaminants. Clearly label and identify all components.

1.6.3 Prohibited Use of Equipment

Do not use food service equipment as tool or material storage, work bench, scaffold, or stacking area.

1.6.4 Damaged Equipment

Immediately submit documentation to the Contracting Officer with a recommendation of action for repair or replacement and the impact on project schedule.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

Prior to commencement of installation, perform a complete walk down of the facility with the Contracting Officer to verify readiness for installation.

Provide adequate protection of all finished surfaces, fixtures, furnishings and other equipment to prevent any damage during the installation work.

Conduct installation procedures conforming to applicable NSF, OSHA and UL standards specified, and the manufacturer's instructions.

Set all equipment plumb and level. Except for mobile and adjustable-leg equipment, securely anchor and attach items and accessories to walls, floors, or bases with stainless steel bolts.

No drilling, cutting, burning, or welding of structural parts of building is permitted. Provide access panels for concealed valves, vent controls, and control devices and items requiring periodic operation, inspection, or maintenance.

3.1.1 Equipment Connections

Complete equipment connections for all utilities. Provide access panels of sufficient size and so located that concealed items may be serviced and maintained or removed and replaced.

3.1.2 Electrical Work

Electrical systems, components and accessories must be certified to be in accordance with NFPA 70 and the following:

3.1.2.1 Installed Equipment Load

If the electrical load of the approved equipment differs from that specified or shown on the drawings, provide and install electrical service compatible with the approved equipment.

3.1.2.2 Electrical Equipment and Components

Food service equipment furnished under this section must have loads, voltages, and phases compatible with building system, and conform to manufacturer standards.

3.1.2.3 Cords and Caps

Coordinate all food service equipment cord/caps with related receptacles. All 120/208/240 volt "plug-in" equipment must have Type SO or SJO cord and a plug with ground, fastened to frame/body of item. Provide mobile equipment with a strain-relief assembly at the cord connection of the appliance. Mobile electrical support equipment and counter appliances mounted on mobile stands must have cord/cap assembly with cord-hanger as provided by the manufacturer.

3.1.2.4 Switches and Controls

Equip each motor-driven appliance or electrically-heated unit with control switch and overload protection per UL 197 and UL 471. Switches, controls, control transformers, starters, equipment protection and enclosures must be Industry Standards for the related equipment environment.

3.1.2.5 Final Electrical Connection Provisions

Tag final electrical connection points of equipment with item number, name of devices on the circuit, total electrical load, voltage, and phase.

3.1.3 Plumbing Work

Tag all plumbing final connection points of equipment, indicating item number, name of devices or components, and type of utility (water, gas, steam, drain). Provide extensions of indirect waste fitting to open-sight hub drain, floor sink or floor drains from food service equipment.

3.2 TESTS

Perform the tests including everything required. Notify the Contracting Officer, in writing, 10 days before performing tests. Perform tests in the presence of the Contracting Officer.

3.2.1 Initial Start-Up and Operational Test

Provide all lubricants and accessories before initial start-up. Start and operate all equipment. Follow the manufacturer's procedures and place the systems under all modes of operation. Supplement initial charges of lubricating oil to assure maximum operating capacity. Adjust all safety and automatic control instruments. Record manufacturer's recommended readings hourly. Operational tests must cover a period of not less than 3 days.

3.2.2 Cleaning and Adjusting

Test and adjust equipment for proper operation. Test rotating components and motors for proper rotation. Lubricate moving parts if suggested by manufacturer's literature. Prior to acceptance of project, clean and sanitize equipment both inside and outside.

3.3 CONTRACTOR'S WARRANTY for INSTALLATION

Submit contractor's warranty for installation to the Contracting Officer prior to final commissioning and acceptance.

-- End of Section --

SECTION 11 06 40.13

FOODSERVICE EQUIPMENT SCHEDULE
08/17

PART 1 GENERAL

1.1 REFERENCES

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

NSF INTERNATIONAL (NSF)

NSF Food Equipment	(2005) NSF Product Listings of Food Equipment and Related Products, Components and Materials
NSF/ANSI 2	(2019) Food Equipment
NSF/ANSI 169	(2012)Special Purpose Food Equipment and Devices

U.S. DEPARTMENT OF DEFENSE (DOD)

DOD 4000.25-1-M	(2006) MILSTRIP - Military Standard Requisitioning and Issue Procedures

U.S. DEPARTMENT OF ENERGY (DOE)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA WaterSense	(2006) WaterSense Water Efficiency Labeling System

1.2 DEFINITIONS

1.2.1 Abbreviations

Abbreviations used in paragraph FOOD SERVICE EQUIPMENT SCHEDULE are defined as follows:

AMPS:	Amperes
BTU:	British Thermal Units
CRS:	Corrosion Resistant Steel

CW:	Cold water
DIA:	Diameter
DR:	Drain
FED:	Federal Specification
G:	Gas
GAL:	Gallon
HP:	Horsepower
HW:	Hot Water
IN:	Inches
JSN:	Joint Schedule Numbers
KW:	Kilowatts
L:	Left
LB:	Pounds
LOG CLASS:	Logistical Classification
MIL:	Military Specification
MIN:	Minimum
NSF:	National Sanitation Foundation
R:	Right
SS:	Stainless Steel

STM:	Steam
x:	By, in usage describing dimensions of a rectangular solid

1.2.2 Dimensions

Dimensions used in paragraph FOOD SERVICE EQUIPMENT SCHEDULE are in inches, unless otherwise noted. Dimensions are listed in order of length, width, and height, unless otherwise noted. Terms are defined as follows:

a. Length: Distance across front of equipment

b. Width: Distance from front edge to back edge

c. Height: Distance from bottom edge to top of equipment

d. Depth: Distance from rim to bottom at drain, as in a sink.

1.2.3 Logistical Classification

Method of Procurement listed in paragraph FOOD SERVICE EQUIPMENT SCHEDULE is defined as follows:

a. Class A: Contractor-furnished and Contractor-installed.

b. Class B: Government-furnished and Contractor-installed.

c. Class C: Government-furnished and Government-installed.

Equipment designated Logistical Class "C" will be Government-provided. Equipment which is Government-provided will be furnished and installed by the Government in space made available by the Contractor and with rough-in made by the Contractor in accord with the information made available or referenced herein or indicated.

1.3 GENERAL REQUIREMENTS

Submit detailed Food Service Equipment Schedule conforming to DOD 4000.25-1-M. Electrically powered equipment specified within this section must conform to EPA Energy Star requirements and labeling. Food Service Equipment must conform to NSF/ANSI 2 and NSF Food Equipment standards. Special purpose equipment must conform to NSF/ANSI 169. Submit in the same format as the equipment schedule on the drawings. Include Energy Star Labeled models and EPA WaterSense Fixtures.

1.3.1 Design Requirements

Submit detail drawings for all food service equipment and accessory items. Drawings must be 1/4 inch scale minimum.

Submit a complete list of equipment, material data, and drawings as specified.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When

used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Food Service Equipment Schedule; G

PART 2 PRODUCTS

2.1 LIST OF EQUIPMENT

2.1.1 Format

Provide the equipment listed except as otherwise specified as a result of the Logistical Class listed. Entries in paragraph FOOD SERVICE EQUIPMENT SCHEDULE include the following information, when applicable:

a. Equipment Symbol.

b. Logistical Classification.

c. Generic description of equipment.

d. Referenced applicable document or statement that equipment is Custom Fabricated or of Commercial design.

e. Classification: Type, Style, Class, Size, Group, Model and Grade for equipment defined by referenced applicable document.

f. Description for Custom Fabricated and Commercial design, and required features or accessories.

g. Dimension: listed in order of length, width and height.

h. Utility Requirements: Electrical: volts, hertz, phase; gas; plumbing: water, drain; listed in order.

2.1.2 Food Service Equipment Schedule

Equipment Symbol	Logical Class	Description
__-__-_	C	Blender
__-__-_	C	Cashier Point of Sales
__-__-_	C	Coffee Maker, Espresso Machine
__-__-_	C	Coffee Urn
__-__-_	C	Condiment Racks

Equipment Symbol	Logical Class	Description
	a	Hand Sink
__-__-_	B	Ice Machine
__-__-_	C	Napkin Dispenser
__-__-_	C	Personnel Protective Equipment
__-__-_	C	Remote Syrup Containers
__-__-_	B	Refrigerated Display Cases and Coolers, 1 door front loading
	A	Slip Resistant Mats
__-__-_	a	Undercounter Refrigerators, 2 door
	A	Waste Containers
__-__-_	a	Waste Disposal Unit
__-__-_	a	Water Dispenser
__-__-_	B	Pastry Case
__-__-_	B	Degital Display Menu Board

PART 3 EXECUTION

3.1 LABELING AND IDENTIFICATION

Clearly label and identify all components with respective number as enumerated in approved Food Service Equipment Schedule. Provide equipment with tags numbered and stamped for their use as indicated on the Food Service Equipment Schedule. Provide brass or non-ferrous plates and tags. Minimum letter and numeral sizes are 1/8 inch high.

-- End of Section --

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SECTION 11 31 13

ELECTRIC KITCHEN EQUIPMENT
08/17

PART 1 GENERAL

1.1 REFERENCES

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

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code

U.S. DEPARTMENT OF ENERGY (DOE)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Kitchen Equipment

Energy Star Label for Refrigerator; S

Energy Star Label for Ice Maker; S

SD-08 Manufacturer's Instructions

Kitchen Equipment

SD-10 Operation and Maintenance Data

Kitchen Equipment; G

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

SD-11 Closeout Submittals

Contractor's Warranty for Installation

1.2.1 Sustainable Design Submittals

a. Provide product data for commercial refrigeration equipment stating refrigerant type listed in pounds. Include Energy Star label if applicable.

PART 2 PRODUCTS

2.1 KITCHEN EQUIPMENT

2.1.1 Undercounter Refrigerator

UL listed, under counter refrigerator with no freezer, minimum 13.3 cubic feet. Provide refrigerator that is Energy Star labeled. Provide data identifying Energy Star label for refrigerator. Provide four fixed rollers or adjustable leg levelers.

2.1.2 Ice Maker

UL listed and NSF approved; self-contained, air-cooled model, minimum ice cube production of 140 to 190 pounds per 24 hours, and minimum bin storage capacity of 90 pounds of ice cubes. Provide ice maker that is Energy Star labeled. Provide data identifying Energy Star label for ice maker. Provide stainless steel cabinet panels, solid state automatic thickness controls, built-in self-analyzing integrated circuits, removable access panels, and bin of polyethylene foam or equivalent noncorrosive construction.

2.1.3 Pastry Case

UL listed pastry case; refrigerated self serve bottom display with service top display. Rear access to the refrigeration system. R404 refrigerant. Provide adjustable leg levelers.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install items that show visual evidence of biological growth.

NFPA 70, Section 22 00 00 PLUMBING, GENERAL PURPOSE and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Install kitchen equipment in accordance with manufacturers' instructions.

3.2 FIELD QUALITY CONTROL

Conduct inspection and testing in the presence of the Contracting Officer.

3.2.1 Field Inspection

Before and after installation, inspect each piece of kitchen equipment for compliance with specified requirements.

3.2.2 Operation Tests

Upon completion, but before final acceptance, perform operation tests on each piece of equipment to determine that components, including controls, safety devices, and attachments, operate properly and in accordance with specified requirements.

3.3 CONTRACTOR'S WARRANTY FOR INSTALLATION

Submit contractor's warranty for installation to the Contracting Officer prior to final commissioning and acceptance.

-- End of Section --

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SECTION 11 41 11

REFRIGERATED AND FROZEN FOOD STORAGE EQUIPMENT
08/17

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ANSI/ASHRAE 15 & 34	(2016) ANSI/ASHRAE Standard 15-Safety Standard for Refrigeration Systems and ANSI/ASHRAE Standard 34-Designation and Safety Classification of Refrigerants
ASHRAE 189.1	(2014) Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings

NSF INTERNATIONAL (NSF)

NSF Food Equipment	(2005) NSF Product Listings of Food Equipment and Related Products, Components and Materials

1.2 GENERAL REQUIREMENTS

Refer to Section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT for general requirements. Refer to Section 11 06 40.13 FOODSERVICE EQUIPMENT SCHEDULE for detailed requirements.

1.3 DESCRIPTION OF WORK

The work includes installing refrigerated food service equipment and all related work necessary to provide a complete installation. Verify existing dimensions, site conditions, and required utility connections prior to commencement of work. Coordinate delivery of components with finished openings and other vertical handling limitations within the building. Advise the Contracting Officer of discrepancies prior to installation of equipment. Submit Contractor's Field Verification Data prior to the preconstruction meeting.

Provide rough-in and utility connections to equipment in accord with requirements specified in other sections of this specification. Coordinate physical dimensions, capacities, manufacturer's instructions, and other requirements of the equipment furnished.

1.3.1 Design Requirements

Submit detail drawings as stated in Section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT for refrigerated food and drink storage cases. Provide drawings at a minimum 1/4 inch scale.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contractor's Field Verification Data; G

SD-02 Shop Drawings

Manufacturer's Detail Drawings; G

Custom Fabricated Equipment; G

Installation Instructions and Diagrams; G

SD-03 Product Data

Refrigerated Food and Drink Storage Cases; G

SD-06 Test Reports

Field Test Reports; G

SD-08 Manufacturer's Instructions

Manufacturer's Instructions for Shipping, Handling, Storage, Installation, and Start-Up.

SD-11 Closeout Submittals

Manufacturer's Warranty

Contractor's Warranty for Installation

1.4.1 Sustainable Design Submittals

a. Provide product data for commercial refrigeration equipment stating refrigerant type listed in pounds. Include Energy Star label if applicable.

1.5 SHOP DRAWINGS

Submit manufacturer's detail drawings and custom fabricated equipment drawings for each refrigerated enclosure. Include insulation details, utility connections, and installation instructions and diagrams. Base shop drawings on verified field measurements and include contractor's field verification data.

1.6 QUALITY ASSURANCE

Refer to Section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT.

1.6.1 Pre-Installation Conference

Thirty days prior to commencement of work, notify the Contracting Officer that the following items are prepared and ready for review:

a. Shop Drawings, product data and installation instructions

(1) Installation instructions and diagrams

b. Product Data

(1) Refrigerated food and drink storage cases

c. Manufacturer's Instructions

For shipping, handling, storage, installation, and start-up.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install items that show visual evidence of biological growth.

Prior to commencement of installation, perform a complete walk through of the facility with the Contracting Officer to verify readiness for installation.

Provide adequate protection of all finished surfaces, fixtures,furnishings and other equipment to prevent any damage during the installation work.

Conduct installation procedures in accordance with ANSI/ASHRAE 15 & 34, ASHRAE 189.1, NSF Food Equipment and UL standards stated herein, and with the manufacturer's instructions.

3.1.1 Equipment Connections

Complete equipment connections for all utilities.

3.2 TESTS

Perform the tests as specified. Notify the Contracting Officer in writing, 10 days prior to performing tests. Perform tests in the presence of the Contracting Officer.

3.2.1 Initial Start-Up and Operational Test

Provide all accessories before initial start-up. Start and operate all equipment. Follow the manufacturer's procedures and place the systems in all modes of operation. Adjust all safety and automatic control instruments. Record manufacturer's recommended readings hourly.

Operational tests must cover a period of not less than 3 days. Refer to Section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT for detailed Operation and Maintenance Manuals requirements.

Upon completion of start-up and operational tests submit a list of authorized local service and repair entities.

3.2.2 Test Reports

Submit final field test reports for each system tested, describing test apparatus, instrumentation calculations, and equipment data based on industry standard forms or reasonable facsimiles thereof. Include in data: compressor suction and discharge pressure; refrigerant charge pump, compressor and air moving device ampere readings; power supply characteristics, including phase imbalance, with 1/2 percent accuracy; thermostatic expansion valve superheat-value as determined by field test; subcooling; high and low refrigerant temperature switch set points; low oil pressure switch set point; moisture content; ambient, condensing and coolant temperatures; capacity control set points; field data and adjustments which affect unit performance and energy consumption. Where final adjustments and settings cannot be permanently marked as an integral part of device, include adjustment and setting data in test report.

3.3 MANUFACTURER'S WARRANTY

Submit all manufacturers' signed warranties to Contracting Officer prior to final commissioning and acceptance.

3.4 CONTRACTOR'S WARRANTY for INSTALLATION

Submit contractor's warranty for installation to the Contracting Officer prior to final commissioning and acceptance.

-- End of Section --

SECTION 11 47 00

ICE MACHINES
08/17

PART 1 GENERAL

1.1 SUMMARY

The work includes installing ice making equipment, including dispensing, production, storage, and autocleaning equipment and related work. Include coordination of delivery through existing finished opening and vertical handling limitations within the building.

a. Provide rough-in and connect utilities to equipment in accordance with requirements specified in other sections of this specification and in conformance with the physical dimensions, capacities, manufacturer's instructions, and other requirements of the equipment furnished.

b. Refer to Section 11 05 40 COMMON WORK RESULTS FOR FOOD SERVICE EQUIPMENT for general requirements. Refer to Section 11 06 40.13 FOODSERVICE EQUIPMENT SCHEDULE for Food Service Equipment Schedule.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contractor's Field Verification Data; G

SD-02 Shop Drawings

Detail Drawings; G

Custom Fabricated Equipment; G

Installation Instructions and Diagrams; G

SD-05 Design Data

Manufacturer's Applicable Literature; G

SD-08 Manufacturer's Instructions

Manufacturer's Instructions; G

SD-10 Operation and Maintenance Data

Ice Making equipment, Data Package 2; G

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

SD-11 Closeout Submittals

Contractor's Warranty for Installation

1.2.1 Sustainable Design Submittals

a. Provide Energy Star label for ice machine.

1.3 ADMINISTRATIVE REQUIREMENTS

1.3.1 Pre-Installation Meeting

Thirty days prior to the commencement of work, notify the Contracting Officer that the following items are prepared and ready for review:

1.3.1.1 Shop Drawings

Detail drawings, as specified, including insulation and utility requirements, product data, installation instructions and diagrams. Submit custom fabricated equipment drawings after approval of ice machine equipment drawings. Drawings must be 1/4 inch scale minimum.

1.3.1.2 Product Data

Submit the product data for the following equipment, as well as the associated manufacturer's data:

a. Manufacturer's applicable literature

b. Manufacturer's Instructions for shipping, handling, storage, installation, and start-up.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

Do not install items that show visual evidence of biological growth.

After becoming familiar with all details of the work, verify all existing dimensions, contract drawings, product data and all related conditions prior to commencing rough-in work. Advise the Contracting Officer of any discrepancies prior to ordering equipment. Submit Contractor's Field Verification Data prior to the pre-installation meeting.

3.2 INSTALLATION

Refer to Section 11 05 40 COMMON WORK RESULTS FOR FOOD SERVICE EQUIPMENT for detailed installation procedures, operation and maintenance manual requirements, training and project closeout procedures. Include all ice making and autocleaning equipment Field Test Reports.

3.3 CONTRACTOR'S WARRANTY FOR INSTALLATION

Submit contractor's warranty for installation to the Contracting Officer prior to final commissioning and acceptance.

-- End of Section --

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SECTION 12 22 00

CURTAINS AND DRAPES
08/16

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM D3691/D3691M	(2019) Standard Performance Specification for Woven, Lace, and Knit Household Curtain and Drapery Fabrics

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

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

NSF INTERNATIONAL (NSF)

NSF/ANSI 336	(2018) Sustainability Assessment for Commercial Furnishings Fabric

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with

Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Drawings; G

SD-03 Product Data

Drapery System

SD-04 Samples

Drapery Fabric; G

Submit a range of three samples, 36 by 36 inches or larger, to match the fabric quality, weight, pattern, and color shown or specified. Once selected, label approved samples to identify locations for their use in the project. Maintain identification and approval markings until final acceptance of the work.

SD-06 Test Reports

Flame Resistance

SD-07 Certificates

Indoor Air Quality for Fabrics; S

SD-08 Manufacturer's Instructions

Drapery Hardware

Special Fabrication

Before fabrication, submit the manufacturer's printed instructions for fabrics requiring special fabrication methods.

SD-10 Operation and Maintenance Data

Drapery System, Data Package 1; G

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for fabric, if available, that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification; Facts –

NSF/ANSI 336.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

2. Low-Emitting Materials - Wall panels:

a. Meet the VOC emissions evaluation, or inherently nonemitting sources criteria, or salvaged and reused materials criteria. The wall panels product category includes all finish wall treatments (wall coverings, wall paneling, wall tile), surface wall structures such as gypsum or plaster, cubicle/curtain/partition walls, trim, doors, frames, windows, and window treatments. Removable/interchangeable fabric panels, built-in cabinetry, and vertical structural elements are excluded. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full emissions requirements.

b. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality Certifications

1.3.1.1 Fabrics

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold. Provide current product certification documentation from certification body.

1.4 DRAWINGS

Submit drawings indicating the following:

Windows and other locations requiring drapery extent of drapery, to

ceiling or to specific height above windows; location of each different drapery fabric when more than one type, pattern or color is to be provided; width of window and width of drapery extension if bay window. Motor and Controller location and any integrated components or accessories.

1.5 SYSTEM REQUIREMENTS

Submit data for completed drapery system in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA. Include laundering and dry cleaning instructions for fabrics requiring special care. Furnish separate instruction sheet for each material (one for fiberglass, one for Verel). For fabrics which are not permanently or inherently flame resistant, furnish instruction to include frequency and process required for retreating the fabric to renew the effectiveness of the flame resistant treatment. Head each sheet with name and number of room or rooms in which each material is hung. In lieu of instruction sheets, provide instructions on small, permanent labels (either iron-on type or sewn-on) affixed to back of the heading of each panel.

1.6 DELIVERY, STORAGE, AND HANDLING

Deliver draperies and hardware to the site in sealed containers clearly labeled with manufacturer's name and contents. Store in a safe, dry, clean, and well ventilated area. Do not open containers until needed for installation, unless verification inspection is required.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Fabrics

Provide fabrics meeting the emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type). Provide certification or validation of indoor air quality for fabrics.

a. Building Product Declarations: Provide fabric with Material Ingredient Report, if available.

2.1.1.1 Drapery Fabric

ASTM D3691/D3691M. Provide fabric manufactured from man-made fibers. Fabric physical characteristics must be as follows:

a. Finished fabric weight: 12.5 ounces / linear yard

b. Pattern: Woven

c. Weave: Closed (0 to 7 percent)

d. Texture: Twill

e. Color: as indicated in the color material legend on the drawings.

f. Shading coefficient (single glass with drapery): 2.1.1.2 Flame Resistance

NFPA 701. Drapery fabric must pass the small and large scale test.

Treatment to enhance flame resistance must be permanent type. If treated, fabric must pass the small and large scale test after being subjected to the accelerated dry cleaning or laundering cycles specified in NFPA 701.

2.1.2 Sewing Thread

Pre-shrunk mercerized cotton (50/3) or monofilament in equivalent size, except do not use monofilament in the heading.

2.1.3 Heading

2.1.3.1 Snap-Tape System (Ripplefold)

Heavy vinyl or nylon tape with locking fasteners attached to tape to form desired pleat spaces and fullness. Cut tapes to size and sew to drapery fabric to form the heading.

2.1.4 Drapery Hardware

Traverse ceiling mounted tracks of heavy-duty type. Traverse rods or tracks must be manually operated, one-way draw, left-to-right. Rods and tracks must be cold-rolled, commercial quality steel minimum 0.030 inch thick or extruded aluminum minimum 0.050 inch thick. Rod and track cross section width and depth must be sufficient to carry the drapery without sagging. Track configuration (number of channels) must be such so as to permit drapery operation as specified or indicated. Finish steel components with a black baked enamel, vinyl, or epoxy coating as standard with the manufacturer. Finish aluminum components with an anodic clear (natural) coating as standard with the manufacturer. Provide smooth and non-sticking sliding surfaces. Provide one-piece rod and track up to 16 feet long. Provide steel brackets and intermediate supports. Provide one manufacturer's design throughout.

2.1.4.1 Track Sets

Include ceiling track, sliding or rolling carriers, and caps for stationary draperies; ceiling track, sliding or rolling carriers, master sliding or rolling carriers, ball bearing end pulleys, and traverse cord with cord tension pulleys for traverse draperies.

2.1.4.2 Rod Sets

Include wall-hung rod, sliding or rolling carriers, master sliding or rolling carriers, ball bearing end pulleys, brackets, intermediate supports with 2-1/2 to 3-1/2 inch projection, and traverse cord with cord tension pulleys for traverse draperies.

2.1.4.3 Traverse Cord

Size No. 4 with fiberglass center. Provide cord tension pulley, metal tube type, with mounting
bracket, helical spring, and ball bearing pulley wheel. Finish color, white or off-white.

2.1.4.4 Hand Traverse Cordless Track System

Extra heavy duty track assembly with baton on roomside of draperies where it is readily visible and easily used. Ceiling mounted in extruded aluminum track anodized in clear (natural) finish.

2.1.5 Fasteners

Provide zinc plated.

2.2 FABRICATION

Prior to cutting and fabrication, field measure each drapery location paying particular attention to field conditions affecting the work.

2.2.1 Drapery Fabrication

2.2.1.1 Panels

Make from full or half widths of fabric to give a minimum of 100 percent fullness, which is defined as 2 times the rod width plus overlaps and returns. Provide ripplefold. Draperies must be floor length. Floor length draperies must hang 1 inch above finish floors. Cut fabric to allow for pleats and for outside ends to return to the walls. Accurately match patterned fabrics to provide identical designs horizontally and vertically. When fabricating panels from fabrics which require special methods or instructions, conform to the workroom instructions provided by the fabric manufacturer. Sew seams and hems using a firm interlocking stitch at a stitch rate per inch appropriate to fabric being sewn. Sew with enough slack present so that thread shrinkage due to laundering and dry cleaning will not pucker seams and hems. Do not expose seam and hem raw edges.

2.2.1.2 Seams

Join widths by serging, overlock, and safety stitch. Retain selvage when practical.

2.2.1.3 Hems

Double fold hems (top and bottom) and blind stitch so as not to show on the panel face. Make side seams 1-1/2 inches wide and bottom seams 4 inches deep with weights sewn 1/2 inch above hem bottom. Provide weights at corners and each vertical seam. When lining is attached to the drapery fabric, single fold heading is acceptable, however, double fold the bottom hem.

PART 3 EXECUTION

3.1 EXAMINATION

Ensure that work of other trades and cleaning operations are completed. Test completed installation to ensure smooth and continuous operation of all draperies, hardware and accessories.

3.2 INSTALLATION

Install draperies in rooms and areas indicated . Include all material indicated, specified, or necessary for a complete finished drapery installation. Contractor is responsible for the required quantities of draperies and hardware.

Do not install building construction materials that show visual evidence of biological growth.

3.2.1 Hardware

Install in accordance with the manufacturer's printed instructions and as specified herein. Provide fasteners for installation as follows:

Fastener	Structural Material
Self tapping screw	Metal
Case hardened, self-tapping sheet metal screw	Sheet metal

3.2.2 Draperies

Install with a minimum clearance of 1/4 inch between the ceiling and top of drapery heading. Floor length draperies must hang 1 inch above finished floors. Insert heading hooks at rear of each pleat, placed to obtain the clearance specified. Press well before hanging, except fiberglass. Dress-down and adjust hung draperies to provide best form and appearance. Traverse draperies must operate smoothly and easily over the full range of travel. Remove incorrectly sized drapery and remake to correct size. Remove damaged, spotted, or otherwise defective fabric and repair to original state or replace with new material.

-- End of Section --

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SECTION 12 24 13

ROLLER WINDOW SHADES
08/20

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI/WCMA A100.1	(2018) American National Standard for Safety of Window Covering Products

ASTM INTERNATIONAL (ASTM)

ASTM G21	(2015) Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

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

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

UNDERWRITERS LABORATORIES (UL)

UL 2818	(2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES

SD-02 Shop Drawings

Detailed Drawings; G

Location Schedule; G

SD-03 Product Data

Window Shades; G

Recycled Content for various fiber components; S

SD-04 Samples

Window Shades; G

SD-06 Test Reports

Flammability Requirements; G

SD-07 Certificates

Indoor Air Quality for roller window shades; S

Qualifications

SD-10 Operation and Maintenance Data

Window Shades, Data Package 1; G

SD-11 Closeout Submittals

Submit Data Package 1 for roller window shades, and Data Package 2 for electrical operators, in accordance with Section 01 78 23 OPERATIONS AND MAINTENANCE DATA.

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment, if available; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party

certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Low-Emitting Materials - Wall panels (shades):

a. Meet the VOC emissions evaluation, or inherently nonemitting sources criteria, or salvaged and reused materials criteria. The wall panels product category includes all finish wall treatments (wall coverings, wall paneling, wall tile), surface wall structures such as gypsum or plaster, cubicle/curtain/partition walls, trim, doors, frames, windows, and window treatments. Removable/interchangeable fabric panels, built-in cabinetry, and vertical structural elements are excluded. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4.1 for full emissions requirements.

b. Product is considered an inherently non-emitting source of VOCs if it is one of the following, and has no integral organic-based surface coatings, binders, or sealants: powder-coated metals, plated or anodized metal, and unfinished or untreated solid wood.

1.3 CERTIFICATES

1.3.1 Indoor Air Quality Certifications

1.3.1.1 Roller Window Shades

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold. Provide current product certification documentation from certification body.

1.4 QUALITY ASSURANCE

1.4.1 Qualifications

1.4.1.1 Installer's Qualifications

Installer trained and certified by the manufacturer with a minimum of ten years of experience in installing products comparable to those specified in this section.

1.4.2 Flammability Requirements

Passes in accordance with NFPA 701 small and large-scale vertical burn. Materials tested are identical to products proposed for use.

1.4.3 Anti-Microbial Requirements

'No Growth' per ASTM G21 results for fungi ATCC9642, ATCC 9644, ATCC9645.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver components to the jobsite in the manufacturer's original packaging

with the brand or company name, item identification, and project reference clearly marked. Store components in a dry location that is adequately ventilated and free from dust, water, or other contaminants and has easy access for inspection and handling. Store materials flat in a clean dry area with temperature maintained above 50 degrees F. Do not open containers until needed for installation unless verification inspection is required. Handle and store shades in accordance with manufacturer's recommendations.

1.6 WARRANTY

Provide manufacturer's warranty to repair or replace defective materials and workmanship for a period of 10 years from date of final acceptance of the work.

PART 2 PRODUCTS

2.1 WINDOW SHADES

Submit drawings showing plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to work. Submit a location schedule showing location, size and quantity of shades. Include the use of same room designations as indicated on the drawings.

Provide product data composed of catalog cuts, brochures, and operating and maintenance instructions on each product to be used. Include styles, profiles and features.

Furnish samples of each type and color of roller shade fabric and roller shade channel. Provide shade material minimum 6 by 6 inches in size. Mark face of material to indicate interior faces.

Mock up: Install shade in area designated by Contracting Officer. Do not proceed with remaining work until the Contracting Officer approves workmanship and operation. Rework mock up as required to produce acceptable work. The approved shade can be used in the installation.

Submit fire resistance data, flame spread and smoke contribution data.

Provide roller tube that operates smoothly and of sufficient diameter and thickness to prevent excessive deflection. Provide brackets that are appropriate for outside mount. Provide shade cloth meeting the performance described in NFPA 701, small scale test. Treat steel features for corrosion resistance.

Provide Various Fiber Components with a minimum of 60 percent recycled content. Provide data identifying percentage of recycled content for various fiber components.

Provide certification of indoor air quality for roller window shades.

2.1.1 Manufacturer's Qualifications

Obtain roller shades through one source from a single manufacturer with a minimum of twenty years of experience and minimum of three projects of similar scope and size in manufacturing products comparable to those specified in this section. Furnish manual and motorized shades produced by the same manufacturer to provide matching appearance.

2.1.2 Manually Operated Shades with Single Rollers

2.1.2.1 Chain-and-Clutch Operating Mechanisms

Provide continuous-loop bead chain and clutch that stops shade movement when bead chain is released; shade to be permanently adjusted and lubricated.

2.1.2.2 Bead Chains

Provide bead chain from #10 stainless steel rated to 90 lb. minimum breaking strength with pull chain tensioning device complying with ANSI/WCMA A100.1

a. Loop Length: Full length of roller shade.

b. Limit Stops: Allows shade to stop when chain is released. Provide limit stops to prevent shade from being raised or lowered too far.

c. Chain-Retainer Type: Chain tensioner, jamb mounted.

2.1.2.3 Crank-and-Gear Operating Mechanisms

Sealed gearbox drive system controlled by crank handle, permanently mounted.

a. Crank-Handle Length: Manufacturer's standard for height of shade.

b. Coupling system: Provide system to operate shades from single crank by coupling shade rollers together. System to consist of endcaps, plus couplings to connect rollers.

2.1.2.4 Rollers

Provide corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shade bands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shade cloth for service.

a. Roller Drive-End Location: Right side of interior face of shade.

b. Direction of Shade cloth Roll: Regular, from back (exterior face) of roller.

c. Shade cloth-to-Roller Attachment: Manufacturer's standard method. Adhesive attachment is not acceptable.

2.1.2.5 Mounting Hardware

Provide corrosion resistant brackets or endcaps compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated. Provide hardware that allows for field adjustment or removal of shade roller tube and other operable hardware component without removal of brackets and end or center supports.

2.1.2.6 Shade Cloth

a. Shade Material: Light-filtering fabric: Openness 3 percent.

b. Shade Cloth Bottom (Hem) Bar: Steel or extruded aluminum. Provide shade bar enclosed in sealed pocket of shade band material.

2.1.2.7 Installation Accessories

a. Front Fascia: L-shaped aluminum extrusion to conceal shade roller and hardware that snaps onto end caps without requiring exposed fasteners of any kind. Fascia can be mounted continuously across two or more shade bands. Provide manufacturers standard height fascia as required to conceal roller and shade band assembly when shade is fully open.

b. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure. Provide manufacturers standard height fascia as required to conceal roller and shade band assembly when shade is fully open.

c. Endcaps: Extruded aluminum with universal design suitable for mounting to window mullions. Provide size compatible with roller size. Provide end cap covers matching fascia/headbox finish.

d. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel. Provide manufacturers standard height fascia as required to conceal roller and shade band assembly when shade is fully open. Provide pocket with lip at lower edge to support acoustical ceiling panel.

e. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.

2.1.2.8 Room Darkening Shades

Provide room darkening (black-out) window shades designed to eliminate all visible light gaps when shades are fully closed and conform with the following:

a. Provide roller tube made of aluminum. Provide shop fabricated light traps consisting of a head box to house the roller shade, and U-shaped channels to serve as guides for the shade along the sides and to receive the bottom edge of the shade along the sill.

b. Provide light trap made of sheet steel having a minimum thickness of 22 gauge or anodized, extruded, aluminum. Provide legs of the channels not less than 1-3/4 inches long and separated by the minimum distance that permits free operation of the shade. Edges of light trap coming into contact with the shade cloth are smooth pile light seal. The exposed face of the head box is hinged or removable for access to the shade roller. The interior or unexposed surfaces of the light trap have a finish coat of flat black enamel. The exposed portions of the light trap have a factory-applied priming coat of gray paint.

c. Provide type of cloth for blackout purposes. Provide shade from a single piece of PVC free material.

d. Fit the bottom edge of the shade with a steel operating bar. Shades to engage positively with bottom rail through operating bar or chain pull. Paint bars with flat black enamel. Make pull cords of No. 4 braided nylon or beaded chain having not less than 175 pounds breaking strength.

2.2 COLOR

Provide color, pattern and texture for metal trim and shade fabric as indicated on the color material legend on the drawings; colors listed are not intended to limit the selection of equal colors from other manufacturers.

PART 3 EXECUTION

3.1 FIELD MEASUREMENTS

After becoming familiar with details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

3.2 ROLLER WINDOW SHADE PLACEMENT SCHEDULE

All exterior windows include roller window shades. Refer to the drawings for placement.

3.3 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

Provide roller window shades, complete with necessary brackets, fittings, and hardware as indicated.

Perform installation in accordance with the approved detailed drawings and manufacturer's installation instructions. Install units level, plumb, secure, and at proper height and location relative to window units. Provide and install supplementary or miscellaneous items in total, including clips, brackets, or anchorages incidental to or necessary for a sound, secure, and complete installation. Do not start installation until completion of room painting and finishing operations.

3.4 CLEAN-UP

Upon completion of the installation, clean window treatments and exposed components as recommended by manufacturer. Adjust window treatment for form and appearance and proper operating condition. Repair or replace damaged units as directed by the Contracting Officer. Isolate metal parts from direct contact with concrete, mortar, or dissimilar metals. Ensure shades installed in recessed pockets can be removed without disturbing the pocket. The entire shade, when retracted, is contained inside the pocket. For shades installed outside the jambs and mullions, overlap each jamb and mullion 0.75 inch or more when the jamb and mullion sizes permit. Include all hardware, brackets, anchors, fasteners, and accessories necessary for a complete, finished installation.

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SECTION 12 48 13

ENTRANCE FLOOR MATS AND FRAMES
08/17

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM D2047	(2017) Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine
ASTM E648	(2019a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED BDC Ref Guide	(2013) USGBC LEED Reference Guide for Building Design and Construction, v4

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

36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation Drawings; G

Detail Drawings; G

Custom Graphics Drawings; G

SD-03 Product Data

Entrance Floor Mats and Frames; G

Adhesives and Concrete Primers; G

SD-04 Samples

Entrance Floor Mats and Frames; G

Custom Graphics; G

SD-08 Manufacturer's Instructions

Manufacturer's Instructions

SD-10 Operation and Maintenance Data

Protection, Maintenance, and Repair Information

1.2.1 Sustainable Design Submittals

1. Building Product Disclosure and Optimization – Environmental Product Declarations (EPD) – MR Credit 2, Option 1:

a. Submit product EPD or life-cycle assessment, if available; refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements. The Life-cycle assessment and EPDs must conform to one of the disclosure types listed in below, in descending order of preference:

1. Products with a publicly available life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope.

2. Product-specific Type III EPD -- Internally Reviewed. Products with an internally critically reviewed LCA in accordance with ISO 14071.

3. Industry-wide Type III EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator.

b. EPDs which conform to ISO 14025 and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

1. Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification and external critical review in which the manufacturer is explicitly recognized as the participant by the program operator.

c. USGBC-approved program – Products that comply with other USGBC approved EPD frameworks.

d. Provide LEED Submittal Cover Sheet in accordance with Section 01 33 29.

2. Building Product Disclosure and Optimization, Material Ingredients: Option 1, Material Ingredient Reporting.

a. Submit Material Ingredient Reports for flooring system, if available, that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm), which meet one of the following disclosure criteria:

1. One of the following product attributes: Health Product Declaration; Cradle to Cradle certifications; Declare product labels; Living Product Challenge; ANSI/BIFMA e3 Furniture Sustainability Standard; Product Lens Certification.

2. Manufacturer Inventory.

3. A publicly available inventory of all ingredients identified by name and Chemical Abstract Service Registration Number (CASRN) and/or European Community Number (EC Number).

4. Materials defined as trade secret or intellectual property may withhold the name and/or CASRN/EC Number but must disclose ingredient/chemical role, amount and hazard score/class using either:

5. Greenscreen List Translator (LT) score and/or Full GreenScreen Benchmark (BM)

6. The Globally Harmonized System of Classification and Labeling of Chemicals rev.6 (2015) (GHS)

7. Refer to https://www.usgbc.org/node/2616399?return=/credits/new-construction/v4/materia for current list of USGBC-approved compliance programs.

b. Refer to Division 01 33 29 and the LEED BDC Ref Guide v4 for full requirements.

c. Provide LEED Materials Content Form in accordance with Section 01 33 29.

1.3 QUALITY CONTROL

Comply with 36 CFR 1191 Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines for installed entrance floor mats and frames. Ensure that entrance floor mats and frames are slip-resistant in accordance with ASTM D2047, with a minimum 0.60 coefficient of friction, for accessible routes and are structurally capable of withstanding a uniform floor load of 300 lb/sq ft. Ensure that flammability is in accordance with ASTM E648, Class 1, Critical Radiant Flux, minimum 0.45 watts/square meter.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the project site in their original packages or containers bearing labels clearly identifying the manufacturer, brand name, and quality or grade.

Store materials in their original unbroken packages or containers in the area in which they will be installed. Unwrap, inspect, and place mats at indicated locations. Remove all excess packing materials.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

2.1.1 Entrance Floor Mats and Frames

Submit the manufacturer's catalog data. Submit samples of assembled sections of floor mats showing corners, intersections, and other details of construction. Submit samples of custom graphics, exposed floor mats, frame finishes and accessories.

2.1.1.1 Carpet-Type Mats

Provide a polypropylene carpet bonded to a 1/8-inch to 1/4-inch-thick, flexible vinyl backing to form mats that are 3/8 inch thick with nonraveling edges.

2.1.1.2 Frames

Provide surface-mounted frames that have a tapered flexible vinyl edge at least 1 1/2 inches wide, with welded corners and attached to the mat at all four edges. Frame color is clear anodized . Ensure that edge-frame members are fabricated in single lengths or with the fewest pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins. Ensure that any concealed surfaces of aluminum frames that contact cementous material are coated with the manufacturer's standard protective coating. Ensure that frames include accessories and devices required for a complete installation.

2.1.1.3 Tread Insert Options

Provide tread inserts consisting of carpet composed of solution-dyed nylon or polypropylene carpet fibers fusion-bonded to a rigid two-ply backing to prevent fraying and supplied in continuous splice-free lengths; carpet has antistatic and antistain treatments. Ensure that pile weight is a minimum 30 ounces per square yard.

2.1.2 Adhesives and Concrete Primers

Provide adhesives and concrete primers, where required, according to the manufacturer's recommendations.

2.1.3 Graphics

Clearly illustrate details in drawing of custom graphic logo.

2.1.4 Color and Size

Ensure that color is in accordance with the color material legend on the drawings. Ensure that the size of mat is as indicated.

PART 3 EXECUTION

3.1 EXAMINATION

Comply with the manufacturer's requirements for substrates and floor conditions affecting installation of floor mats and frames. Ensure that all unsatisfactory conditions have been corrected before installation.

3.2 INSTALLATION

Submit detail drawings, and custom graphics drawings as required. Provide installation drawings. Provide the manufacturer's protection, maintenance, and repair information.

Install floor mats and frames according to manufacturer's instructions. Set mat tops at the height recommended by the manufacturer for the most effective cleaning action. Provide clearance between bottoms of doors and tops of mats. Coordinate recess frame installation with concrete construction to ensure that frame anchorage is correct and that the base is level and flat. Install grout and fill around frames and, if required to set mat tops at proper elevations, in recesses under mats. Finish grout and fill smooth and level.

-- End of Section --

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SECTION 12 50 00.13 10

FURNITURE AND FURNITURE INSTALLATION
08/17

PART 1 GENERAL

Purchase and install furniture as identified within this specification. This specification section includes a Furniture, Fixtures and Equipment (FF&E) Package attachment.

The requirements of this specification also apply to systems furniture unless otherwise specified in Section 12 59 00 Systems Furniture.

1.1 REFERENCES

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

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 90.1 - IP	(2013) Energy Standard for Buildings Except Low-Rise Residential Buildings

ASTM INTERNATIONAL (ASTM)

ASTM D4157	(2013; R 2017) Standard Test Method for Abrasion Resistance of Textile Fabrics (Oscillatory Cylinder Method)
ASTM E 1537	(2016) Standard Test Method for Fire Testing of Upholstered Furniture
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials

BIFMA INTERNATIONAL (BIFMA)

ANSI/BIFMA M7.1	(2011; R 2016) Test Method for Determining VOC Emissions from Office Furniture Systems, Components and Seating
ANSI/BIFMA X5.1	(2017) American National Standards For Office Furnishings - General Purpose Office Chairs
ANSI/BIFMA X5.3	(2007; R2012) American National Standards For Office Furnishings - Vertical Files
ANSI/BIFMA X5.4	(2012) American National Standards For Office Furnishings - Lounge Seating
ANSI/BIFMA X5.5	(2014) American National Standards For Office Furnishings -Desk Products

ANSI/BIFMA X5.6	(2016) American National Standards For Office Furnishings -Panel Systems
ANSI/BIFMA X5.9	(2012) American National Standards For Office Furnishings - Storage Units

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2018; ERTA 18-1; ERTA 18-2; ERTA 18-3; ERTA 18-4; TIA 18-1; TIA 18-2; TIA 18-3; TIA 18-4) Life Safety Code
NFPA 265	(2019) Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls

STATE OF CALIFORNIA DEPARTMENT OF CONSUMER AFFAIRS, BUREAU OF ELECTRICAL AND APPLIANCE REPAIR, HOME FURNISHINGS AND THERMAL INSULATION (BEARHFTI)

TB 133	(1991) Flammability Test Procedure for Seating Furniture in Public Occupancies

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-568-C.2	(2009; Errata 2010; Add 2 2014; Add 1 2016) Balanced Twisted-Pair Telecommunications Cabling and Components Standards

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

36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

UNDERWRITERS LABORATORIES (UL)

UL 723	(2018) UL Standard for Safety Test for Surface Burning Characteristics of Building Materials

1.2 SUBMITTALS

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SD-02 Shop Drawings

Installation Drawings; G

Grommet, Power and Communication Units, and Wire Management

Locations; G

SD-03 Product Data

Product Data; G

Product Style Options; G

SD-04 Samples

Fabric and Finishes; G

SD-07 Certificates

Authorized Dealer; G

Certified Furniture Installers; G

Licensed Electrician; G

Certified Telecommunications Installer; G

Manufacturer's Certification; G

Warranty; G

SD-10 Operation and Maintenance Data

Furniture, Data Package 1; G

SD-11 Closeout Submittals

Energy Efficient Equipment; S

Reduced VOC's for Furniture; S

Recycled Content of Furniture; S

Bio-Based Content of Furniture; S

1.2.1 Sustainable Design Submittals:

Comply with Section 01 33 29 SUSTAINABILITY REPORTING. Submit LEED Cover Sheet for each material.

a. Material Ingredient Report, if available: Publicly available report demonstrating the chemical inventory of the product to at least 0.1 percent (1000 ppm).

b. Sourcing of Raw Materials: Publicly available manufacturer's product data. Include material cost.

1. Percentage pre-consumer and post-consumer recycled content, if available.

2. Percentage biobased content, if available.

c. Low-Emitting Materials - Furniture: ANSI/BIFMA M7.1–2011 Standard Method (R2016) Certificate. Include material cost.

1. Include compliance with ANSI/BIFMA e3-2014e or e3-2019e Furniture Sustainability Standard, Sections 7.6.1, 7.6.2, 7.6.3 if applicable.

1.3 SERVICES

Provide services to include furniture purchase, field measuring, installation drawings, shipping and delivery coordination, receiving, inspection, submitting and processing freight and warranty claims, unpacking, storing, assembly, installation and other related activities or tasks for a complete and functional installation. Reference Section 01 45 00.00 10 QUALITY CONTROL for inspection requirements. The Contracting Officer must be allowed to participate in inspections. In addition provide services for existing furniture as specified, reference paragraph on EXISTING FURNITURE for more information. Develop project timelines and establish shipping, receiving and installation dates that coordinate with the building construction schedule. Hold at a minimum weekly team meetings to brief the project team, include the Contracting Officer. Notify the Contracting Officer immediately of any scheduling problems, discontinued furniture items including fabrics and finishes, or other conditions which may cause delays, and recommend available substitutes, solutions, and provide updated timeline to coordinate with building construction schedule. Substitutes and solutions must comply with the specification and be approved by the Contracting Officer.

1.4 FURNITURE PURCHASE

Purchase furniture, including checking accuracy of all acknowledgements and schedules from manufacturers and making necessary corrections to insure that the manufacturer has a correct understanding of the order and requirement. Provide furniture from the GSA Schedules and provide GSA pricing. Provide furniture from open market only when an item is not available on the GSA Schedules. See FAR clause 52.251-1 Government Supply Sources. Purchase furniture from the open market. The furniture provided needs to be available on the GSA Schedules to assist the User with future purchases. GSA information is provided FOR INFORMATIONAL PURPOSES ONLY. It is encouraged to solicit and provide GSA pricing on furniture. Compete the furniture purchase by obtaining a minimum of (3) separate proposals. Furniture is subject to FAR clause 52.236-5 Materials and Workmanship.

1.5 ALTERNATE DESIGN

When a manufacturer's product is unable to provide desk and workstation configurations and filing/storage that conform exactly to the furniture layouts shown in the contract drawings and specifications, alternate designs may be submitted for consideration by the Contracting Officer. Alternate designs must meet or exceed the following criteria. Alternate designs that are submitted but do not meet these criteria will be rejected.

1.5.1 Desk and Workstation Size and Configuration

The alternate design must provide desks and workstations of the same basic size and configuration shown, with only the sizes of the individual components within the desk and workstation changed to meet the standard product of the manufacturer. Panel heights shall be provided as shown on the drawings.

1.5.2 Filing and Storage Size and Configuration

The alternate design must provide filing and storage of the same basic size and configuration shown, with only the size changed to meet the standard product of the manufacturer. The storage capacity must not be reduced.

1.5.3 Furniture Requirements

The furniture provided must comply with the drawings, specifications, and the requirements identified in the FF&E Package Attachment.

1.5.4 Layout

The storage capacity, number of desks and workstations, number of persons accommodated, width of aisles, and functionality must be maintained. Layout must comply with NFPA 101 and 36 CFR 1191.

1.6 AUTHORIZED DEALER, CERTIFIED FURNITURE INSTALLERS, LICENSED ELECTRICIAN AND CERTIFIED TELECOMMUNICATIONS INSTALLER

When required by the furniture manufacturer, furniture must be installed by an authorized dealer and a certified furniture installation crew must be used on the project. Services provided to reuse existing furniture must comply with manufactures warranty requirements to maintain warranty. If warranty for existing furniture to be reused has expired, services must be completed by a furniture installation crew with a minimum of 5 years experience. All furniture requiring hardwiring must be completed by a licensed electrician. Communications installers must be Building Industry Consulting Services International (BICSI) Registered Cabling Installers, Technician Level or have a minimum of 3 years experience in the installation of the specified cables and components. All installers, furniture, electrical and communications, must be on-site if questions arise. Submit copies of authorized dealer, furniture installation crew, licensed electrician and certified telecommunications installer certifications.

1.7 DELIVERY, STORAGE AND HANDLING

1.7.1 Delivery

Deliver furniture to the jobsite in manufacturer's original packaging or blanket wrapping. Original packaging must be marked with the manufacturer name, item identification, and project reference clearly marked.

1.7.2 Furniture Inspection

Inspect furniture and provide notification of damage within the time frame required by the shipping company while carrier is still on-site. Complete claims for concealed damage within the time frame required by the shipping company and furniture manufacturer. A claim file must be maintained that documents each claim. Forward copies of claims to the Contracting Officer on a daily basis.

1.7.3 Storage

Storage space is not available on-site and furniture must be stored at an off site location. Provide any storage space required for furniture and transport stored furniture to the project site for installation. Storage

location must be approved by the Contracting Officer at the time of the furniture order. If storage is required, furniture must be stored in a dry location that is adequately ventilated and free from dirt and dust, water, and other contaminants, in a manner that permits easy access for inspection and handling, and in an environment in accordance with furniture manufacturers instructions.

1.7.4 Furniture Staging Area

Coordinate location of the furniture staging area with the Contracting Officer.

1.8 WARRANTY

Provide manufacturer performance guarantees or warranties for single-shift service and include parts, labor and transportation as follows, unless otherwise noted:

a. Systems Furniture - see Section12 59 00 Systems Furniture

b. Desks and Workstations - 12 year minimum

c. Filing and Storage - 12 year minimum

d. Seating

(1) Seating, unless otherwise noted - 10 year minimum

(2) 24/7 Seating (multiple shift use) - 10 year minimum

(3) Seating Mechanisms and Pneumatic Cylinders - 10 year minimum

(4) Lounge Seating - 10 year minimum

(5) Stacking Chairs - 10 year minimum

e. Tables

(1) Unless otherwise noted - 10 year minimum

(2) Table Mechanisms - 5 year minimum

(3) Table Ganging Device - 1 year minimum

f. Miscellaneous

(1) Fabric - 3 year minimum

(2) LED Task Lighting - 5 year minimum

(3) Task Lighting - 3 year minimum

Provide items not listed with a 1 year minimum. When manufacturers standard performance guarantees or warranties exceed the minimum requirements identified, provide the standard performance guarantee or warranty. Submit manufacturer's warranty information for all furniture items.

PART 2 PRODUCTS

2.1 PRODUCT SUSTAINABILITY CRITERIA

For products in this section, where applicable and to extent allowed by performance criteria, provide and document the following:

2.1.1 Energy Efficient Equipment

Coordinate requirement for energy efficient equipment, such as appliances and lighting, and provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING paragraph ENERGY EFFICIENT EQUIPMENT.

2.1.2 Reduced VOC's for Furniture

Coordinate requirement for reduced VOC requirements for furniture and provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING paragraph REDUCE VOLATILE ORGANIC COMPOUNDS.

2.1.3 Recycled Content of Furniture

Coordinate requirement for recycled content for furniture and provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING.

2.1.4 Bio-Based Content of Furniture

Coordinate requirement for biobased content for furniture and provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING.

2.2 REFERENCE TO MANUFACTURER NAMES AND COLORS

Where product and color is shown as being specific to one manufacturer in the FF&E Package Attachment, an equivalent color or product by another manufacturer may be submitted for approval. Manufacturers, style lines, model numbers, finish, and fabric information are provided to establish design intent and are not intended to limit the selection of equal products and colors from other manufacturers.

2.3 FURNITURE REQUIREMENTS

Use the FF&E Package Attachment in conjunction with the drawings and specifications for the furniture requirements. Systems furniture is specified in Section 12 59 00 SYSTEMS FURNITURE. Provide furniture from manufacturer's standard product as shown in the most current published price list or amendment. Furniture provided must be part of current line as indicated with no intent to discontinue within two years. Provide furniture that is intended for commercial use not residential. submit product data for all furniture items, to include catalog cuts, brochures, product information, and other necessary literature to indicate compliance with specifications. Provide product data for all items together in a single submittal. Provide product data for all similar types of items together as a group, such as desks/workstations, seating, storage, and tables. Submit each grouping of similar type items in a single submittal. When applicable, include GSA schedule information to confirm that items are available on GSA schedule. Tag product data sheets with applicable furniture item code and name. Submit data for all product style options for selection when options are available. This applies to but is not limited to furniture items that have options such as edge details, hardware options, and grommet colors. Submit manufacturer's certification

stating that furniture meets the specifications.

2.3.1 EXISTING FURNITURE (GOVERNMENT FURNISHED/CONTRACTOR INSTALLED-GF/CI)

2.3.1.1 Existing Furniture to be Reused

Disassemble, pack, move, store, transport to the project site and install existing furniture identified to be reused. This includes disconnecting and reconnecting furniture electrical connections at the building source. Coordinate with electrician for safe terminations or removal of disconnected building electric system supply circuits.

2.3.1.2 Existing Furniture Communications

Remove existing Information Technology (IT) cables (i.e. SIPRNET, NIPRNET, J-WIC'S, etc.) and telephone wiring from existing furniture systems identified to be reused or requiring excessing.

2.3.2 Construction

a. Provide furniture that complies with the following testing requirements:

(1) ANSI/BIFMA

(a) Office Seating - ANSI/BIFMA X5.1

(b) Vertical Files - ANSI/BIFMA X5.3

(c) Lounge Seating - ANSI/BIFMA X5.4

(d) Desk Products - ANSI/BIFMA X5.5

(e) Panel Systems - ANSI/BIFMA X5.6

(f) Storage - ANSI/BIFMA X5.9

(2) Flammability

(a) Systems furniture and workstation panel components must meet requirements for flame spread and smoke development as specified by NFPA 101 except as follows. Conduct testing in accordance with either ASTM E84 or UL 723 on the entire assembled panel of the worst case (most combustible) combination of fabric and interior construction. In addition, fabric must meet the requirements of NFPA 265. Panel flame spread shall not exceed 200 for Class C, and panel smoke development shall not exceed 450 for Class A, B, and C.

(b) Upholstered furniture must comply with TB 133 or ASTM E 1537.

b. Provide furniture with no rough or sharp edges or exposed connections. Clips, screws, and other construction elements must be concealed wherever possible.

c. Items such as desks, workstations and systems furniture must include all necessary components to be structurally sound and must not be attached to the wall unless specified to be wall mounted in the contract documents.

d. Desks, workstations, storage, and tables must have leveling devices to compensate for uneven floors.

e. The underside of desks, workstations, and tables must be completely and smoothly finished.

f. The backside of freestanding desks, workstations, and storage must be finished.

g. Provide chair casters and glides appropriate for the floor material they are located on, such as carpet and resilient flooring.

2.3.3 Locks and Keying

a. All drawers and doors, including but not limited to overhead storage cabinets, storage towers, supply cabinets, storage cabinets, desk and workstation pedestals, and filing cabinets must be lockable.

b. Key each desk and workstation in an office differently and key locks within each desk and workstation alike.

c. Furniture storage components in private offices must be keyed alike. Key each private office differently.

d. Provide field changeable lock cylinders in desks and workstations with a minimum of 100 different key options. Number keys and lock cylinders for ease of replacement or clearly label locks with a key number, except for those manufacturers who have removable format locks.

e. Drawers within a pedestal must be lockable either by a central lock that controls all pedestals under one work surface or an individual keyed lock in each pedestal.

f. Central file and storage units which are grouped together but are not a part of a workstation must be keyed alike unless otherwise specified.

g. Provide two keys for each workstation when components are keyed alike. Also provide two keys for each miscellaneous item such as filing cabinets, supply cabinets, storage cabinets, and similar type furniture items.

h. Provide three copies of each master key to the Contracting Officer.

i.Leave keys in locks Inventory keys, label keys by lock number, room number and furniture item and turn over inventory and keys to the Contracting Officer.

2.3.4 Receptacle Bodies and Device Cover Plates

Provide furniture panel faceplates and receptacle body types and color as specified in FF&E Package Attachment.

2.3.5 Fabric and Finish

Submit samples of all furniture fabric and finishes. Samples must be actual samples, not photographic representations, size must be a minimum of 3 by 3 inches. If necessary, provide larger size samples to clearly represent pattern. Label samples with fabric or finish code, furniture

item code and name, manufacturer name, and color information. Fabric samples must also be labeled with fiber content and double rub testing information.

2.3.5.1 Fabric

a. Fabric must be from manufacturer's graded-in textile manufacturer's fabrics, and customer's own material (COM).

b. Provide a mid grade fabric, unless otherwise noted. Example: manufacturer available grades 1 through 4 (even number of grades), provide grade 3; manufacturer available grades A through D (even number of grades), provide grade C; manufacturer available grades A through E (odd number of grades), provide grade C (middle grade).

c. Provide a topical or inherent soil retardant treatment where indicated.

d. Comply with double rub testing as specified in the FF&E Package Attachment.Fabric for seating must comply with a minimum of 55,000 double rubs unless otherwise noted. Perform double rub testing in accordance with the ASTM D4157 Wyzenbeek Method.

e. Provide vinyl, polypropylene or similar type fabric for seating only if allowed in FF&E Package Attachment.

f. Pattern:

(1) Provide patterned upholstery fabric to help hide soiling. Pattern is defined as follows:

(a) Solid Color: textured, single color.

(b) Small Size Pattern: minimum 1/2 inch

(c) Medium Size Pattern: minimum 2 inch

(d) Large Size Pattern: minimum 5 inch

(2) Provide patterns as specified in the FF&E Package Attachment. as follows:

(a) Desk Chairs: solid color, small size pattern

(b) Side or Guest Chairs: medium size pattern

(c) Lounge Type Chairs: medium and large size pattern

g. See FF&E Package Attachment for additional information.

2.3.5.2 Finishes

Provide furniture finishes as listed below unless otherwise noted:

a. Finishes must be able to be cleaned with ordinary household cleaning solutions. Wood finishes must be able to be cleaned with damp cloth as directed by the manufacturer.

b. The finish of steel surfaces must be the manufacturer's most durable finish such as factory powder coat or baked enamel.

c. Grommet colors must be compatible and coordinated with desk, workstation, and table finish colors.

d. Finishes must be neutral in color.

e. Plastic laminate worksurfaces and table tops must be neutral in color and must have a pattern to help hide soiling.

f. See FF&E Package Attachment for additional information.

2.4 FURNITURE LAYOUT

Provide furniture layout as indicated.

PART 3 EXECUTION

3.1 BUILDING EXAMINATION

Become familiar with details of the work, inspect all areas and conditions under which furniture is to be installed, and coordinate scheduling of dedicated elevators and docks. Notify the Contracting Officer in writing of any conditions detrimental to the proper and timely completion of the installation. Work will proceed only when conditions have been corrected.

3.2 BUILDING PROTECTION

Protect building surfaces to prevent soiling and damage during delivery and installation. Any soiling and damage that occurs to the building during the installation of furniture must be cleaned and repaired, or replaced to its original condition and must be approved by the Contracting Officer.

3.3 INSTALLATION

3.3.1 Installation Drawings

Installation drawings must include furniture layout, critical dimensions and locations of electrical and communications. Furniture layouts shall reflect field verified conditions. Drawings must be at 1/4 inch = 1 foot scale, unless otherwise specified. Provide typical plans and isometrics/elevations of desks and workstations at a scale of 1/2 inch = 1 foot. When applicable, provide desk and workstation electrical and communications locations. When applicable include controlled-circuit identification for each furniture receptacle and coordinate with the building electrical system circuits in accordance with ASHRAE 90.1 - IP. Critical dimensions include, but are not limited to clearances and aisle widths. Drawings must include layout for furniture systems workstations for coordination purposes. Label furniture with furniture item code identified in this specification. Submit grommet, power and communication units, and wire management locations.

3.3.2 Furniture Installation Procedures

Complete installation in accordance with manufacturer's installation instructions, assembly manuals, warranty requirements and approved installation drawings. Also comply with the following requirements:

a. Use material handling equipment with rubber wheels.

b. Furniture and components must be installed level, plumb, square, and with proper alignment with adjoining furniture.

c. Match keys to locks and check locking mechanisms.

d. Check drawers, doors, lighting, and other operable items and mechanisms for proper operation.

e. Remove all protective wrapping tape, residue, and related type items.

f. Securely interconnect furniture components where required.

g. Securely attach and anchor furniture components to the building when required.

h. Securely anchor furniture such as shelving and storage units to the building when required by the manufacturer.

i. All items with an electrical plug, such as but not limited to task lighting and tables with electrical power, must be fully operational.

j. All hardwired furniture, such as but not limited to furniture systems, must be fully operational. Verify that voltage is present in electrical outlets. Verify controlled-circuit outlets are properly configured in accordance with the installation drawings.

k. Furniture must not block SIPRNET and jacks or the jack enclosures on walls. Report conflicts to Contracting Officer to discuss resolution.

l. Upon completion of installation, all furniture must be completely cleaned, finished, leveled, aligned, operational and functional.

m. Install artwork with security mount hardware as recommended by the manufacturer.

3.3.3 Furniture Communications Installation

Provide all Information/Technology (IT) cables (i.e. SIPRNET, NIPRNET, J-WIC'S, etc.) and phone wiring up to and including the face plate/box of all furniture as required and the services to install the cables, wiring and face plates/boxes in the furniture. Coordinate cable type, cable jacket and outlet jack color with Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM. Furniture communication installers must be on site to install communication cables, wiring and other components for furniture during furniture installation. Coordinate the TIA-568-C.2 pin/pair assignments for communication outlets to match the configuration of the building's non-furniture outlets; coordinate with Contracting Officer. All items with a communication interface must be fully operational.Installation of Information/Technology (IT) wiring, cables and face plates/boxes in the furniture will be completed by others.

3.4 CLEANING

Remove all packing materials and other trash from the jobsite. Upon completion of installation, all products must be clean, including inside all drawers and doors, and the area must be free of debris and left in a clean and neat condition. Any defects in or damage to furniture must be

repaired or replaced and approved by the Contracting Officer. Damaged products that cannot be satisfactorily repaired must be replaced. Correct any problems with assembly and installation. Prior to any furniture repair, replacement, and/or assembly and installation corrections, protect the building surfaces.

3.5 OPERATION AND MAINTENANCE MANUALS

Submit the Furniture, Data Package 1 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA and include the following:

3.5.1 Assembly Manuals

Describe assembly and re-configuration procedures. Provide three sets of installation video tapes if available.

3.5.2 Installation Instructions

Provide a copy of the instructions used to install the furniture. Also describe any special procedures or helpful hints learned during the installation process.

3.5.3 Maintenance Manuals

Describe proper cleaning and minor repair procedures, include cleaning instructions for fabrics.

3.5.4 Electrical System Manuals

Describe the functions, configuration, and maintenance of the furniture electrical system (power, communication, and data). This information may be included in the assembly or maintenance manuals.

3.5.5 Special Tools

Provide three sets of special tools necessary for assembly and disassembly of furniture and components from each manufacturer. Mark tool(s) with manufacturer and product information.

3.5.6 Furniture Drawings

Provide hard copy and electronic, showing installed furniture layout. Include all modifications. Provide electronic copies on a CD-ROM. Coordinate type (such as but not limited to Microstation, AutoCad and Revit) and version required with User. Include critical dimensions, and locations of building and furniture electrical and communications. Provide drawings at 1/4 inch = 1 foot scale, unless otherwise specified. Provide typical plans and isometrics/elevations of workstations at a scale of 1/2 inch = 1 foot. Code all furniture with furniture item code identified in this specification.

3.5.7 Furniture Listing

Provide complete listing, hard copy and electronic, of furniture provided. Include all modifications. Provide electronic copies on a CD-ROM. Coordinate type of electronic file required with User (such as but not limited to Word and Excel). Listing must include furniture item code and name used in FF&E Package, part/model numbers, fabrics and finishes for all components furnished. Organize listing by item name and

code and provide building totals.

3.5.8 Order Form Documentation

Provide Order Form Documentation with Purchase Order number and project name and location to allow the User to follow up on warranty issues and help with future purchases.

3.5.9 Key Control System

Key Control System. Provide system in excel format; indicate lock number, room number and location of lock within rooms if more than one lock number.

-- End of Section --

SECTION 12 59 00

SYSTEMS FURNITURE
08/17

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1	(2015) Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 90.1 - IP	(2013) Energy Standard for Buildings Except Low-Rise Residential Buildings
ASHRAE 90.1 - SI	(2013) Energy Standard for Buildings Except Low-Rise Residential Buildings

ASTM INTERNATIONAL (ASTM)

ASTM C423	(2009a) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
ASTM C1048	(2018) Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass
ASTM E84	(2020) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E290	(2014) Bend Testing of Material for Ductility

BIFMA INTERNATIONAL (BIFMA)

ANSI/BIFMA M7.1	(2011; R 2016) Test Method for Determining VOC Emissions from Office Furniture Systems, Components and Seating
ANSI/BIFMA X5.5	(2014) American National Standards For Office Furnishings -Desk Products
ANSI/BIFMA X5.6	(2016) American National Standards For Office Furnishings -Panel Systems

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA WD 1	(1999; R 2015) Standard for General Color Requirements for Wiring Devices
NEMA WD 6	(2016) Wiring Devices Dimensions Specifications

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code
NFPA 101	(2018; ERTA 18-1; ERTA 18-2; ERTA 18-3; ERTA 18-4; TIA 18-1; TIA 18-2; TIA 18-3; TIA 18-4) Life Safety Code
NFPA 265	(2019) Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-568-C.2	(2009; Errata 2010; Add 2 2014; Add 1 2016) Balanced Twisted-Pair Telecommunications Cabling and Components Standards
TIA-569	(2016d) Commercial Building Standard for Telecommunications Pathways and Spaces

U.S. DEPARTMENT OF ENERGY (DOE)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

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

36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

UNDERWRITERS LABORATORIES (UL)

UL 723	(2018) UL Standard for Safety Test for Surface Burning Characteristics of Building Materials
UL 1286	(2008; Reprint Jan 2018) UL Standard for Safety Office Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability

eNotebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G

SD-03 Product Data

Warranty; G

Workstations

Power and Communications

Communications

Recycled Content for system furniture components; S

Energy Star Label for Task Lighting; S

SD-04 Samples

Workstations; G

Samples

SD-06 Test Reports

Selected Components; G

Panel Acoustics; G

Fire Safety; G

Electrical System; G

SD-07 Certificates

Workstations

SD-10 Operation and Maintenance Data

Assembly Manuals; G

Maintenance Manuals; G

Cleaning; G

Electrical System; G

Maintenance Agreements

Installation; G

1.3 CERTIFICATIONS

1.3.1 Indoor Air QualityCertifications

1.3.1.1 Office Furniture Systems and Seating

Provide furniture meeting emissions requirements of ANSI/BIFMA M7.1–2011 Standard Method (R2016).

a. Give preference to furniture in compliance with ANSI/BIFMA e3-2014e or e3-2019e Furniture Sustainability Standard, Sections 7.6.1, 7.6.2, 7.6.3.

1.4 QUALITY ASSURANCE

1.4.1 General Safety

Provide workstation products free of rough or sharp edges. Provide panel supported components with a positive, integral locking device which secures components without the use of additional screws or clamps to prevent the components from being accidentally pulled or knocked off the panels. Provide desk-based workstation components with an option for a positive, integral locking device that secures components to the base units.

1.4.2 Fire Safety

Components must meet requirements for flame spread and smoke development as specified by NFPA 101 except as follows. Conduct testing in accordance with either ASTM E84 or UL 723 on the entire assembled panel of the worst case (most combustible) combination of fabric and interior construction. In addition, fabric must meet the requirements of NFPA 265. Do not exceed 200 for Class C for panel flame spread and 450 for Class A, B and C panel smoke development.

1.4.3 Electrical System

Task lights are required to be UL listed and installation of task lighting must meet the requirements of NFPA 70. The electrical system must meet the requirements of UL 1286. Submit three sets of electrical system manuals describing the functions, configuration, and maintenance of the electrical system (power , communications , data). This material may be included in the Assembly or Maintenance manuals at the Contractor's option.

1.4.4 Detail Drawings

Submit detail drawings showing communications, electronic data processing (EDP) and local area network (LAN); locations may be provided as a separate submittal from remaining workstation drawings. Provide drawing requirements, which are the furniture manufacturer's responsibility, as a single submittal. Provide electronic drawings to the user for future re-configuration in the software package requested by the user. Include in the electronic drawings all modifications made during installation. As a minimum, submit the following:

a. Overall reference drawings: Drawings showing workstation locations and overall plan view within each floor in a scale of 1/8 inch = 1 foot. Layouts must reflect field verified conditions and clearly illustrate the overall space planning concept and intent.

b. Installation drawings: Drawings showing workstations, panels, components, and plan view within each floor. Identify workstations by workstation type; submit drawings showing the proposed workstation installation at a scale of 1/4 inch = 1 foot, unless otherwise specified. Installation drawings must reflect field verified conditions.

c. Workstation elevations: Dimensioned workstation elevations showing each type of workstation with panel frame configurations and all components identified with manufacturer's catalog numbers. Draw elevations at 1/2 inch = 1 foot scale.

d. Panel drawings: Panel drawings showing locations and critical dimensions from finished face of walls, columns, panels, including clearances and aisle widths. Key assemblies to a legend which includes width, height, configuration and composition of frame covers finishes and fabrics (if different selections exist within a project), power or nonpower, connectors and wall mount hardware. Coordinate panel placement with location of electrical, voice/date LAN, SIPRNet, NIPERNet, mechanical and fire protection fixtures. Drawings must reflect field verified conditions.

e. Electrical drawings: Drawings showing power provisions including type and location of feeder components (service entry poles, base or ceiling feeds), activated power receptacles and other electrical components. Wiring configuration (circuiting, switching, internal and external connections) identified and a legend provided as applicable. Identify which receptacles in typical furniture configurations will be connected to controlled building power circuits as applicable to meet ASHRAE 90.1 - IP and ASHRAE 90.1 - SI requirements. Coordinate with electrical drawings.

f. Wire management capacity drawings.

g. Communication drawings showing telephone provisions: Drawings indicating the type and location of feeder components and communications jacks with wiring configuration identified where applicable.

h. Communication drawings showing electronic data processing provisions: Drawings indicating the type and location of feeder components, communications jacks, or accessories with wiring configuration identified where applicable.

i. Communication drawings showing local area network provisions: Drawings indicating the type and location of feeder components and data jacks with extra ports for future expansion with wiring configuration identified where applicable.

j. Communications drawings indicating the TIA-568-C.2 pin/pair assignment that will be used for communications outlet as coordinated with the COR.

k. Reflected ceiling plan for projects specified with power poles.

l. Drawings indicating cabling is protected at all transition points, and that metallic separation is provided between telecommunication and power wiring in the utility columns and systems furniture track in

accordance with TIA-569 and NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver components to the jobsite in the manufacturer's original packaging with the brand, item identification, and project reference clearly marked. Remove furniture from packaging and store in an unoccupied, dry location that is ventilated. Storage shall be free from dirt and dust, water, and other contaminants, and in a manner that permits easy access for inspection and handling.

1.6 WARRANTY

Warrant the systems furniture for a minimum period of 12 years with the following exceptions: fabrics and other covering materials, and paper handling products for 3 years, LED drivers/power supplies for 5 years, and electromagnetic ballasts for 3 years. Warranties must be signed by the authorized representative of the manufacturer. Present warranties, accompanied by document authenticating the signer as an authorized representative of the guarantor, to the Contracting Officer upon the completion of the project. Guarantee that the workstation products and installation are free from any defects in material and workmanship from the date of delivery. Submit two copies of the warranty.

1.7 MAINTENANCE AGREEMENTS

Collect information from the manufacturer about maintenance agreement options, and submit to Contracting Officer. Submit documentation that includes contact information, summary of procedures, and the limitations and conditions applicable to the project. Indicate manufacturer's commitment to reclaim materials for recycling and/or reuse and avoid landfilling and burning reclaimed materials. When such a service is not available through a manufacturer, local recyclers should be sought after to reclaim the materials.

PART 2 PRODUCTS

2.1 MATERIALS

Provide System Furniture Components with a minimum of 55 percent recycled content. Provide data identifying percentage of recycled content for system furniture components.

Provide certification of indoor air quality for Office Furniture Systems and Seating.

2.2 SYSTEM DESCRIPTION

2.2.1 Workstations

This specification establishes the minimum requirements for the acquisition and installation of a complete and usable system of workstations composed of panels, freestanding work surfaces or base units, supporting components, electrical hardware, communications, special electrical features, and accessories. Provide workstation requirements and configurations in accordance with the furniture layout and typical workstation types shown in drawings and specified herein. Provide

components and hardware from a single manufacturer that are standard products as shown in the most recent published price lists or amendments. Proposed product must be part of the manufacturer's current line with no intent to discontinue within two years. Submit complete listing of part/model numbers for all components to be provided, including names and codes of components referenced on updated drawings. Provide electrical components from a single manufacturer to the extent practicable (different types of components may be of different manufacturers, but all units of a given component must be from a single source). Conformance with NFPA 70, UL 1286, NFPA 101, and 36 CFR 1191 is required. Coordinate the work of this section with that to be performed under other sections. This specification may include items which are not manufactured by the furniture manufacturer; provide any such items under this section. Submit two complete sets of certificates attesting that the proposed workstation meets specified requirements. Date the certificate after the award of the contract, include the name of the project, and list specific requirements being certified.

2.2.2 Samples

Submit samples as required to obtain final approval. The Government reserves the right to reject any finish samples that do not satisfy the technical or color requirements. Work can not proceed without sample approval in writing from the Contracting Officer. Submit four sets of the finish samples listed below:

a. Panel, tackboard and overhead door fabric. Minimum 6 by 6 inches with label designating the manufacturer, pattern, color, fiber content, fabric width, fabric weight, fire rating, and use (panel and/or tackboard).

b. Workstation component finishes. Minimum 2-1/2 by 3 inches with label designating the manufacturer, material composition, thickness, color, and finish.

c. Personal Task lights (Not overhead task lights).

d. Panel glazing. Glazing samples with label designating the material and safety ratings.

2.2.3 Alternate Design

Manufacturers who are unable to provide workstations that conform exactly to the furniture layouts and typical workstation types shown in the contract drawings, may submit alternate designs for consideration by the Contracting Officer. Alternate designs must meet or exceed the following criteria. Alternate designs that are submitted but do not meet these criteria will be rejected. In the alternate design provide workstations and components of the same basic size and configuration shown, with only the sizes of the individual components within the workstation changed to meet the standard product of the manufacturer or site conditions.

2.2.3.1 Component Requirements

Provide the types of components or elements as shown on the drawings and as specified in PART 2 PRODUCTS of this specification. Do not reduce the storage capacity, number of workstations accommodated, width of aisles, or workstation configuration.

2.2.3.2 Wiring Configuration

Alternate configurations shall support the circuiting and connection capabilities identified under the provisions pertaining to power distribution of paragraph POWER AND COMMUNICATIONS. Generally any alternate will be acceptable which involves only a variation in size or quantity that exceeds the specified configuration.

2.2.4 Performance Requirements

Panels, frames and frame covers, connection system, work surfaces, pedestals, shelf units, overhead door cabinets, lateral files, locks, accessories, and miscellaneous hardware must meet testing as specified. ISO 9001 certified manufacturers may perform in-house testing. Manufacturers not ISO 9001 qualified will be required to produce testing by an independent testing laboratory. Component specific requirements are listed in appropriate paragraphs.

2.2.4.1 Selected Components

Workstation conformance to ANSI/BIFMA X5.5 and ANSI/BIFMA X5.6 is required with the following exceptions: Panels, or panel supported components conformance to ANSI/BIFMA X5.6 is required. Representative items will be selected for testing based on worst case situations (i.e., the deepest and widest work surface or shelf). Perform the keyboard drawer or shelf test applying a 50 lb load to the center of the keyboard shelf for a period of 5 minutes. Any loosening of attachments or damage to the operation of the drawer or shelf will be cause for rejection.

2.2.4.2 Panel Acoustics

Provide acoustical panels with a minimum noise reduction coefficient (NRC) of 0.80 when tested in accordance with ASTM C423 and a minimum sound transfer coefficient (STC) of 22 when tested in accordance with ASTM E290. Conduct the test on the entire assembled panel, full face area (the complete core, adhesive, decorative fabric, frame and joining components).

2.2.4.3 Panel Glazing

Tempered glass must conform to ANSI Z97.1 and ASTM C1048, Kind FT, Condition A, Type I, Class 3 - Light reducing, patterned, tinted or translucent. Frameless glass shall be a minimum 1/2" thick and shall have the ability to attach to panels and stack modules.

2.2.5 Pattern and Color

Provide pattern and color of finishes and fabrics for panel systems, components, and trim as shown on the drawings.

2.3 SYSTEMS FURNITURE

2.3.1 Panel System Components

Supply aaccessories and appurtenances for a completely finished panel assembly with the system. Provide a system capable of structurally supporting cantilevered work surfaces, shelves, files, overhead cabinets, and other components in the configurations shown on the drawings plus more than one fully loaded component per panel per side. Provide panels that are acoustical, stackable with a system capable of lowering or raising the

overall panel assembly height at horizontal connections by removing or adding panel-frames on-site without disturbing adjacent panel components, segmented as designated on the drawings. Segments will be field removable from both sides of the panel. Provide capability for worksurfaces to attach to the panels in 1 - 2 inch increments. Provide a spine wall system where electrical and data management will be easily accessible by removable wall covers that can be removed while workstation components are still attached. Cables must be laid in the system, not threaded through the frame. Provide a panel system that is available in a variety of nominal widths and heights as designated on the drawings. Measure heights from the finished floor to the top of the panel. Supply powered and nonpowered panels that are compatible in height. Coordinate panel heights with the HVAC and electrical designs. Minimum panel thickness is 2 1/2 inches thick. Submit three sets of Assembly Manuals describing assembly and reconfiguration procedures.

2.3.2 Panel Finishes

Provide panels in the following options: safety glazed, tackable fabric, acoustical fabric, and paint. Frame covers may have different options on either side of the frame. Exposed panel trim to have a factory baked enamel or epoxy powder finish. Filler trim will either match the panel trim or be fabric covered to match the panel fabric. Provide each fabric-faced panel with a seamless width of fabric stretched over the entire face of the panel. The fabric color throughout the installation must be consistent. Curved panels may use adhesives on curved sections. Attach the fabric securely and continuously along the entire perimeter of the panel and allow for easy removal and replacement in the field (with the exception of curved panels). Fabric must be factory installed.

2.3.3 Raceways

Provide raceways and covers as an integral part of the panel whether powered or nonpowered. Magnet held base covers will not be accepted.

2.3.4 Leveling Glides

Provide precise alignment of adjacent panels and include leveling glides to compensate for uneven floors. Provide quantity and location of leveling glides as recommended by the manufacturer. A minimum 3/4 inch adjustment range is required.

2.3.5 Connection System

Provide connectors which accommodate a variety of configurations as indicated on the drawings to include: a straight line connection of 2 panels (180 degrees), corner connection of 2 panels (90 degrees), T connection of 3 panels (90 degrees), cross connection of 4 panels (all 90 degrees). Provide tight connections with continuous visual and acoustical seals. Plastic, painted metal, fabric or wood finish connections are required to match system. Provide connector system that allows removal of a single panel within a typical workstation configuration, without requiring disassembly of the workstation or removal of adjacent panels. Provide for connection of similar or dissimilar heights to include trim pieces to finish the exposed edge. Right angle (90 degree) connections between panels must not interfere with the capability to hang work surfaces and other components on any adjacent panel. Provide, as required, the continuation of electrical and communications wiring within workstations and from workstation to workstation. Filler posts must be

level with the top rail.

2.3.6 Glazed Panel Inserts

Provide safety glass glazed panel inserts in accordance with ANSI Z97.1 and ASTM C1048. Acrylic glazing will not be accepted.

2.4 DESK-BASED SYSTEM

Supply accessories and appurtenances for a completely finished desk-based assembly within the system. Provide a desk-based system that is free-standing, independent of panel system support and capable of structurally supporting work surfaces, shelves, and other components in the configurations shown on the drawings. Provide a variety of nominal widths and depths as indicated on drawings.

2.5 WORK SURFACES

2.5.1 Construction

Construct work surfaces to prevent warpage. Fully support work surfaces from the panels or support jointly by the panels and supplemental legs, pedestals, or furniture end panels. Use supplemental end supports only under work surfaces when the work station configuration does not permit full support by the panels. Use metal support brackets to support work surfaces from the panels, provide metal-to-metal fitting to the vertical uprights of the panels, vertically adjustable, to lock the work surfaces in place without panel modifications. Abutting work surfaces must line up closely and be at equal heights when used in side-by-side configurations in order to provide a continuous and level work surface. Provide pre-drilled holes to accommodate storage components, pedestals and additional supports in work surfaces, or drill holes at the job site to accommodate these items. Provide work surfaces in sizes and configurations shown on the drawings. Provide work surfaces in nominal depths of 20 inches, and 24 inches, and 30 inches, plus or minus 2 inches, nominal lengths from 24 to 72 inches, and a nominal thickness from 1 to 1-3/4 inches. Provide height adjustable work surfaces from 25 to 52 inches above the finished floor with a electrical control. Provide counter/transaction work surfaces as shown on the drawings and include hardware necessary to provide firm and rigid support.

2.5.2 Finishes

Provide work surfaces with a finished top surface of high pressure plastic laminate, and a smoothly finished underside. The work surface must not be damaged by ordinary household solvents, acids, alcohols, or salt solutions. Provide metal support brackets that match the color and finish of trim. Provide PVC and laminate edges.

2.6 PEDESTALS

Provide drawer configurations and pedestal height as shown on the drawings. Provide the deepest possible pedestal for each work surface size specified.

2.6.1 Construction

Provide pedestals and drawers of steel construction with the exception of

drawer fronts. Securely attach drawer faces to the drawer front.

2.6.2 Finishes

Provide a factory baked enamel finish or powder coated for steel surfaces. Provide plastic laminateveneer drawer fronts.

2.6.3 Drawer Requirements

Pedestals must be field interchangeable from left to right, and right to left, and must retain the pedestal locking system capability. Design pedestals to protect wires from being damaged by drawer operation. Provide pedestals that are support work surfaces,free standing. Drawers must stay securely closed when in the closed position and provide each drawer with a safety catch to prevent accidental removal when fully open. File drawers to be provided with full extension ball bearing drawer slides or rack and pinion suspension. File drawers to be provided with hanging folder frames or rails and capable of hanging side-to-side or front-to-back.
Provide box drawers with pencil trays. Provide center pencil drawer and mount under the work surface.

2.7 STORAGE

Provide storage units in the sizes and configurations shown on the drawings. Provide task lights under overhead cabinets and shelf units. Depth to accommodate a standard three ring binder.

2.7.1 Shelf Unit Construction

Provide metal construction shelf pan with formed edges. Provide shelf supporting end panels of metal, high density particle board, molded phenolic resin, or molded melamine. Provide relocatable shelf dividers with shelf units.

2.7.2 Overhead Cabinet Construction

Provide metal construction overhead cabinets. Provide sliding doors on overheads. Overhead cabinet must be ADA accessible.

2.7.3 Lateral File and Book Case Construction

Provide units and file fronts, top and end panels of steel construction. File drawers to be provided with full extension ball bearing drawer slides or rack and pinion suspension. File drawers to be provided with hanging folder frames or rails and capable of hanging side-to-side or front-to-back.

2.7.4 Finish

Provide a factory baked enamel or epoxy powder coat finish for shelves, dividers and top dust cover. Provide either a factory baked enamel, epoxy powder coat or laminate finish for shelf supporting end panels. Shelf bottom is required to match end panel color. Provide metal doors with an exterior finish of factory baked enamel and an interior finish of factory baked enamel or epoxy powder coat. Provide a factory baked enamel finish or epoxy powder coat on metal drawers.

2.8 ACCESSORIES

2.8.1 Coat Hook

Provide one mounted coat hook per workstation.

2.8.2 Tackboards

Fabric must be factory installed. Provide fabric content of tackboards. Location and size as shown on the drawings.

2.8.3 Wall Mounted Components

Provide wall tracks when components are shown attached directly to wall surfaces. Provide tracks of heavy duty extruded metal with finish and color matching the the panel trim. Provide vertically aligned tracks slotted on 1 inch centers in heights required that match slot spacing for components.

2.8.4 CPU Holder

Provide a mounting to support the computer hard drive. Desk top and floor locations are not acceptable.

2.8.5 Signage

Provide panel mounted signage composed, at a minimum, of aluminum frame, back panel, clear plastic cover, and hanging device. Provide signage approximately 3 by 8 inches and capable of receiving a replaceable standard white paper insert. Match text type. Include name of occupant on signage for each workstation with names provided by customer prior to installation. Provide software for creating text in PC computers for owner production of replacement paper inserts after project completion.

2.8.6 Monitor Arm

Provide monitor arm that allows 360 degree monitor rotation for portrait and landscape viewing, and 60 degree range of lateral and vertical monitor tilt for additional viewing adjustability. Provide monitor arm that supports monitors weighing 7 to 19 lbs. Provide dual monitor arm for 2 screens. Mount monitor arm on work surface.

2.9 MISCELLANEOUS HARDWARE

Provide brackets, supports, hangers, clips, panel supported legs, connectors, adjustable feet, cover plates, stabilizers, and other miscellaneous hardware that contribute to a complete and operable furniture system.

2.10 LOCKS AND KEYING

Provide overhead cabinets, pedestals and lateral files with keyed locks, unless otherwise noted. Provide field changeable lock cylinders with a minimum of 100 different key options. Key each workstation individually, and key locks alike within a workstation. Provide lockable drawers within a pedestal either by a central lock that controls all pedestals under one work surface or an individual keyed lock in each pedestal. Key alike central file and storage units which are grouped together but are not a part of a workstation unless otherwise specified. Provide two keys for

each lock or two keys per workstation when keyed alike, and provide three master keys per area as indicated. Number keys and lock cylinders for ease of replacement. Clearly label locks with a key number, except for those manufacturers who have removable format locks.

2.11 POWER AND COMMUNICATIONS

Provide both powered and nonpowered panels with base raceways capable of distributing power circuits, communication cables and data lines. Provide nonpowered bases that are capable of easy field conversion to powered base without requiring the panel to be dismantled or removed from the workstation. Provide panels able to support lay-in cabling and having a large capacity for power and data. Provide ample space for storing excess wires and fiber optic cables in the interior of the spine wall frame. Provide easy access to power and data systems in the spine wall without having to move return panels or components. Provide the ability for the spine wall system to supply power to a wall-attached panel system and/or an adjacent desk system. A termination center or utility closet may be utilized in the wall or at the end of a panel run. Provide copper cable assemblies, wiring harnesses or electrified bus for the system and meet the requirements of UL 1286 and NFPA 70, Article 605. Provide conductors with 20 amp 90 or 75 degree C, #12 AWG wires (unless indicated otherwise) or the equivalent in the bus configuration. A single circuit must not serve more than four (4) cubicles or workstations under any circumstances. The label or listing of Underwriter's Laboratories, Inc. will be accepted as evidence that the material or equipment conforms to the applicable standards of that agency. In lieu of this label or listing, submit a statement from a nationally recognized, adequately equipped testing agency indicating that the items have been tested in accordance with required procedures of UL and that the materials and equipment comply with contract requirements. Electrical work not addressed in this section must conform to the requirements of Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

2.11.1 Panel Raceways

Provide panels that have hinged or removable covers that permit easy access to the raceway when required but are securely mounted and cannot be accidentally dislodged under normal conditions. Place raceways in locations such as the base, beltline, and below and above the beltline. The raceway must not extend past either panel face or frame cover by more than 1/2 inch. Provide metal or plastic covers which attach securely to the raceway as required and match the finish and color of the panel trim. Provide a minimum of 2 knockouts (doors) per side for power receptacles and communications jacks as indicated in raceways in full size over 24 inches powered panels . Provide other raceways that are flush with panel faceframe covers.

2.11.2 Power Distribution

Provide power distribution as indicated on the drawings. Provide an internal power and communications raceway and the capability of disconnecting and connecting external circuits to the electrified raceway in the panel. Capacity for at least six 4-pair category 6 cables is required for the communications receiving raceway. Power and communications wiring may share a common wireway if a metal divider is included to ensure electrical isolation. Provide doors or access openings for entry of communications cable. Provide the electrified power raceway for the 8-wire configuration indicated. Unless otherwise indicated,

allocate conductors of the 8-wire system as follows (4-2-2 shared neutrals, 2+2): the three-phase system will have one equipment ground, one isolated ground, two oversized (133 percent minimum) neutral, and four phase conductors; each neutral will be used by two phase conductors, no neutral conductor will be connected to multiple phase conductors of the same phase, and no ground conductor will be on the same circuit as two phase conductors from the same phase; circuits sharing a given neutral conductor will share the same ground conductor.

2.11.2.1 Receptacles

Provide power receptacles in the powered panels. Electrical power receptacles and communications jacks should have the ability to be hung at multiple vertical increments throughout the frame via power harnesses. Unless otherwise indicated, receptacles must be 20 amp (NEMA 5-20R) commercial grade conforming to NEMA WD 1 and NEMA WD 6. Provide 10 percent spare devices of each type shown on these plans if receptacles are not interchangeable or will not permit field adjustment of phase and circuit selection. All receptacles are required to be of the duplex configuration; unless otherwise indicated, special use receptacles are required to be of the simplex configuration with the blade/pin arrangement identified on the plans. Coordinate the color of receptacle bodies with the color of the panel trim. Furniture receptacles whose building power supply circuit is controlled by an energy management system, timer, or some other automatic means or are provided with local automatic control, will be identified using the standard symbol shown in NFPA 70 Figure 406.3(E); each outlet on a multi-outlet receptacle shall be identified individually. Provide field applied identification that is permanent; stick-on or non-setting adhesives are not acceptable. Provide 5 percent spare devices for each configuration and type of receptacle. Provide a minimum of 5 receptacle removal tools for systems that require special tools for proper receptacle removal.

2.11.2.2 Power Cabling Variations

The paragraph Power Distribution has identified specific cabling configurations. Since universal conventions have not been established, variant configurations available from various manufacturers will be considered. Alternates shall allow the same circuiting, device connections, neutral and ground separation, and upstream feeder connections as shown on the plans. See paragraph ALTERNATE DESIGN. An example of an acceptable variation includes the use of a manufacturer's configuration which allocates individual conductors differently, but which has the same quantity of conductors and allows devices to be physically connected in the field as shown on the plans. It is not necessary that the manufacturer's labeling codes or terminology match the designations used on project plans or in the specifications; however, neutrals and grounds shall have insulation color coded per standard practice or be provided with tags, colored tape, colored ribbons or similar identification. (The reference to "dedicated" conductors in this specification pertains to circuit connections upstream and load connections downstream of panels; it is not necessary that manufacturer's designations correspond.)

2.11.3 Electrical Connections

2.11.3.1 Internal Connections

Utilize straight or flexible plug/receptacle connector assemblies for

internal panel-to-panel power connections and provide the powered configurations shown on the drawings.

2.11.3.2 Connections to Building Services

Supply external power and communications services to the panels via direct-wired top or base entry modules.hard wired top or base entry junction box assemblies. Extend wiring from building services to the entry modules or panel bases in metal conduit or tubing or in flexible liquidtight conduit 6 foot maximum. Extend wiring from building services to junction box assemblies in metal conduit or tubing. Provide wiring from junction boxes that is flexible liquid-tight conduit 6 foot maximum or in metal conduit or tubing. Do not use cord and plug assemblies for any portion of external links. Provide base feed modules that plug into the end or either side of the raceway at receptacle doors. Top entry modulesjunction box assemblies are required to extend the power and communications wiring into service entry poles attached to the electrified panels. External wiring must conform to Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

2.11.4 Wire Management

Provide wire management capability at all workstations and accommodate all cable types specified, including the applicable manufacturer required bending radius at corners. Design raceways and interfaces to the raceways to accommodate the bend radius as shown in TIA-569 for Category 6 and fiber optic cables communication wiring whichever is greater. Copper and fiber cabling shall meet the requirements of Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM. The capability may be accomplished by cable access cutouts (1 minimum per work surface), covered wire management troughs in vertical end panels, horizontal wiring troughs, internal midpanel (beltline) raceways, or rear gaps (between the back edge of the work surface and the facing support panel). Provide grommet kits or another suitable finish arrangement for all cable cutouts. Provide accessories for an externally mounted vertical and horizontal wire management and concealment system as recommended by the manufacturer. Supply horizontal wire managers for mounting under all work surfaces. Attach the wire managers either to the underside of the work surface or to the vertical panel without damaging the face. Exposed or loose wiring will not be acceptable. Wire managers must be prefinished and secure, conceal, and accommodate outlet cords as well as electrical and communications wiring. Wire channels are required to match color of panel trim, attach by means of clip-on attachment, and conceal wires routed vertically. Separate power wiring from communication wiring by use of separate raceways or by placement of channels in joint use troughs or wireways.

2.11.5 Circuit Layout

Provide the circuit layout for workstations on the drawings. Connect devices to the designated circuits in the neutral, ground, and automatic control configurations indicated. Connections must be made to the building electrical distribution system as shown on the contract drawings and in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

2.11.6 Task Lighting

Provide task lights with light emitting diode (LED) technology to include a built-in reflector and shielding device that prevents direct glare into

an occupant's eyes when they are in a typical working position. Provide task light size and placement on the contract drawings. It is required that lights be a standard component of the manufacturer's workstation products, and the ends of the task light length can not extend beyond the edges of the overhead cabinet. Enclose task light power cords within vertical wire cover or clips. Luminaires shall be UL approved for use in the configurations indicated on the drawings.Provide task lighting that is Energy Star labeled. Provide data identifying Energy Star label for task lighting.

2.11.6.1 Luminaire Configuration

Provide luminaires and lamps as specified in Section 26 51 00 INTERIOR LIGHTING and modified herein. For undershelf or undercabinet lighting, provide luminaires that are light emitting diode (LED) type and have prismatic lenses, baffles, or other shielding device configured to minimize glare by shielding the lamp from view of the seated user. Provide task lights for each workstation with a minimum of 60 footcandles of light (horizontally measured) without veiling reflections, on the work surface directly below and a maximum of 20 inches from the luminaire. Easily removable diffusers, grilles, or other coverings are required to allow for cleaning and relamping. For LED-type task lighting, power consumption shall not exceed 8 watts per foot. Correlated Color Temperature (CCT) of task lighting shall match the CCT of the ambient room lighting. Provide an easily accessible on-off switch and one ballast or driver per luminaire. A variable intensity control is acceptable if the low setting is equivalent to "off" with zero energy consumption. Multiple level switching is also acceptable. For LED type technology, ganged luminaires or shared drivers are permitted for up to 4 continuous feet in length. A single driver designed for use with an individual LED housing of greater than 4 feet in length is allowed.

2.11.6.2 Wiring

Provide each luminaire with a 6 foot minimum, factory installed, heavy duty electrical cordset with a grounded plug for luminaries that are mounted on the same wall as the receptacle. Provide luminaires mounted on non-powered wall with a 9 foot minimum, factory installed heavy duty electrical cordset with a grounded plug. Direct or hard wire connections are not acceptable. Unless otherwise indicated, conceal cord. Built-in cord concealment is required within panels or utilize field installed, manufacturer approved accessories. Cords may be extended through dedicated channels located at any point within panels or may be placed in vertical slots or in the space between panels if held in place by retainers and concealed by a cover plate. Vertical wire managers are required to be prefinished and cut to size and shall extend from the task light level down to the top of the work surface below the task light. Attach each manager to a panel vertical edge or connector strip without damage to the surfaces.

2.11.6.3 Control Device

Provide occupancy sensors with "manual ON", "automatic OFF" controls for luminaire control.

2.11.7 Communications

Communications wiring will be extended to, and installed in, the electrified panels as shown on the plans. Install communications jacks at

designated locations. Communications work may be performed in conjunction with the installation of workstations or may be separately executed at the Contractor's option; however, equipment, materials, and installation must conform to the requirements of Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM Section 27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM, and properly coordinate all interfaces.

PART 3 EXECUTION

3.1 INSTALLATION

Install the workstations using certified installers in accordance with manufacturer's recommended installation instructions. A licensed electrician is required to hardwire the workstations. Install workstation components level, plumb, square, and with proper alignment with adjoining furniture. Securely interconnect and attach components to the building where required. Provide three sets of special tools and equipment necessary for the relocation of panels and other components. Verify that equipment is properly installed, connected, and adjusted.

3.2 CLEANING

Provide cleanup as specified in Section 01 78 00 CLOSEOUT SUBMITTALS. Upon completion of installation, clean and polish all products and leave the area in a clean and neat condition. Any defects in material and installation are required to be repaired, and damaged products that cannot be satisfactorily repaired are required to be replaced. Submit three sets of Maintenance Manuals describing proper cleaning and minor repair procedures.

-- End of Section --

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SECTION 14 21 23

ELECTRIC TRACTION PASSENGER ELEVATORS
05/16

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7-16	(2017; Errata 2018; Supp 1 2018) Minimum Design Loads and Associated Criteria for Buildings and Other Structures

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME A17.1/CSA B44	(2019) Safety Code for Elevators and Escalators
ASME A17.2	(2017) Guide for Inspection of Elevators, Escalators, and Moving Walks Includes Inspection Procedures for Electric Traction and Winding Drum Elevators, Hydraulic Elevators, and Escalators and Moving Walks

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2020) Structural Welding Code - Steel

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41	(1991; R 1995) Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code

NATIONAL ELEVATOR INDUSTRY, INC. (NEII)

NEII-1	(2000; R thru 2017) Building Transportation Standards and Guidelines, including the Performance Standards Matrix for New Elevator Installation

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2020; ERTA 20-1 2020; ERTA 20-2 2020; TIA 20-1; TIA 20-2; TIA 20-3; TIA 20-4) National Electrical Code

NFPA 70E	(2018; TIA 18-1; TIA 81-2) Standard for Electrical Safety in the Workplace
NFPA 72	(2019; TIA 19-1; ERTA 1 2019) National Fire Alarm and Signaling Code
NFPA 101	(2018; ERTA 18-1; ERTA 18-2; ERTA 18-3; ERTA 18-4; TIA 18-1; TIA 18-2; TIA 18-3; TIA 18-4) Life Safety Code

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-560-01	(2017, with Change 2, 2019) Operations and Maintenance: Electrical Safety

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

36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Elevator System; G

Elevator Components; G

Elevator Machine; G

Elevator Controller; G

Wiring Diagrams; G

SD-03 Product Data

Elevator and Accessories

Elevator Components

Data Sheets

Elevator Microprocessor Controller; G

SD-05 Design Data

Emergency Power Systems

Heat Loads

Reaction Loads

SD-07 Certificates

Elevator Parts and Components Price Lists; G

Warranty

Endorsement Letter

Welders' Qualifications

Elevator Controller Certification; G

SD-10 Operation and Maintenance Data

Elevator, Data Package 4; G

Maintenance Control Program (MCP); G

Software and Documentation; G

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA and 01 78 24.05 20 FACILITY OPERATION AND MAINTENANCE SUPPORT INFORMATION.

1.2.1 Shop Drawing Requirements

Provide assembly and arrangement of elevators, accessories, and elevator components. Show location of elevator machine in elevator machine room (MR) or machinery space (MS). Show location of elevator controller in elevator machine room or elevator control room (CR). Provide details for materials and equipment, including but not limited to operating and signal fixtures, doors, door and car frames, car enclosure, controllers, motors, guide rails and brackets, layout of hoistway in plan and elevation, and other layout information and clearance dimensions.

1.2.2 Product Data Requirements

Provide manufacturers' product data for all elevator components, including but not limited to the following: elevator controller, hoist machine and drive motor, design counterbalance, hoist ropes and shackles, overspeed governor, emergency braking system, car and hall fixture buttons and switches, cab, machine room, control room, and machinery space communication devices, door operator, door protection system, and car and counterweight roller guides and buffers. For data sheets, provide document identification number or bulletin number, published or copyrighted prior to the date of contract bid opening. Provide controller manufacturer's published procedures for performance of each and all testing required by ASME A17.1/CSA B44.

1.2.3 Design Data

1.2.3.1 Reaction Loads

Provide calculations by registered professional engineer for reaction loads imposed on building by elevator system. Calculations must comply with ASCE 7-16 and ASME A17.1/CSA B44

1.2.3.2 Heat Loads

Provide calculations from elevator manufacturer, or by registered professional engineer, for total anticipated heat loads generated by all of the elevator equipment.

1.2.3.3 Emergency Power Systems

Where the facility does have an emergency power system, confirm the elevators that will be connected to the emergency power system. Confirm the complete emergency power system and sequence of operation for all elevators, including elevator sequential operation and operation of the elevator lobby manual selection switch. Provide wiring diagrams for building emergency power interface with elevator controls. For elevators not supplied by an emergency power system, provide manufacturers' product data for auxiliary power systems.

1.2.4 Welders' Requirements

Comply with AWS D1.1/D1.1M, Section 5. Include certified copies of field welders' qualifications. List welders' names with corresponding code marks to identify each welder's welding work

1.2.5 Maintenance Control Program (MCP)

For each elevator, prepare and provide a written Maintenance Control Program (MCP) that complies with ASME A17.1/CSA B44 Section 8.6, including written documentation that details the test procedures for each and every test that is required to be performed by ASME A17.1/CSA B44. Assemble all MCP documentation, and supporting technical attachments, in a single MCP package and provide in both electronic and hard copy. Assemble entire hard copy MCP in 3-ring binders. For each elevator provided, the MCP must include only documentation and instruction that apply to the elevator specified.

For each elevator, provide an additional, separate binder that includes all maintenance, repair, replacement, call back, and other records required by ASME A17.1/CSA B44. The records binder must be kept in the elevator mechanical room, maintained by elevator maintenance and service personnel, and be available at all times to authorized personnel.

Provide detailed information regarding emergency service procedures and elevator installation company personnel contact information. Provide a listing of all tools to be provided to the Contracting Officer as components of the elevator system.

1.3 QUALITY ASSURANCE

1.3.1 Qualification

Provide a designed and engineered elevator system by an elevator contractor regularly engaged in the installation of elevator systems. Provide elevator components manufactured by companies regularly engaged in the manufacture of elevator components. Utilize only licensed and certified elevator personnel for the installation, adjusting, testing, and servicing of the elevators.

1.3.1.1 Elevator Contractor's Elevator Technicians

For elevator installations in the United States, including United States territories, perform all elevator related work under the direct guidance of a state certified elevator technician with a minimum of three years of experience in the installation of elevator systems of the type and complexity specified in the contract documents. Provide an endorsement letter from the elevator manufacturer, certifying that the elevator specialist is qualified. All elevator technicians must carry a current certification issued by one of the following organizations:

a. National Association of Elevator Contractors (NAEC)

b. National Elevator Industry Education Program (NEIEP)

1.3.2 Manufacturers' Technical Support

Provide elevator components from manufacturers that provide factory training and online and live telephone elevator technical support to any elevator installation, service, and maintenance contractor. Provide elevator components from manufacturers that guarantee accessibility to all replacement and repair parts and components to any elevator installation, service, and maintenance contractor. Use only elevator component manufacturers that provide current published price lists for all elevator parts and components.

1.3.3 Operation and Maintenance Data

Assemble all shop drawing and product data material into O&M Data Packages in accordance with Article SUBMITTALS. Provide two complete O&M Data Packages in hard copy and two complete electronic O&M data packages on separate CDs, in PDF format. Provide all O&M Data Packages to Contracting Officer. Include controller diagnostic documentation and software as required under Article CONTROL EQUIPMENT.

1.3.4 Wiring Diagrams

Provide complete wiring diagrams and sequence of operations, which show electrical connections and functions of elevator systems. Provide one set (11 inch by 17 inch minimum size) of wiring diagrams, with individual sheets laminated in plastic and assembled in binder, to be stored in the machine room or control room cabinet. Provide one additional hard copy set and two complete electronic sets on separate CDs, in PDF format. Provide all wiring diagram sets to the Contracting Officer. Coded diagrams are not acceptable unless fully identified.

1.3.5 Machine Room/Control Room Cabinet

For storage of O&M Data Packages and Wiring Diagrams, provide locking metal cabinet with a minimum size of 20 inch W by 12 inch D by 30 inch H. Cabinet must be sized large enough to accommodate all O&M Data and hardware required in paragraphs OPERATION AND MAINTENANCE DATA and WIRING DIAGRAMS. Secure cabinet to machine room or control room wall.

1.4 NEW INSTALLATION SERVICE

Provide elevator warranty service in accordance with the manufacturer's maintenance plan, warranty requirements, and applicable safety codes, for a period of 12 months after the date of acceptance by Contracting

Officer. Perform this work during regular working hours. Provide supplies and parts to keep elevator system in operation. Perform service only by factory trained personnel. Provide Monthly services to include repairs, adjustments, greasing, oiling, and cleaning. Provide service log in elevator machine room or control room cabinet and update Monthly, throughout the one-year warranty period.

Provide 24-hour emergency service, with one hour on-site response time, during this period without additional cost to the Government.

1.4.1 Periodic Elevator Certification Inspection and Testing

Provide elevator mechanic to support QEI Certified Elevator Inspector in the periodic six-month and the annual Category 1 elevator certification inspection and testing. Perform Category 1 inspection and testing no greater than 30 days prior to the end of the warranty period. Perform all elevator certification testing in the presence of QEI Certified Elevator Inspector.

In conjunction with the testing noted above, test systems for Emergency Power Operation, Earthquake Emergency Operation, and Hospital Emergency Commandeering Service Operation, as applicable. Schedule so that testing does not interfere with building operations.

1.5 FIRE PROTECTION SYSTEM

Coordinate interface between building fire protection system and elevator controls.

Additional fire protection requirements are located in: Section 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM, ADDRESSABLE; Section 21 13 13 WET PIPE SPRINKLER SYSTEMS, FIRE PROTECTION; and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

1.5.1 Fire Alarm Initiating Devices

Fire alarm initiating devices are specified in Section 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM, ADDRESSABLE, including conduit and wiring from each detector to fire protection addressable modules in elevator machine room or control room.

1.5.2 Fire Sprinklers

Provide fire sprinklers in accordance with all applicable safety codes and with Section 21 13 13 WET PIPE SPRINKLER SYSTEMS, FIRE PROTECTION. Provide shutoff valve, check valve, and non-adjustable, zero time-delay flow switch, in each sprinkler line immediately outside of each machine room, control room, and hoistway, as applicable. Provide inspectors' test valve for periodic testing of flow switch and shunt trip disconnect.

Pipe sprinkler piping serving these spaces in a series manner with no laterals. Locate inspectors' test connection at the end of pipe runs such that operation of the test connection will purge air from system piping.

1.5.3 Shunt Trip Disconnect

Provide flow switches specified in paragraph FIRE SPRINKLERS to comply with ASME A17.1/CSA B44 and NFPA 72 for shunt trip of the main line power supply. For each elevator, provide control wiring connecting the flow

switch to a shunt trip equipped circuit breaker located in the elevator machine room or control room. Upon flow of water, flow switch will instantaneously cause opening of the shunt-trip circuit breaker and remove power from the elevator. Flow switch must also send a signal to fire alarm control panel to indicate water flow condition.

PART 2 PRODUCTS

2.1 ELEVATOR DESCRIPTION

Provide elevator system that complies with ASME A17.1/CSA B44 in its entirety, ASME A17.2 in its entirety, and additional requirements specified herein. Provide elevator system that meets or exceeds the NEII-1 Ride Quality Performance Standards Matrix (RQPSM). For elevator speeds of 500 fpm and higher, comply with the RQPSM "High Performance" criteria. For elevator speeds 350 fpm, up to but not including 500 fpm, comply with the RQPSM "Intermediate Performance" criteria.

Provide and install elevators in accordance with 36 CFR 1191 - ABAAS, ICC IBC, IEEE C62.41, NFPA 70 and NFPA 101 requirements.

2.1.1 Elevator Design Parameters

Elevator must comply with this schedule:

ELEVATOR LEVEL SCHEDULE	
FLOOR MARKING	FLOOR HEIGHT
LEVEL 4	31'-6"
LEVEL 3	21'-0"
LEVEL 2	10'-6"
LEVEL 1	0"
LEVEL B1 NORTH WING	-10'-6"
LEVEL B2 NORTH WING	-20'-8"
LEVEL B3 NORTH WING	-31'-10"

2.1.1.1 Elevator No.1 - Larger Capacity (Pallet-Sized) Loading

a. Type: Gearless

b. Rated load: 5,000 lb.

c. Rated Speed: 350 fpm

d. Car Door Type: Two-speed, center opening, horizontally sliding.

e. Car Door Opening Width:4 ft.-0 in.

2.1.2 Cab Enclosure and Hoistway Entrance Assemblies

Provide finishes as listed below:

a. Floor; Aluminum diamond pattern.

b. Walls; on plywood stainless steel. Provide each cab wall with equally spaced and equally sized wall panels. All wall panel fasteners must be concealed.

Wall trim; stainless steel.

Accessories; Provide hand rails on full length of back wall and side walls of elevator cab.

c. Car doors, car door returns, and wall reveals; stainless steel.

d. Ceilings; supported, prefinished steel panels.

Ceiling frame; prefinished steel.

e. Hoistway Entrance Assembly Material and Finishes; stainless steel.

2.2 ELEVATOR OPERATION

ASME A17.1/CSA B44, Introduction, Section 3, Definitions.

2.2.1 Selective Collective Automatic Operation

Provide Selective Collective Automatic Operation.

2.3 SPECIAL OPERATION AND CONTROL

Provide the following special operations and control systems.

2.3.1 Keys for Elevator Key Switches

Provide a minimum of twelve keys per unique cylinder used on all key switches for a single elevator. If there is more than one elevator, additional keys will not be required unless there are additional unique lock cylinders. Provide keys with brass or fiberglass tags marked "PROPERTY OF THE U.S. GOVERNMENT" on one side with function of key or approved code number on the other side.

2.3.2 Firefighters' Emergency Operation (FEO)

Provide FEO equipment and signaling devices. The designated level for the FEO Phase I key operated switch is the ground floor. In the FEO Phase I fixture, provide FEO Operating Instructions.

2.3.2.1 Firefighters' Emergency Operation (FEO) Key Box

Provide flush mounted, locking, FEO Key Box of a minimum size of 5 inch W by 9 inch H by 1.5 inch D. Install at a height of 6 feet above floor level and directly above the FEO Phase I key switch. Provide box equipped with lock that uses the FEO K1 key.

2.3.3 Hoistway Access Operation

Provide hoistway access operation with switches at top and bottom terminal landings. Locate switch 6 feet above floor level, within 12 inches of elevator hoistway entrance frame or with the ferrule exposed when located in the elevator entrance frame.

2.3.4 In-Car Inspection Operation

Provide In-Car Inspection Operation.

2.3.5 Independent Service

Provide exposed key-operated switch in car operating panel to enable independent service and simultaneously disable in-car signals and landing-call responses. Provide indicator lights that automatically illuminate during independent service. For duplex or group operation, if one car is removed from group another car will respond to its hall calls.

2.3.6 Elevator Emergency Power Operation

Provide elevator emergency power operation for elevator 1,2,3.... Coordinate power supply and control wiring to accomplish initiation and operation of elevators on emergency power.

2.3.7 Elevator Auxiliary Power Operating System

Provide elevator auxiliary power operating system for elevator No. 1

2.4 ELEVATOR DRIVE MACHINE, HOIST MOTOR, AND DRIVE MOTOR

Provide elevator drive machine, hoist motor, and motor drive system that is designed to be installed in an elevator machine room (MR) or an elevator machinery space. The elevator machine, motor, and drive configuration and installation design must be mechanically and electrically interchangeable with a minimum of two other elevator manufacturer's drive machines that are readily available in the elevator industry. Paint or finish ferrous surfaces with a minimum of one coat of manufacturer applied rust- inhibiting paint.

Design the elevator drive system so that the hoist motor amperage does not exceed the motor data tag full load amperage in any operating condition, exclusive of acceleration and deceleration. Provide elevator hoist motor that is designed with Class F insulation and rated for 120 starts/hr. Design the elevator drive system to limit Total Harmonic Distortion to a maximum of 5 percent. No single harmonic may exceed 3 percent.

Provide an elevator drive machine designed for and provided with stranded steel wire rope for elevator suspension and counterbalance. The minimum acceptable diameter of suspension and counterweight ropes is 3/8 inches. Aramid fiber ropes, coated steel ropes, and non-circular coated steel belts may not be used for elevator suspension or counterbalance.

The elevator drive machine must be equipped with machine manufacturer's designed and installed standard means for the manual release of the driving-machine brake.

2.4.1 Manufacturer's Factory Training and Technical Support

Provide an elevator drive machine from a manufacturer that provides comprehensive factory training and technical support for installation, adjustment, service, and maintenance of the drive system. The training and support must be identified as available to any licensed elevator contractor. Provide verification of an established and documented training schedule, with pricing, for factory training classes that have been provided for a minimum period of one year prior to contract award date.

The elevator drive system must be identified as available for purchase and installation by any licensed elevator contractor. All drive system related components, parts, diagnostic tools, and software must be available for purchase, installation, and use by any licensed elevator contractor; "exchange-only" provisions for the purchase of spare parts are not acceptable.

2.4.2 Ascending Car Overspeed and Unintended Car Movement Protection

Provide elevator Ascending Car Overspeed and Unintended Car Movement Protection means that is designed to act directly upon, and apply a retarding force to, the elevator suspension ropes. In addition to the requirements of ASME A17.1/CSA B44, the means must be designed to detect and stop movement of the elevator suspension ropes that occurs as a result of loss of traction between the suspension ropes and the elevator machine drive sheave.

2.5 CONTROL EQUIPMENT

Enclose all elevator control equipment in factory-primed and baked-enamel coated sheet-metal cabinets with ventilation louvers and removable or hinged doors. Mount cabinets at a height of 10 inches above machine room or control room finish floor.

2.5.1 Motor Control Equipment

Provide variable voltage with Variable-Frequency Variable Voltage (VVVF) alternating current (ac) drive control.

2.5.1.1 Electrical Isolation Protection

Provide individual isolation transformers and individual choke reactors for each individual hoist motor. Provide filtering to maintain harmonic distortion below IEEE C62.41 standards as measured at the elevator machine room or control room disconnect.

2.5.2 Elevator Microprocessor Controller

For each individual elevator controller, and for each group controller, provide a microprocessor controller that complies with the following paragraphs. Provide controller(s) package that includes all hardware and software required for the installation, maintenance, and service of the elevator, in its' entirety. Provide verification of technical support service that the controller manufacturer provides to any licensed elevator installation, service, and maintenance company.

Provide an elevator controller from a manufacturer that provides comprehensive factory training to include controller installation,

adjustment, service, and maintenance. The training must be identified as available to any licensed elevator contractor. Provide verification of an established and documented training schedule, with pricing, for factory training classes that manufacturer has provided for a minimum period of one year prior to contract award date.

The elevator controller must be identified as available for purchase and installation by any licensed elevator contractor. All components, parts, diagnostic tools, and software must be available for purchase and installation and use by any licensed elevator contractor; "exchange-only" provisions for the purchase of spare parts are not acceptable. The elevator controller manufacturer must publish an industry competitive price listing for all controller parts, diagnostic tools, and software.

Provide verification of telephone and internet based technical support service that the elevator controller manufacturer provides to any licensed elevator installation, service, and maintenance company at an industry competitive price. The service must include live telephone based technical support for installation, adjustment, maintenance, and troubleshooting of the elevator controller and related elevator components. The service must be available during standard working hours.

Provide an elevator controller that is designed to automatically reestablish normal elevator operation following any temporary loss of power, regardless of duration.

2.5.2.1 Elevator Controller Interface Cabinet

For each individual elevator microprocessor controller, provide a separate elevator control cabinet with an integrated human interface system. The separate controller interface cabinet must be supplied by the elevator controller manufacturer and include a minimum 12 inch wide keyboard and a minimum 10 inch monitor. The elevator controller interface cabinet must comply with arc-flash protection requirements of NFPA 70E and UFC 3-560-01.

2.5.2.1.1 Elevator Microprocessor Human Interface

The interface system must provide complete elevator controller interface capability and must include the elevator controller manufacturer's comprehensive package of installation and diagnostic software. The microprocessor interface system must provide unrestricted access to all parameters, all levels of adjustment, and all flags necessary for installation, adjustment, maintenance, and troubleshooting of each elevator. All software programming must be stored in non-volatile memory. The elevator controller fault log must provide non-volatile memory fault log storage of all faults, trouble calls, and fault history for a minimum of one year and the ability to download or print the fault log. The controller interface must also provide the capability to display and diagnose trouble calls, faults, and shutdowns. Expiring software, degrading operation, and "key" access controls are not acceptable.

2.5.2.2 Software and Documentation

Provide three copies of the manufacturer's maintenance and service diagnostic software, with complete software documentation, that will enable the same level of unrestricted access to all controllers of the same make and model, regardless of the installation date or location. Provide signed certification, from the manufacturer's corporate headquarters, that guarantees that the microprocessor software and access

system will not terminate the unlimited and unrestricted access at any future date.

2.5.2.3 Elevator Controller Certification

For elevator installations in the United States, including United States territories, provide an elevator microprocessor controller that has a current certificate of safety code compliance issued by the Technical Standards and Safety Authority (TSSA), Toronto, Canada.

2.6 OPERATING PANELS, SIGNAL FIXTURES, AND COMMUNICATIONS CABINETS

For all panels and fixtures, provide identical and uniform fixture design, material, finish, and components for all elevators. For all panels and fixtures, legibly and indelibly identify all buttons and all operating positions for each device. Use engraving and backfilling, or photo etching, for button and switch designations. Do not use attached signs. Provide elevator manufacturers' standard grade for all key switches unless otherwise specified. All illuminating panels and fixture components must utilize LED lighting for energy efficiency.

2.6.1 Car and Hall Buttons

For all cab and landing fixture buttons, provide industry-standard, vandal resistant push buttons with positive-stop assembly design. Buttons must be minimum 3/4 inch diameter, satin-finish stainless steel, with illuminating LED halo.

2.6.2 Passenger Car-Operating Panel

Provide each car with one car operating panel that contains operation controls and communication devices. Provide exposed, flush mounted buttons for the controls identified in subparagraph PASSENGER CONTROLS. Provide a lockable service cabinet for the controls listed in subparagraph SERVICE CONTROLS. Use engraving and backfilling or photo etching for button and switch designations. Do not use attached signs.

2.6.2.1 Passenger Controls

In addition to ASME A17.1/CSA B44 requirements, provide the following operating controls, identified as indicated:

a. LED illuminating car-call buttons identified to correspond to landings served by the elevator.

b. "DOOR OPEN" and "DOOR CLOSE" buttons. For front openings.

c. Red, illuminating "ALARM" button.

d. Key-operated "Independent Service" switch.

e. "Help" communication device to include communication between elevator cab and elevator machine room or control room.

2.6.2.2 Service Controls

In addition to ASME A17.1/CSA B44 requirements, provide the following operating controls, identified as indicated:

a. Provide a key-operated, three-position switch for "In car Inspection Operation" and "Hoistway Access". The center switch position will provide normal, automatic operation.

b. "Car Light" switch.

c. "Car Fan" switch with two speed settings identified.

d. 120-volt ac 60 Hz single-phase duplex electrical outlet of ground-fault-circuit-interrupt (GFCI) design.

2.6.2.3 Certificate Window

Provide a minimum 4 inch wide by 6 inch high certificate window for elevator inspection certificate. Locate window in the Service Controls door of the Car Operating Panel.

2.6.2.4 Emergency Signaling Devices

Provide an audible signaling device, operable from the Car Operating Panel button marked "ALARM". The audible signaling device must have a sound pressure rating between 80 and 90 dBA at 10 ft. Provide battery backup power capable of operating the audible signaling device for at least one hour.

2.6.3 Elevator In-Car Position Indicators

For all elevators, provide illuminating LED position indicator in the Car Operating Panel.

2.6.4 Hall Call Landing Fixtures

Provide a hall call fixture adjacent to each elevator. Provide a single push-button for terminal landings and dual push-buttons, up and down, at intermediate landings.

2.6.4.1 Designated Landing Hall Call Fixture

2.6.4.1.1 Location of COMMUNICATION MEANS FAILURE (CMF) Visual Signal

When required by ASME A17.1/CSA B44, provide an elevator CMF audible and illuminating signal, and reset switch, in the FEO Designated Landing hall call fixture. Mount the signal and reset switch at a minimum of 7 inches above the "UP" hall call button.

2.6.4.1.2 COMMUNICATION MEANS FAILURE (CMF) Visual and Audible Signal Operation

Provide a CMF visual and audible signal system that conforms to ASME A17.1/CSA B44. Provide continuous verification of operability of the telephone line and immediate activation of audible and visual signals when verification means determines that the telephone line is not functioning. Provide illumination of visual signal at one second intervals. Provide a minimum of 65 dBA audible signal at 30 second intervals.

2.6.4.1.3 Firefighters' Emergency Operation Phase I Switch and Visual Signal

When required by ASME A17.1/CSA B44, provide an elevator Firefighters'

Emergency Operation Phase I switch and illuminating visual signal in the FEO Designated Landing hall call fixture. Provide FEO Phase I visual signal that is designed with intermittent, flashing, illumination when actuated by the machine room, control room, or hoistway fire alarm initiating device. Locate FEO Phase I key switch above the CMF visual signal with a minimum of 6 inches vertical between the centerlines of the CMF signal and the FEO Phase I key switch. Locate FEO Phase I visual signal directly above the Phase I switch. In addition, locate Elevator Corridor Call Station Pictograph at top of hall call fixture.

2.6.5 Elevator Car Position and Direction Indicators and Car Arrival Signal

For elevator installations with three or more stops, provide a separate hall landing fixture that includes the visual elevator position indicator, visual direction indicators, and audible car arrival signal, in accordance with ABA Standards.

2.6.6 Emergency or Standby Power

When emergency or standby power is provided for elevator operation, provide an elevator emergency power visual indicator that conforms to ASME A17.1/CSA B44. Locate the visual signal in the Firefighters Emergency Operation fixture for each simplex elevator and for each elevator group. When an emergency power selector switch is required, provide switch in a separate, flush mounted fixture located at the designated level, in view of all elevator entrances.

2.7 CAR DOOR EQUIPMENT

2.7.1 Car Door Operator

Provide elevator door operator equipment and circuitry that is designed and installed as discreet communication. Serial communication must not be used for this system.

2.7.2 Infra-red Curtain Unit

Provide Infra-red Curtain Unit (ICU) with multiple infra-red beams that protect to the full height and width of the door opening. Provide door nudging operation.

2.8 PASSENGER ELEVATOR GUIDES, PLATFORM, AND ENCLOSURE

2.8.1 Roller Guides

Provide coil-spring loaded roller guide assemblies in adjustable mountings on each side of car and counterweight frames in accurate alignment at top and bottom of frames.

2.8.2 Car Enclosure Wall Panels, Return Panels, Doors, Entrance Columns, and Transom

Provide 14 Gauge minimum stainless steel cab wall panels and entrance components. Use same material and finish for all hoistway and car entrance assemblies. Apply sound-deadening material on exterior of all cab wall panels.

2.8.3 Car Enclosure Top

Provide reinforced, 12 gauge minimum steel car enclosure top. Provide hinged emergency exit with lock that complies with the seismic risk zone 2 or greater design requirements of ASME A17.1/CSA B44. Locate emergency exit hinge towards the rear of the elevator cab. Design and configure the elevator cab interior ceiling to provide convenient and unobstructed access to, and use of, emergency exit from inside the elevator cab.

2.8.4 Car Door

Provide 16 gauge minimum stainless steel car doors of sandwich construction with flush surfaces on car and landing sides. Provide a minimum of 2 door guide assemblies per door panel, one guide at leading and one at trailing door edge with guides in the sill groove their entire length of travel.

2.8.5 Car Entrance Sill

Provide one piece cast nickel silver, entrance sill(s). Set sills level and flush with floor finish. Use same material for hoistway and car entrance sills.

2.8.6 Cab Finish Floor

Provide cab finish floor with top of finish floor flush with the cab sill.

2.8.7 Car Fan

Provide 2-speed fan for car enclosure forced ventilation. Fan must be mounted in the car enclosure top.

2.8.8 Car Lighting

Utilize LED lighting for elevator car interior illumination. Provide a minimum of 10 foot-candles, measured at all areas of the car enclosure floor. Provide automatic car lighting operation that will turn off car lights after 3 minutes of inactivity. Car lights must automatically turn on upon actuation of an elevator car or hall call.

2.8.9 Car Protection Pads and Hooks

Provide fire retardant, hanging car protection pads that provide protection for all car interior wall panels. Provide permanently installed studs in car that are designed for hanging the car protection pads in the car.

2.9 PASSENGER ELEVATOR HOISTWAY DOORS AND ENTRANCES

Provide hoistway entrance assemblies with a minimum 1-1/2 hour fire rating. Use same material and finish for all hoistway and car entrance assemblies.

2.9.1 Hoistway Entrance Frames

Provide 14 gage minimum stainless steel hoistway entrance frames. Solidly grout uprights of entrance ways to height of 5 feet.

2.9.2 Hoistway Entrance Sills

Provide one-piece cast nickel silver. Set top of landing sill flush with top of finish floor. Solidly grout under full length of sill. Use same material for all hoistway and car entrance sills.

2.9.3 Hoistway Entrance Doors

Provide stainless steel non-vision construction hoistway entrance doors with flush surfaces on car and landing sides. Provide a minimum of 2 door guide assemblies per door panel, one guide at leading edge and one at trailing edge with guides in the sill groove the entire length of door travel. Use same material and finish for all hoistway and car entrance assemblies.

2.9.4 Hoistway Entrance Door Track Dust Covers

Provide sheet metal hoistway door track dust covers at each landing. Dust covers must cover top and hoistway side of door locks and door roller tracks, and extend the full width of the door track and associated hardware. Dust cover sections will not exceed 3 feet in length.

2.10 HOISTWAY EQUIPMENT

2.10.1 Car and Counterweight Guide Rails and Fastenings

Provide T-section type guide rails for car and counterweight. Paint rail shanks with one coat of black enamel.

2.10.2 Pit Equipment and Support Channels

Provide rail-to-rail pit channels to serve as mounting surface for main guide rails and counterweight guide rails. In addition, pit channels will serve as mounting surfaces for car and counterweight buffers. Method of installation of channels, brackets and buffer mounts will be such that pit waterproofing is not punctured.

2.10.3 Pit "STOP" Switch

Provide push-to-stop/pull-to-run type pit "STOP" switch.

2.10.4 Traveling Cables

Suspend traveling cables by means of self-tightening webbed devices or internal suspension members.

2.10.5 Hoistway Pit Ladder

Provide continuous horizontal rungs for the full height of the pit ladder.

PART 3 EXECUTION

3.1 INSTALLATION

Install in accordance with DOD design criteria, contract specifications, manufacturer's instructions, NEII-1 Building Transportation Standards and Guidelines, and all applicable building and safety code requirements.

3.1.1 Structural Members and Finish Materials

Do not cut or alter structural members. Do not alter finish materials from manufacturer's original design. Restore any damaged or defaced work to original condition.

3.1.2 Miscellaneous Requirements

Provide recesses, cutouts, slots, holes, patching, grouting, and refinishing to accommodate elevator installation. Use core drilling to drill all new holes in concrete. Finish work to be straight, level, and plumb. During installation, protect machinery and equipment from dirt, water, or mechanical damage. At completion, clean all work and spot paint.

3.2 FIELD QUALITY CONTROL

The Contractor will provide and utilize a third-party licensed and certified Qualified Elevator Inspector (QEI) to conduct elevator pre-acceptance inspection and testing. The QEI must perform inspections and witness tests to ensure that the installation conforms to all applicable safety codes and contract requirements. The QEI will be directly employed by the Contractor and independent of the elevator contractor.

Upon completion, the QEI must provide written test data for all ASME A17.1/CSA B44 Acceptance Tests and written certification that the elevator is complete and ready for final Acceptance Inspection, Testing, and Commissioning.

3.3 ACCEPTANCE INSPECTION, TESTING AND COMMISSIONING

When elevator system installation is complete and ready for final inspection, notify Contracting Officer that elevator system is ready for Acceptance Inspection, Testing, and Commissioning. Provide QEI certification specified in Article FIELD QUALITY CONTROL.

Contracting Officer will obtain the services of a third-party QEI Certified Elevator Inspector. The QEI must utilize an Elevator Acceptance Inspection Form to record the results of inspection and all testing and to identify safety code and contract deficiencies. Specific values must be provided for all tests required by ASME A17.1/CSA B44, ASME A17.2, and contract documents. Upon completion of inspection and testing, the QEI must sign a copy of the completed forms and provide to the Contracting Officer. Within 2 weeks of the inspection, the QEI must also prepare a formal inspection report, including all test results and deficiencies. Upon successful completion of inspection and testing, the QEI will complete, sign, and provide a certificate of compliance with ASME A17.1/CSA B44.

3.3.1 Acceptance Inspection Support

Prime and Elevator Contractors must provide inspection support and perform all required tests, in order to demonstrate proper operation of each elevator system and to prove that each system complies with contract requirements and all applicable building and safety codes. Inspection procedures in ASME A17.2 form a part of this inspection and acceptance testing. All inspection and testing must be conducted in the presence of the Qualified Elevator Inspector (QEI).

If the elevator does not comply with all contract and safety code requirements on the initial Acceptance Inspection and Test, the Contractor is responsible for all costs involved with re-inspection and re-testing required as a result of contractor delays and discrepancies discovered during inspection and testing.

3.3.2 Testing Materials and Instruments

Provide all testing materials and instruments necessary for Acceptance Inspection, Testing and Commissioning. At a minimum, include calibrated test weights, tachometer, accelerometer, hydraulic pressure gauge, 600-volt megohm meter, volt meter and ammeter, infrared temperature gauge, door pressure gage, dynamometer, and 20 foot tape measure.

3.3.3 Field Tests

3.3.3.1 Endurance Tests

Test each elevator for a period of one hour continuous, automatic operation, with specified rated load in the elevator cab. During the one hour test, stop car at each floor, in both directions of travel, and allow automatic door open and close operation. The requirements for Automatic Operation, Rated Speed, Leveling, Temperature Rise and Motor Amperes must be met throughout the duration of the Endurance Test. Restart the one hour test period from the beginning, following any shutdown or failure.

3.3.3.2 Speed Tests

Determine actual speed of each elevator, in both directions of travel, with rated load and with no load in elevator car. Make Speed tests at the beginning and at the end of the Endurance test. Determine speed by tachometer reading or accelerometer, excluding accelerating and slow-down zones. Under all conditions, minimum acceptable elevator speed is the Rated speed specified. Maximum acceptable elevator speed is 110 percent of Rated speed.

3.3.3.3 Leveling Tests

Test elevator car leveling operation and provide a leveling accuracy equal to or less than 1/8 inch at each floor with no load in car, balanced load in car, and with rated load in car, in both directions of travel. Determine leveling accuracy at the beginning and at the end of the endurance tests.

3.3.3.4 Temperature Rise Tests

Determine temperature rise of elevator drive machine motor during one-hour full-load test run. Under these conditions, maximum temperature rise must not exceed acceptable temperature rise indicated on manufacturer's data plate. Start test only when equipment is within 5 degrees C of ambient temperature.

3.3.3.5 Balanced Load Test

Place balanced load in the elevator cab, according to the manufacturer's designed counterbalance. Perform electrical and mechanical balanced load tests of car and counterweight.

3.3.3.6 Motor Ampere Tests

At beginning and end of Endurance test, measure and record motor amperage in both directions of travel and in both no-load and rated load conditions.

3.3.3.7 Elevator Performance and Ride Quality Testing

Evaluate elevator performance to ensure compliance with specification requirements related to the NEII-1 Performance Standards Matrix for New Elevator Installations.

-- End of Section --

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