WORK ORDER NO.
N40080-14-1190188

PWB # 2011253

READY-TO-ADVERTISE SPECIFICATION
Volume 2 of 3
(Divisions 02-14)

Replace Quantico Middle High School

At the

Marine Corps Base, Quantico, VA
P-021

PREPARED BY:

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(A/E Contract W91236-15-C-0023)

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SECTION 02 41 00

DEMOLITION
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 ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 145	(1991; R 2008) Standard Specification for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
AASHTO T 180	(2010) Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.6	(2006) Safety Requirements for Demolition Operations

CARPET AND RUG INSTITUTE (CRI)

CRI CIS	(2011) Carpet Installation Standard

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	(June 2000) Storage and Handling of Liquefied and Gaseous Compressed Gases and Their Full and Empty Cylinders

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) 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 Demolition Plan

Prepare a Demolition Plan and submit proposed demolition, and removal procedures for approval before work is started. Include in the plan procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services, and a detailed description of methods and equipment to be used for each operation and of the sequence of operations. Identify components and materials to be salvaged for reuse or recycling with reference to paragraph Existing Facilities to be Removed. Append tracking forms for all removed materials indicating type, quantities, condition, destination, and end use. Coordinate with Waste Management Plan. Include statements affirming Contractor inspection of the existing roof deck and its suitability to perform as a safe working platform or if inspection reveals a safety hazard to workers, state provisions for securing the safety of the workers throughout the performance of the work. 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.

1.2.2 General Requirements

Do not begin demolition or deconstruction until authorization is received from the Contracting Officer. The work of this section is to be performed in a manner that maximizes the value derived from the salvage and recycling of materials. The work includes demolition, , salvage of identified items and materials, and removal of resulting rubbish and debris. Remove rubbish and debris from Government property daily, unless otherwise directed. Store materials that cannot be removed daily in areas specified by the Contracting Officer. In the interest of occupational safety and health, perform the work in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections. Refer to 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS for additional safety requirements.

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, deconstruction, or demolition work performed under this contract. Do not overload structural elements . 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 Trees

Protect trees within the project site which might be damaged during demolition or deconstruction, and which are indicated to be left in place, by a 6 foot high fence. Erect and secure fence a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Replace any tree designated to remain that is damaged during the work under this contract with like-kind or as approved by the Contracting Officer.

1.3.4 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 .

1.3.5 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
Existing Middle/High School	Upon occupancy of new Middle/High School as directed and approved by Contracting Officer

1.6 SUBMITTALS

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

SD-01 Preconstruction Submittals

Existing Conditions; G

SD-07 Certificates

Demolition Plan; G
Notification; G

SD-11 Closeout Submittals

Receipts

1.7 QUALITY ASSURANCE

Submit timely notification of demolition projects to Federal, State, regional, and local authorities in accordance with 40 CFR 61, Subpart M. Notify the 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 ASSE/SAFE A10.6. Comply with the Environmental Protection Agency requirements specified. Use of explosives will not be permitted.

1.7.1 Dust and Debris Control

Prevent the spread of dust and debris and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution.

1.8 PROTECTION

1.8.1 Traffic Control Signs

a. Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights. 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 work continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the project site. No area, section, or component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.9 FOREIGN OBJECT DAMAGE (FOD)

Aircraft and aircraft engines are subject to FOD from debris and waste material lying on airfield pavements. Remove all such materials that may appear on operational aircraft pavements due to the Contractor's operations. If necessary, the Contracting Officer may require the Contractor to install a temporary barricade at the Contractor's expense to control the spread of FOD potential debris. The barricade shall include a fence covered with a fabric designed to stop the spread of debris. Anchor the fence and fabric to prevent displacement by winds or jet/prop blasts. Remove barricade when no longer required.

1.10 RELOCATIONS

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

1.11 EXISTING CONDITIONS

Before beginning any demolition or deconstruction work, survey the site and examine the drawings and specifications to determine the extent of the work. Record existing conditions in the presence of the Contracting Officer 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.

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. Fill material shall be waste products from demolition or deconstruction until all waste appropriate for this purpose is consumed.

b. Fill material shall conform to the definition of satisfactory soil material as defined in AASHTO M 145, Soil Classification Groups A-1, A-2-4, A-2-5 and A-3. In addition, fill material shall be free from roots and other organic matter, trash, debris, frozen materials, and stones larger than 2 inches in any dimension.

c. Proposed fill material must be sampled and tested by an approved soil testing laboratory, as follows:

Soil classification	AASHTO M 145
Moisture-density relations	AASHTO T 180, Method B or D

PART 3 EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

Inspect and evaluate existing structures onsite for reuse. Existing construction scheduled to be removed for reuse shall be disassembled. Dismantled and removed materials are to be separated, set aside, and prepared as specified, and stored or delivered to a collection point for reuse, remanufacture, recycling, or other disposal, as specified. Materials shall be designated for reuse onsite whenever possible.

3.1.1 Structures

a. Remove existing structures indicated to be removed to 3 feet below grade. Interior walls, other than retaining walls and partitions, shall be removed to 3 feet below grade or to top of concrete slab on ground. Break up basement slabs to permit drainage. Remove sidewalks, curbs, gutters and street light bases as indicated.

b. Demolish structures in a systematic manner from the top of the structure to the ground. Complete demolition work above each tier or floor before the supporting members on the lower level are disturbed. Demolish concrete and masonry walls in small sections. Remove structural framing members and lower to ground by means of derricks, platforms hoists, or other suitable methods as approved by the Contracting Officer.

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.

d. Building, or the remaining portions thereof, not exceeding 80 feet in height may be demolished by the mechanical method of demolition.

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 on the station in accordance with instructions of the Contracting Officer.

3.1.3 Paving and Slabs

Remove concrete and asphaltic concrete paving and slabs including aggregate base as indicated to a depth of 12 inches below existing adjacent grade. Provide neat sawcuts at limits of pavement removal as indicated. Pavement and slabs designated to be recycled and utilized in this project shall be moved, ground and stored as directed by the Contracting Officer. Pavement and slabs not to be used in this project shall be removed from the Installation at Contractor's expense.

3.1.4 Structural Steel

Dismantle structural steel at field connections and in a manner that will prevent bending or damage. Salvage for recycle structural steel, steel joists, girders, angles, plates, columns and shapes. Flame-cutting torches are permitted when other methods of dismantling are not practical. Obtain hot work permits. Transport steel joists and girders as whole units and not dismantled. Transport structural steel shapes to a designated area as directed by the Contracting Officer, stacked according to size, type of member and length, and stored off the ground, protected from the weather.

3.1.5 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. 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.

3.1.6 Carpentry

Salvage for recycle lumber, millwork items, and finished boards, and sort by type and size. Recycle salvaged wood unfit for reuse, 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 for reuse. Brace the open end of door frames to prevent damage.

3.1.7 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 CIS. Recycle removed carpet cushion.

3.1.8 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.

3.1.9 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.

3.1.10 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."

3.1.11 Cylinders and Canisters

Remove all fire suppression system cylinders and canisters and dispose of in accordance with the paragraph entitled "Disposal of Ozone Depleting Substance (ODS)."

3.1.12 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.

3.1.13 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; provide to recycling service for disassembly and recycling of parts.

3.1.13.1 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.

3.1.13.2 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.

3.1.13.3 Ducts

Classify removed duct work as scrap metal.

3.1.13.4 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 non-porcelain 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.

3.1.14 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.

3.1.14.1 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.

3.1.14.2 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.

3.1.14.3 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.

3.1.14.4 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.

3.1.15 Elevators and Hoists

Remove elevators, hoists, and similar conveying equipment and salvage as whole units, to the most practical extent. Remove and prepare items for salvage without damage to any of the various parts. Salvage and store rails for structural steel with the equipment as an integral part of the unit.

3.1.16 Items With Unique/Regulated Disposal Requirements

Remove and dispose of items with unique or regulated disposal requirements in the manner dictated by law or in the most environmentally responsible manner.

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.

3.3.3 Salvaged Materials and Equipment

Remove materials and equipment that are listed in the Demolition Plan specified 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 5 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. On site sales of salvaged material is prohibited.

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. Deliver the following items reserved as property of the Government to the areas designated by the Contracting Officer.

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, and turn in to the Navy as directed by the Commanding Officer, 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

The Government will remove and capture Class I ODS refrigerants. To view the web site for ODS, link to: https://www.osd.mil/denix/Public/News/DLA/ODS/sect1.html

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. Products, equipment and appliances containing ODS in a sealed, self-contained system (e.g. residential refrigerators and window air conditioners) shall be disposed of in accordance with 40 CFR 82. Submit Receipts or bills of lading, as specified. Submit a shipping receipt or bill of lading for all containers of ozone depleting substance (ODS) shipped to the Defense Depot, Richmond, Virginia.

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).

3.3.4.2 Fire Suppression Containers

Deactivate fire suppression system cylinders and canisters with electrical charges or initiators prior to shipment. Also, safety caps must be used to cover exposed actuation mechanisms and discharge ports on these special cylinders.

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 Base.

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 off the Base . 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 to Spoil Areas on Government Property

Transport noncombustible materials removed from demolition and deconstruction structures to designated spoil areas on Government property.

3.5.4 Removal from Government Property

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

3.6 REUSE OF SALVAGED ITEMS

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

-- End of Section --

SECTION 02 82 16.00 20

ENGINEERING CONTROL OF ASBESTOS CONTAINING MATERIALS
08/11

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 INDUSTRIAL HYGIENE ASSOCIATION (AIHA)

AIHA Z88.6	(2006) Respiratory Protection - Respirator Use-Physical Qualifications for Personnel

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE Z9.2	(2012) 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 D2794	(1993; R 2010) Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D522/D522M	(2014) Mandrel Bend Test of Attached Organic Coatings
ASTM E119	(2014) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E1368	(2014) Visual Inspection of Asbestos Abatement Projects
ASTM E736	(2000; R 2011) Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
ASTM E84	(2015b) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E96/E96M	(2014) Standard Test Methods for Water Vapor Transmission of Materials

STATE OF VIRGINIA ADMINISTRATIVE CODE (VAC)

16 VAC 25-20-30	Title 16, Agency 25, Chapter 20, Section 30: Notification and Permit Fee

16 VAC 25-30-10	Title 16, Agency 25, Chapter 30, Section 10

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 560/5-85-024	(1985) Guidance for Controlling Asbestos-Containing Materials in Buildings (Purple Book)

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

29 CFR 1926.103	Respiratory Protection
29 CFR 1926.1101	Asbestos
29 CFR 1926.200	Accident Prevention Signs and Tags
29 CFR 1926.51	Sanitation
29 CFR 1926.59	Hazard Communication
40 CFR 61-SUBPART A	General Provisions
40 CFR 61-SUBPART M	National Emission Standard for Asbestos
40 CFR 763	Asbestos

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) Standard for 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 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.

1.2.9 Contractor

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

1.2.10 Competent Person

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. The competent person shall have a current Commonwealth of Virginia asbestos supervisor license.

1.2.11 Encapsulation

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

1.2.12 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).

1.2.13 Friable Asbestos Material

One percent asbestos containing material that can be crumbled, pulverized, or reduced to powder by hand pressure when dry.

1.2.14 Glovebag Technique

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

1.2.15 HEPA Filter Equipment

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

1.2.16 Navy Consultant (NC)

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

1.2.17 Negative Pressure Enclosure (NPE)

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

1.2.18 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.

1.2.19 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.

1.2.20 Private Qualified Person (PQP)

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

tasks.

1.2.21 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.

1.2.22 TEM

Refers to Transmission Electron Microscopy.

1.2.23 Time Weighted Average (TWA)

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

1.2.24 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.

1.3 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 shall be outlined in the Asbestos Hazard Abatement Plan called for elsewhere in this specification.

1.3.1 (Continued)

The asbestos work includes:

The demolition and removal of approximately 4,278 square feet of 9"x9" floor tile (various types) and associated mastic located in Room 202, 202A, 204, 206, 206A, 207A and 208;
The demolition and removal of approximately 190 square feet of asbestos-containing 12"x12" floor tile and associated mastic located in rooms M104, M201 and 214;
The demolition and removal of approximately 1,900 square feet of asbestos-containing mastic beneath non asbestos 12"x12" floor tile in rooms 213, 215, 215A and J102;
The demolition and removal of approximately 500 square feet of asbestos cement laboratory bench, counter and sink top material in room 202, 202A, 204, 206, 208 and 215;
The demolition and removal of approximately 12 square feet of asbestos cement glassware rack material in room 208;
The removal of 1 square foot of asbestos paper debris in room 202;
The demolition and removal of approximately 1 asbestos mud pipe fitting located in room 124B and approximately 500 mud pipe fittings assumed to be present in inaccessible areas. The controlled demolition of fixed walls and ceilings is required to access piping in inaccessible areas;
The demolition and removal of fire doors in rooms 101, 1010, 101E, 110, 112, 113, 114, 114B, 115, 116, 1168, 118, 122, 123, 123A, 123C, 124A, 124C, 1240, 125, 126, 126A, 128A, 128B, 128C, 1280, 128E, 138, 202A, 206A, 209A, 2098, C101, C102, C104, C105, C108, C114, J101, J102, J105, J204, M101, 5101, 5102, 5103, T101, T102, T107, T109, T110, T115, T116, T117, T118, T220, T221 and T223;
The demolition and removal of approximately 24 linear feet of stage light wire from room 124E;
The demolition and removal of 2 asbestos-containing elevator doors from E101.0;
The demolition and removal of asbestos-containing blackboard, bulletin board and mirror mastics from throughout the school following additional visual inspection and bulk sampling;
The demolition of approximately 50,000 square feet of asphaltic roof material.

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 and glove bag techniques as outlined in this specification. The Navy will evacuate the building during the asbestos abatement work. All asbestos removal work shall be supervised by a competent person as specified herein.

1.3.1.1 Wallboard/Joint Compound

Discrete samples of the wallboard were tested and no abestos was detected. Discrete samples of the joint compound were tested and no asbestos was detected.

1.3.2 Medical Requirements

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

1.3.2.1 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 shall 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."

1.3.2.2 Medical Records

Maintain complete and accurate records of employees' medical examinations, medical records, and exposure data for a period of 50 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.

1.3.3 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. Certificates shall be organized by individual worker, not grouped by type of certification. Post appropriate evidence of compliance with the training requirements of 40 CFR 763. Train all 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. The Contractor shall 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. Fully cover engineering and

other hazard control techniques and procedures. All asbestos workers shall have a current Commonwealth of Virginia asbestos worker's license.

1.3.4 Permits , Licenses, and Notifications

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 prior to the start of work. Notify the Asbestos Control Clerk, Virginia Department of Labor and the Contracting Officer in writing 20 working days prior to commencement of work in accordance with 40 CFR 61-SUBPART M and 16 VAC 25-20-30. 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.

1.3.5 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 29 CFR 1926.1101, 40 CFR 61-SUBPART A, 40 CFR 61-SUBPART M, 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 shall apply. The following laws, ordinances, criteria, rules and regulations regarding removal, handling, storing, transporting and disposing of asbestos materials apply:

a. 40 CFR 61-SUBPART M

b. 29 CFR 1926.1101

c. 16 VAC 25-30-10.

1.3.6 Respiratory Protection Program

Establish and implement a respirator program as required by AIHA Z88.6, 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.

1.3.6.1 Respirator Program Records

Submit records of the respirator program as required by AIHA Z88.6, 29 CFR 1926.103, and 29 CFR 1926.1101.

1.3.7 Asbestos Hazard Control Supervisor

The Contractor shall 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.

1.3.8 Hazard Communication

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

1.3.9 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 and demolition of materials containing asbestos. The plan, not to be combined with other hazard abatement plans, shall be prepared, signed, and sealed by the PQP. Provide a Table of Contents for each abatement submittal, which shall follow the sequence of requirements in the contract. Such plan shall 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 shall also include (both fire and medical emergency) response plans. The Asbestos Hazard Abatement Plan must be approved in writing prior to starting any asbestos work. The Contractor, Asbestos Hazard Control Supervisor, and PQP shall 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 shall be identified specifically in the plan to allow for free discussion and approval by the Contracting Officer prior to starting work.

1.3.10 Testing Laboratory

Submit the name, address, and telephone number of each testing laboratory selected for the sampling, analysis, and reporting of airborne concentrations of asbestos fibers along with evidence that each laboratory selected holds the appropriate State license and/or 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 shall be independent of the asbestos contractor and shall have no employee or employer relationship which could constitute a conflict of interest.

1.3.11 Landfill Approval

Submit written evidence that the landfill is for asbestos disposal by the U.S. Environmental Protection Agency, Region 3, Air Enforcement Section (38W12), and local regulatory agencies. Within 3 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 1 day of the shipment leaving the project site.

1.3.12 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 Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Local Exhaust Equipment;

Vacuums;

Respirators;

Pressure Differential Automatic Recording Instrument;

Amended Water;

Glovebags;

Material Safety Data Sheets (Msds) for all materials proposed for transport to the project site; G

Encapsulants; G

SD-06 Test Reports

Air Sampling Results; G

Pressure Differential Recordings For Local Exhaust System; G

Asbestos Disposal Quantity Report; G

Clearance Sampling; G

SD-07 Certificates

Asbestos Hazard Abatement Plan; G

Testing Laboratory; G

Private Qualified Person Documentation; G

Contractor's License; G

Competent Person documentation; G

Worker's License; G

Landfill Approval; G

Employee Training; G

Medical Certification requirements; G

Waste Shipment Records and if applicable exemption report; G

Respiratory Protection Program; G

Delivery Tickets;

Vacuums;

Water Filtration Equipment;

Ventilation Systems;

Other Equipment Used To Contain Airborne Asbestos Fibers;

Chemical Encapsulants Sealers;

Notifications

Show compliance with ASSE Z9.2 by providing manufacturers' certifications.

SD-11 Closeout Submittals

Notifications; G

Rental Equipment;

Respirator Program Records; G

Permits and Licenses; G

Protective Clothing Decontamination Facility Notification;

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 shall be appropriately licensed in the Commonwealth of Virginia as a Project Monitor. The PQP and the asbestos contractor

shall not have an employee/employer relationship or financial relationship which could constitute a conflict of interest. The PQP shall be a first tier subcontractor.

1.5.2 Competent Person Documentation

Submit training certification and a current Commonwealth of Virginia Asbestos Contractor's and Supervisor's License.

1.5.3 Worker's License

Submit documentation that requires all workers have a current Commonwealth of Virginia Asbestos Workers License.

1.5.4 Contractor's License

Contractor shall have current Virginia asbestos contractor's license. Submit a copy of the asbestos contractor's license issued by the Commonwealth of Virginia.

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 3 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 shall 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 Protective Clothing Decontamination Facility Notification

Submit written evidence that persons who decontaminate, store, or transport asbestos contaminated clothing used in the performance of this contract were duly notified in accordance with 29 CFR 1926.1101.

1.6 EQUIPMENT

1.6.1 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

Shall conform to current USEPA requirements, shall contain no toxic or hazardous substances as defined in 29 CFR 1926.59, and shall conform to the following performance requirements.

2.1.1 Removal Encapsulants

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 (Classified by UL for use over fibrous and cementitious sprayed fireproofing)	ASTM E119
Impact Resistance - Minimum 43 in/lb	ASTM D2794 Gardner Impact Test
Flexibility - no rupture or cracking	ASTM D522/D522M Mandrel Bend Test

2.1.2 Bridging Encapsulant

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

2.1.3 Penetrating Encapsulant

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

2.1.4 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
(Tests compatibility with cementitious and fibrous fireproofing)	

PART 3 EXECUTION

3.1 EQUIPMENT

At all times, provide the Contracting Officer or the Contracting Officer's Representative, with at least two complete sets of personal protective equipment as required for entry to and inspection of the asbestos control area. Provide equivalent training to the 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.

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.

3.1.1.1 Respirators for Handling Asbestos

Provide personnel engaged in pre-cleaning, cleanup, handling, removal and or demolition of asbestos materials with respiratory protection as indicated in 29 CFR 1926.1101 and 29 CFR 1926.103.

3.1.2 Exterior Whole Body Protection

3.1.2.1 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 shall not be used alone. Make sleeves secure at the wrists, make foot coverings secure at the ankles, and make clothing secure at the neck by the use of tape.

3.1.2.2 Work Clothing

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

3.1.2.3 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. Provide two separate lockers for each asbestos worker, one in each locker room. 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. 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 . Decontamination units shall be physically attached to the asbestos control area. Build both a personnel decontamination unit and an equipment decontamination unit onto and integral with each asbestos control area.

3.1.2.4 Eye Protection

Provide goggles to personnel engaged in asbestos abatement operations when the use of a full face respirator is not required.

3.1.3 Warning Signs and Labels

Provide warning signs at all approaches to asbestos control areas. Locate signs at such a distance that personnel may read the sign and take the necessary protective steps required before entering the area. Provide labels and affix to all asbestos materials, scrap, waste, debris, and other products contaminated with asbestos.

3.1.3.1 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
Cancer and Lung Disease Hazard	1/4 inch Sans Serif Gothic or Block
Authorized Personnel Only	1/4 inch Sans Serif Gothic or Block
Respirators and Protective Clothing are Required in this Area	1/4 inch Sans Serif Gothic or Block

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

3.1.3.2 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

AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD
BREATHING ASBESTOS DUST MAY CAUSE SERIOUS BODILY HARM

3.1.4 Local Exhaust System

Provide a local exhaust system in the asbestos control area in accordance with ASSE 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 shall be operated 24 hours per day, until the asbestos control area is removed and shall 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. In no case shall the building ventilation system be used as the local exhaust system for the asbestos control area. Filters on exhaust equipment shall conform to ASSE Z9.2 and UL 586. The local exhaust system shall terminate out of doors and remote from any public access or ventilation system intakes.

3.1.5 Tools

Vacuums shall be leak proof to the filter and equipped with HEPA filters. Filters on vacuums shall conform to ASSE 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.

3.1.6 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.

3.1.7 Glovebags

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

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 and negative pressure enclosure techniques. Personnel shall wear and utilize protective clothing and equipment as specified herein. Eating, smoking, drinking, chewing gum, tobacco, or applying cosmetics shall not be permitted in the asbestos work or control areas. Personnel of other trades not engaged in the removal and demolition of asbestos containing material shall 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. 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. If an

asbestos fiber release or spill occurs , stop work immediately, correct the condition to the satisfaction of the Contracting Officer including clearance sampling, prior to resumption of work.

3.2.1 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 shall 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 NC, work may proceed at the discretion of the Contracting Officer.

3.2.2 Furnishings

Furniture and equipment will be removed from the area of work by the Government before asbestos work begins. Any remaining items not designated for salvage shall be disposed of by the Contractor.

3.2.3 Precleaning

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

3.2.4 Asbestos Control Area Requirements

3.2.4.1 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 for removal of asbestos floor tile and mastic in rooms: 202, 202A, 204, 206, 206A, 207A, 208, M104, M201, 213, 215, 215A, and J102. Negative pressure enclosure development shall 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.

3.2.4.2 Glovebag

The construction of a negative pressure enclosure is infeasible for the removal of mud pipe fittings located in inaccessible areas such as behind walls and fixed ceilings. Use alternate techniques as indicated in 29 CFR 1926.1101. Establish designated limits for the asbestos regulated area with the use of rope or other continuous barriers, and maintain all other requirements for asbestos control areas. The PQP shall conduct personal samples of each worker engaged in asbestos handling (removal,

disposal, transport and other associated work) throughout the duration of the project. If the quantity of airborne asbestos fibers monitored at the breathing zone of the workers at any time exceeds background or 0.01 fibers per cubic centimeter whichever is greater, stop work, evacuate personnel in adjacent areas or provide personnel with approved protective equipment at the discretion of the Contracting Officer. This sampling 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 obtained by the Contractor, the Government will determine which results predominate. If adjacent areas are contaminated as determined by the Contracting Officer, clean the contaminated areas, monitor, and visually inspect the area as specified herein.

3.2.5 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. Asbestos containing material shall be containerized while wet. At no time shall asbestos material be allowed to accumulate or become dry. Lower and otherwise handle asbestos containing material as indicated in 40 CFR 61-SUBPART M.

3.2.6 Air Sampling

Sampling of airborne concentrations of asbestos fibers shall be performed in accordance with 29 CFR 1926.1101 and as specified herein. Sampling performed in accordance with 29 CFR 1926.1101 shall be performed by the PQP. Sampling performed for environmental and quality control reasons shall be performed by the PQP and the NC. 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.

3.2.6.1 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 removal site. Establish the background by performing area sampling in similar but uncontaminated sites in the building.

3.2.6.2 Sampling During Asbestos Work

The PQP shall provide personal and area sampling as indicated in 29 CFR 1926.1101 and governing environmental regulations. 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 PQP shall provide personal sampling as indicated in 29 CFR 1926.1101. At the same time the NC will provide area sampling 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. In addition, provided the same type of work is being performed, the NC will provide area sampling 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.

3.2.6.3 Sampling After Final Clean-Up (Clearance Sampling)

Provide area sampling of asbestos fibers using aggressive air sampling techniques as defined in the EPA 560/5-85-024 and establish an airborne asbestos concentration of less than 0.01 fibers per cubic centimeter after final clean-up but before removal of the enclosure or the asbestos work control area. After final cleanup and the asbestos control area is dry but prior to clearance sampling, the PQP and NC shall perform a visual inspection in accordance with ASTM E1368 to ensure that the asbestos control and work area is free of any accumulations of dirt, dust, or debris. Prepare a written report signed and dated by the PQP documenting that the asbestos control area is free of dust, dirt, and debris and all waste has been removed. Perform at least 2 - 5 samples for projects between 0 - 10,000 sf, and 1 additional sample for each additioanl 5,000 sf.
The asbestos fiber counts from these samples shall be less than 0.01 fibers per cubic centimeter or be not greater than the background, whichever is greater. Should any of the final samples indicate a higher value, the Contractor shall take appropriate actions to re-clean the area and shall repeat the sampling and analysis at the Contractor's expense.

3.2.7 Lock-Down

Prior to removal of plastic barriers and after pre-clearance clean up of gross contamination, the PQP and NC shall conduct a visual inspection of all areas affected by the removal in accordance with ASTM E1368. Inspect for any visible fibers .

3.2.8 Site Inspection

While performing asbestos engineering control work, the Contractor shall 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 shall 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 shall 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 shall 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, shall become the property of the Contractor and shall 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

Collect asbestos waste, 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. The name of the waste generator and the location at which the waste was generated shall be clearly indicated on the outside of each container. 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. Procedure for hauling and disposal shall comply with 40 CFR 61-SUBPART M,

State, regional, and local standards. Sealed plastic bags may be dumped from drums into the burial site unless the bags have been broken or damaged. Damaged bags shall remain in the drum and the entire contaminated drum shall be buried. Uncontaminated drums may be recycled. Workers unloading the sealed drums shall wear appropriate respirators and personal protective equipment when handling asbestos materials at the disposal site.

3.3.3.2 Asbestos Disposal Quantity Report

Allow the NC to inspect, record and report the amount of asbestos containing material removed and released for disposal on a daily basis.

-- End of Section --

SECTION 02 83 13.00 20

LEAD IN CONSTRUCTION
08/11

PART 1 GENERAL

The work of this contract involves the demolition of Quantico Middle/High School. No removal of paint from components is required. Separate all steel components, including steel components coated with lead-based paint or lead-contating paint, from general demolition waste stream for recycling. Separate lead drain piping associated with second floor science rooms from other general demoilition waste streams. Lead piping that is not contaminated with mercury or other hazardous residuals is suitable for recycling. Select demolition methods that minimize the release of lead to the environment and comply with OSHA Lead-in-Construction Standard. Use dust suppression methods, such as wetting debris, and engineering controls to protect workers, the public, and the environment. Conduct OSHA employee exposure monitoring to establish respiratory protection requirements. Collect representative samples of demolition waste streams and analyze the samples for leachable lead using the Toxicity Characteristic Leaching Procedure (TCLP). Dispose of all solid waste properly. Assume for bidding purposes that waste is not hazardous for leachable lead. The following specifications shall be followed for the demolition. Refer to the Pre-Demolition Hazardous Materials Survey, June 2014, for further information on the presence of lead-containing materials.

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 Z88.6	(2006) Respiratory Protection - Respirator Use-Physical Qualifications for Personnel

STATE OF VIRGINIA ADMINISTRATIVE CODE (VAC)

18 VAC 15-30	Title 18, Agency 15, Chapter 30: Virginia Lead-Based Paint Activities Regulations

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

29 CFR 1926.103	Respiratory Protection
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
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

UNDERWRITERS LABORATORIES (UL)

UL 586	(2009; Reprint Sep 2014) Standard for High-Efficiency Particulate, Air Filter Units

1.2 DEFINITIONS

1.2.1 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.

1.2.2 Area Sampling

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

1.2.3 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 hazards in accordance with current federal, State, and local regulations and has the authority to take prompt corrective actions to control the lead hazard. 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 is the best choice.

1.2.4 Contaminated Room

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

1.2.5 Decontamination Shower Facility

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

1.2.6 High Efficiency Particulate Arrestor (HEPA) Filter Equipment

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

1.2.7 Lead

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

1.2.8 Lead Control Area

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

1.2.9 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 eight hours in a work day, the PEL shall be determined by the following formula:

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

1.2.10 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.

1.2.11 Personal Sampling

Sampling of airborne lead concentrations within the breathing zone of an employee to determine the 8 hour time weighted average concentration in accordance with 29 CFR 1926.62. Samples shall be representative of the employees' work tasks. Breathing zone shall 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.

1.2.12 Physical Boundary

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

1.3 DESCRIPTION

1.3.1 Description of Work

Construction activities impacting PWL or material containing lead which are covered by this specification include the demolition and/or removal of: glazed CMU blocks associated with some walls in hallways, classrooms, and other rooms; painted interior wood trim in some kitchen areas; structural steel associated with exterior covered walkways and porticos; and some drain piping associated with science classrooms. Separate steel components and lead piping for recycling.

1.3.2 Coordination with Other Work

The contractor shall coordinate with work being performed in adjacent areas. Coordination procedures shall be explained in the Plan and shall describe how the Contractor will prevent lead exposure to other contractors and/or Government personnel performing work unrelated to lead activities.

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. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29SUSTAINABILITY REQUIREMENTS. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Occupational and Environmental Assessment Data Report (if objective data is used to justify excluding the initial occupational exposure assessment); G

Lead Compliance Plan including CP approval (signature, date, and certification number); G

Competent Person qualifications; G

Training Certification of workers and supervisors; G

lead waste management plan; G

written evidence that TSD is approved for lead disposal; G

Certification of Medical Examinations; G

SD-06 Test Reports

sampling results; G

Occupational and Environmental Assessment Data Report; G

SD-07 Certificates

Testing laboratory qualifications; G

Clearance Certification; G

SD-11 Closeout Submittals

Completed and signed hazardous waste manifest from treatment or disposal facility; G

Waste turn-in documents or weight tickets for non-hazardous wastes that are disposed of at sanitary or construction and demolition landfills; 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 entitled "Competent Person (CP) Responsibilities." Provide documented construction project-related experience with implementation of OSHA's Lead in Construction standard (29 CFR 1926.62) which shows ability to assess occupational and environmental exposure to lead, experience with the use of respirators, personal protective equipment and other exposure reduction methods to protect employee health. Submit proper documentation that the CP is trained and licensed in accordance with federal, State (18 VAC 15-30) and local laws. The competent person shall be a licensed lead-based paint abatement Supervisor/Project Designer in the Commonwealth of Virginia.

1.5.1.2 Training Certification

Submit a certificate for each worker and supervisor, signed and dated by the training provider, stating that the employee has received the required lead training specified in 29 CFR 1926.62(l)and is certified to perform or supervise deleading, lead removal or demolition activities in the Commonwealth of Virginia.

1.5.1.3 Testing Laboratory

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

1.5.2 Requirements

1.5.2.1 Competent Person (CP) Responsibilities

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

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

c. Continuously inspect 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 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.

1.5.2.2 Lead Compliance Plan

Submit a detailed job-specific plan of the work procedures to be used in the disturbance of PWL or MCL. The plan shall include a sketch showing the location, size, and details of lead control areas, critical barriers, physical boundaries, location and details of decontamination facilities, viewing ports, and mechanical ventilation system. Include a description of equipment and materials, work practices, controls and job responsibilities for each activity from which lead is emitted. Include in the plan, eating, drinking, smoking, hygiene facilities and sanitary procedures, interface of trades, sequencing of lead related work, collected waste water and dust containing lead and debris, air sampling, respirators, personal protective equipment, and a detailed description of the method of containment of the operation to ensure that lead is not released outside of the lead control area. Include site preparation, cleanup and clearance procedures. Include occupational and environmental sampling, training and strategy, sampling and analysis strategy and methodology, frequency of sampling, duration of sampling, and qualifications of sampling personnel in the air sampling portion of the plan. Include a description of arrangements made among contractors on multicontractor worksites to inform affected employees and to clarify responsibilities to control exposures.

1.5.2.3 Occupational and Environmental Assessment Data Report

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

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

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

b. Submit worker exposure data gathered during the task based trigger

operations of 29 CFR 1926.62 with a complete process description. This includes manual demolition, manual scraping, manual sanding, heat gun, power tool cleaning, rivet busting, cleanup of dry expendable abrasives, abrasive blast enclosure removal, abrasive blasting, welding, cutting and torch burning where lead containing coatings are present.

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

1.5.2.4 Medical Examinations

Initial medical surveillance as required by 29 CFR 1926.62 shall be made available to all employees exposed to lead at any time (1 day) above the action level. Full medical surveillance shall be made available to all employees on an annual basis who are or may be exposed to lead in excess of the action level for more than 30 days a year or as required by 29 CFR 1926.62. Adequate records shall show that employees meet the medical surveillance requirements of 29 CFR 1926.33, 29 CFR 1926.62 and 29 CFR 1926.103. Provide medical surveillance to all personnel exposed to lead as indicated in 29 CFR 1926.62. Maintain complete and accurate medical records of employees for the duration of employment plus 30 years.

1.5.2.5 Training

Train each employee performing work that disturbs lead, who performs 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, and Commonwealth of Viginia and local regulations where appropriate.

1.5.2.6 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.

b. Establish and implement a respiratory protection program as required by AIHA Z88.6, 29 CFR 1926.103, 29 CFR 1926.62, and 29 CFR 1926.55.

1.5.2.7 Hazard Communication Program

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

1.5.2.8 Lead Waste Management

The Lead Waste Management Plan shall 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 hazardous waste 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. Wastes shall be cleaned up and containerized 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.

1.5.2.9 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. Comply with the applicable requirements of the current issue of 29 CFR 1926.62. 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 requirement shall apply.

1.5.3 Pre-Construction Conference

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

1.6 EQUIPMENT

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 dust, fume and mist. Respirators shall comply with the requirements of 29 CFR 1926.62.

1.6.2 Special Protective Clothing

Furnish personnel who will be exposed to lead-contaminated dust with proper disposable protective whole body clothing, head covering, gloves, eye, and foot coverings as required by 29 CFR 1926.62. Furnish proper disposable plastic or rubber gloves to protect hands. Reduce the level of 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 two complete sets of personal protective equipment (PPE) daily, as required herein, for entry into and inspection of the lead removal work within the lead controlled area. Personal protective equipment shall include disposable whole body covering, including appropriate foot, head, eye, and hand protection. PPE shall remain the property of the Contractor. The Government will provide respiratory protection for the Contracting Officer.

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

Not used.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Protection

3.1.1.1 Notification

a. Notify the Contracting Officer 20 days prior to the start of any lead work.

3.1.1.2 Lead Control Area

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

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

3.1.1.3 Furnishings

The Government will remove furniture and equipment from the building before lead work begins.

3.1.1.4 Heating, Ventilating and Air Conditioning (HVAC) Systems

Shut down, lock out, and isolate HVAC systems that supply, exhaust, or pass

through the lead control areas. Seal intake and exhaust vents in the lead control area with 6 mil plastic sheet and tape. Seal seams in HVAC components that pass through the lead control area.

3.1.1.5 Decontamination Shower Facility

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

3.1.1.6 Eye Wash Station

Where eyes may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes shall be provided within the work area.

3.1.1.7 Mechanical Ventilation System

a. To the extent feasible, use local exhaust ventilation or other collection systems, approved by the CP. Local exhaust ventilation systems shall be evaluated and maintained in accordance with 29 CFR 1926.62.

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.

3.1.1.8 Personnel Protection

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

3.2 ERECTION

3.2.1 Lead Control Area Requirements

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

3.3 APPLICATION

3.3.1 Lead Work

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

3.3.2 Personnel Exiting Procedures

Whenever personnel exit the lead-controlled area, they shall perform the following procedures and shall 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. Wash hands and face at the site, don appropriate disposable or uncontaminated reusable clothing, move to an appropriate shower facility, shower.

d. 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 Sampling

Conduct sampling for lead in accordance with 29 CFR 1926.62 and as specified herein. Air sampling shall be directed or performed by the CP.

a. The CP shall be on the job site directing the air 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.

3.5 CLEANING AND DISPOSAL

3.5.1 Cleanup

Maintain surfaces of the lead control area free of accumulations of dust and debris. Restrict the spread of dust and debris; keep waste from being distributed over the work area. Do not dry sweep or use pressurized air to clean up the area. At the end of each shift and when the lead operation has been completed, clean the controlled area of visible contamination by vacuuming with a HEPA filtered vacuum cleaner, wet mopping the area and wet wiping the area as indicated by the Lead Compliance Plan. Reclean areas showing dust or debris. After visible dust and debris is removed, wet wipe and HEPA vacuum all surfaces in the controlled area. If adjacent areas become contaminated at any time during the work, clean, visually inspect, and then wipe sample all contaminated areas. The CP shall then certify in writing that the area has been cleaned of lead contamination before clearance testing.

3.5.1.1 Clearance Certification

The CP shall certify in writing that air samples collected outside the lead control area during demolition operations are less than 30 micrograms 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; and that there were no visible accumulations of material and dust containing lead left in the work site. Do not remove the lead control area or roped off boundary and warning signs prior to the Contracting Officer's acknowledgement of receipt of the CP certification.

3.5.2 Disposal

a. All material, whether hazardous or non-hazardous shall be disposed 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. Determine whether any solid, liquid, and/or sludge residue remians in lead drain piping. Test residues in piping for hazardous constituents including mercury.

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

c. Dispose of lead-contaminated material classified as hazardous waste at an EPA approved hazardous waste treatment, storage, or disposal facility off Government property.

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

3.5.2.1 Disposal Documentation

Submit written evidence to demonstrate the hazardous waste treatment, storage, or disposal facility (TSD) is approved for lead disposal by the EPA, State or local regulatory agencies. Submit one copy of the completed hazardous waste manifest, signed and dated by the initial transporter in accordance with 40 CFR 262. Contractor shall 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 certifying the amount of lead-containing materials or non-hazardous waste delivered is returned and a copy is furnished to the Government.

-- End of Section --

SECTION 02 84 16

HANDLING OF LIGHTING BALLASTS AND LAMPS CONTAINING PCBs AND MERCURY
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.

STATE OF VIRGINIA ADMINISTRATIVE CODE (VAC)

9 VAC 20-60	Title 9, Agency 20, Chapter 60: Hazardous Waste Management Regulations
9 VAC 20-80	Title 9, Agency 20, Chapter 80: Solid Waste Management Regulations

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

29 CFR 1910.1000	Air Contaminants
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 270	EPA Administered Permit Programs: The Hazardous Waste Permit Program
40 CFR 273	Standards For Universal Waste Management
40 CFR 761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
49 CFR 178	Specifications for Packagings

1.2 REQUIREMENTS

Removal and disposal of any identified PCB containing lighting ballasts and mercury-containing fluorecent lamps. Identify PCB containg ballasts as any magnetic ballasts without a "No PCBs" label. Most if not all older ballasts have been removed during earlier lighting retrofit programs; however some PCB ballasts could potentially be present. Assume less than 50 PCB ballasts will be encountered. Contractor may encounter leaking PCB ballasts.

1.3 DEFINITIONS

1.3.1 Certified Industrial Hygienist (CIH)

A industrial hygienist hired by the contractor shall be certified by the American Board of Industrial Hygiene.

1.3.2 Leak

Leak or leaking means any instance in which a PCB article, PCB container, or PCB equipment has any PCBs on any portion of its external surface.

1.3.3 Lamps

Lamp, also referred to as "universal waste lamp", is defined as the bulb or tube portion of an electric lighting device. A lamp is specifically designed to produce radiant energy, most often in the ultraviolet, visible, and infra-red regions of the electromagnetic spectrum. Examples of common universal waste electric lamps include, but are not limited to, fluorescent, high intensity discharge, neon, mercury vapor, high pressure sodium, and metal halide lamps.

1.3.4 Polychlorinated Biphenyls (PCBs)

PCBs as used in this specification shall mean the same as PCBs, PCB containing lighting ballast, and PCB container, as defined in 40 CFR 761, Section 3, Definitions.

1.3.5 Spill

Spill means both intentional and unintentional spills, leaks, and other uncontrolled discharges when the release results in any quantity of PCBs running off or about to run off the external surface of the equipment or other PCB source, as well as the contamination resulting from those releases.

1.3.6 Universal Waste

Universal Waste means any of the following hazardous wastes that are managed under the universal waste requirements 40 CFR 273:

(1) Batteries as described in Sec. 273.2 of this chapter;
(2) Pesticides as described in Sec. 273.3 of this chapter;
(3) Thermostats as described in Sec. 273.4 of this chapter; and
(4) Lamps as described in Sec. 273.5 of this chapter.

1.4 QUALITY ASSURANCE

1.4.1 Regulatory Requirements

Perform PCB related work in accordance with 40 CFR 761 and 9 VAC 20-60 and 9 VAC 20-80 . Perform mercury-containing lamps storage and transport in accordance with 40 CFR 261, 40 CFR 264, 40 CFR 265, 40 CFR 273 and 9 VAC 20-60 and 9 VAC 20-80 .

1.4.2 Training

Certified industrial hygienist (CIH) shall instruct and certify the training of all persons involved in the removal of PCB containing lighting ballasts and mercury-containing lamps. The instruction shall include: The dangers of PCB and mercury exposure, decontamination, safe work practices, and applicable OSHA and EPA regulations. The CIH shall review and approve the PCB and Mercury-Containing Lamp Removal Work Plans.

1.4.3 Regulation Documents

Maintain at all times one copy each at the office and one copy each in view at the job site of 29 CFR 1910.1000, 40 CFR 260, 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 265, 40 CFR 268, 40 CFR 270, 40 CFR 273 and 9 VAC 20-60 9 VAC 20-80 and of the Contractor removal work plan and disposal plan for PCB and for associated mercury-containing lamps.

1.5 SUBMITTALS

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

SD-07 Certificates

Qualifications of CIH; G

Training Certification; G

PCB and Lamp Removal Work Plan; G

PCB and Lamp Disposal Plan; G

SD-11 Closeout Submittals

Transporter certification of notification to EPA of their PCB waste activities and EPA ID numbers; G

Certification of Decontamination

Certificate of Disposal and/or recycling. Submit to the Government before application for payment within 30 days of the date that the disposal of the PCB and mercury-containing lamp waste identified on the manifest was completed.

Testing results

1.6 ENVIRONMENTAL REQUIREMENTS

Use special clothing:

a. Disposable gloves (polyethylene)

b. Eye protection

c. PPE as required by CIH

1.7 SCHEDULING

Notify the Contracting Officer 20 days prior to the start of PCB and mercury-containing lamp removal work.

1.8 QUALITY ASSURANCE

1.8.1 Qualifications of CIH

Submit the name, address, and telephone number of the Industrial Hygienist selected to perform the duties in paragraph entitled "Certified Industrial Hygienist." Submit training certification that the Industrial Hygienist is certified, including certification number and date of certification or re certification.

1.8.2 PCB and Lamp Removal Work Plan

Submit a job-specific plan within 20 calendar days after award of contract of the work procedures to be used in the removal, packaging, and storage of PCB-containing lighting ballasts and associated mercury-containing lamps. Include in the plan: Requirements for Personal Protective Equipment (PPE), spill cleanup procedures and equipment, eating, smoking and restroom procedures. The plan shall be approved and signed by the Certified Industrial Hygienist. Obtain approval of the plan by the Contracting Officer prior to the start of PCB and/or lamp removal work.

1.8.3 PCB and Lamp Disposal Plan

Submit a PCB and lamp Disposal Plan within 45 calendar days after award of contract. The PCB and Lamp Disposal Plan shall comply with applicable requirements of federal, state, and local PCB and Universal waste regulations and address:

a. Estimated quantities of wastes to be generated, disposed of, and recycled.

b. Names and qualifications of each Contractor that will be transporting, storing, treating, and disposing of the wastes. Include the facility location. Furnish two copies of EPA and state PCB and mercury-containing lamp waste permit applications and EPA identification numbers, as required.

c. Names and qualifications (experience and training) of personnel who will be working on-site with PCB and mercury-containing lamp wastes.

d. Spill prevention, containment, and cleanup contingency measures to be implemented.

e. Work plan and schedule for PCB and mercury-containing lamp waste

removal, containment, storage, transportation, disposal and or recycling. Wastes shall be cleaned up and containerize daily.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 WORK PROCEDURE

Furnish labor, materials, services, and equipment necessary for the removal of PCB containing lighting ballasts, associated mercury-containing fluorescent lamps, and high intensity discharge (HID) lampsin accordance with local, state, or federal regulations. Do not expose PCBs to open flames or other high temperature sources since toxic decomposition by-products may be produced. Do not break mercury containing fluorescent lamps or high intensity discharge lamps during removal, packing, or transport.

3.1.1 Work Operations

Ensure that work operations or processes involving PCB or PCB-contaminated materials are conducted in accordance with 40 CFR 761, 40 CFR 262 40 CFR 263, and the applicable requirements of this section, including but not limited to:

a. Obtaining suitable PCB and mercury-containing lamp storage sites.

b. Notifying Contracting Officer prior to commencing the operation.

c. Reporting leaks and spills to the Contracting Officer.

d. Cleaning up spills.

e. Inspecting PCB and PCB-contaminated items and waste containers for leaks and forwarding copies of inspection reports to the Contracting Officer.

f. Maintaining inspection, inventory and spill records.

3.2 PCB SPILL CLEANUP REQUIREMENTS

3.2.1 PCB Spills

Immediately report to the Contracting Officer any PCB spills.

3.2.2 PCB Spill Control Area

Rope off an area around the edges of a PCB leak or spill and post a "PCB Spill Authorized Personnel Only" caution sign. Immediately transfer leaking items to a drip pan or other container.

3.2.3 PCB Spill Cleanup

40 CFR 761, subpart G. Initiate cleanup of spills as soon as possible, but no later than 24 hours of its discovery. Mop up the liquid with rags or other conventional absorbent. The spent absorbent shall be properly contained and disposed of as solid PCB waste.

3.2.4 Records and Certification

Document the cleanup with records of decontamination in accordance with 40 CFR 761, Section 125, Requirements for PCB Spill Cleanup. Provide test results of cleanup and certification of decontamination.

3.3 REMOVAL

3.3.1 Ballasts

As ballast are removed from the lighting fixture, inspect label on ballast. Ballasts without a "No PCB" label shall be assumed to contain PCBs and containerized and disposed of as required under paragraphs STORAGE FOR DISPOSAL and DISPOSAL. If there are less than 1600 "No PCB" labeled lighting ballasts dispose of them as normal demolition debris. If there are more than 1600 "No PCB" labeled ballasts, establish whether the "No PCB" labeled ballasts contain diethylhexyl phthalate (DEHP) either by test or by checking with the ballast manufacturer indicated on the label. Submit testing results and/or written confirmation from the manufacturer to the Contracting Officer. If the ballasts do not contain DEHP, dispose of them as normal construction debris. If they do contain DEHP, dispose of them as hazardous material in accordance with Federal, State, and local regulations. As a basis of bid assume ballasts with "No PCB" labels do not contain DEHP and may be disposed of as normal construction debris. If 1600 or more DEHP ballasts are disposed of in a 24 hour period, notify the National Response Team at 800-424-8802.

3.3.2 Lighting Lamps

Remove lighting tubes/lamps from the lighting fixture and carefully place (unbroken) into appropriate containers (original transport boxes or equivalent). In the event of a lighting tube/lamp breaking, sweep and place waste in double plastic taped bags and dispose of as universal waste as specified herein.

3.4 STORAGE FOR DISPOSAL

3.4.1 Storage Containers for PCBs

49 CFR 178. Store PCB in containers approved by DOT for PCB.

3.4.2 Storage Containers for lamps

Store mercury containing lamps in appropriate DOT containers. The boxes shall be stored and labeled for transport in accordance with 40 CFR 273.

3.4.3 Labeling of Waste Containers

Label with the following:

a. Date the item was placed in storage and the name of the cognizant activity/building.

b. "Caution Contains PCB," conforming to 40 CFR 761, CFR Subpart C. Affix labels to PCB waste containers.

c. Label mercury-containing lamp waste in accordance with 40 CFR 273. Affix labels to all lighting waste containers.

3.5 DISPOSAL

Dispose of off Government property in accordance with EPA, DOT, and local regulations at a permitted site.

3.5.1 Identification Number

Federal regulations 40 CFR 761, and 40 CFR 263 require that generators, transporters, commercial storers, and disposers of PCB waste posses U.S. EPA identification numbers. The contractor shall verify that the activity has a U.S. EPA generator identification number for use on the Uniform Hazardous Waste manifest. If not, the contractor shall advise the activity that it must file and obtain an I.D. number with EPA prior to commencement of removal work. For mercury containing lamp removal, Federal regulations 40 CFR 273 require that large quantity handlers of Universal waste (LQHUW) must provide notification of universal waste management to the appropriate EPA Region (or state director in authorized states), obtain an EPA identification number, and retain for three years records of off-site shipments of universal waste. The contractor shall verify that the activity has a U.S. EPA generator identification number for use on the Universal Waste manifest. If not, the contractor shall advise the activity that it must file and obtain an I.D. number with EPA prior to commencement of removal work.

3.5.2 Transporter Certification

Comply with disposal and transportation requirements outlined in 40 CFR 761 and 40 CFR 263. Before transporting the PCB waste, sign and date the manifest acknowledging acceptance of the PCB waste from the Government. Return a signed copy to the Government before leaving the job site. Ensure that the manifest accompanies the PCB waste at all times. Submit transporter certification of notification to EPA of their PCB waste activities (EPA Form 7710-53).

3.5.2.1 Certificate of Disposal and/or Recycling

40 CFR 761. Certificate for the PCBs and PCB items disposed shall include:

a. The identity of the disposal and or recycling facility, by name, address, and EPA identification number.

b. The identity of the PCB waste affected by the Certificate of Disposal including reference to the manifest number for the shipment.

c. A statement certifying the fact of disposal and or recycling of the identified PCB waste, including the date(s) of disposal, and identifying the disposal process used.

d. A certification as defined in 40 CFR 761.

-- End of Section --

SECTION 03 11 19.00 10

INSULATING CONCRETE FORMING
05/14

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.

AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)

ACI 117	(2010; Errata 2011) Specifications for Tolerances for Concrete Construction and Materials and Commentary
ACI 301	(2010; Errata 2011) Specifications for Structural Concrete
ACI 305R	(2010) Guide to Hot Weather Concreting
ACI 306R	(2010) Guide to Cold Weather Concreting
ACI 318	(2014; Errata 1-2 2014; Errata 3 2015) Building Code Requirements for Structural Concrete and Commentary

ASTM INTERNATIONAL (ASTM)

ASTM C177	(2013) Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
ASTM C203	(2005; R 2012) Breaking Load and Flexural Properties of Block-Type Thermal Insulation
ASTM C518	(2010) Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
ASTM C578	(2014a) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM D1621	(2010) Compressive Properties of Rigid Cellular Plastics
ASTM D1622/D1622M	(2014) Apparent Density of Rigid Cellular Plastics
ASTM D7611/D7611M	(2013; E 2014) Standard Practice for Coding Plastic Manufactured Articles for Resin Identification

ASTM E119	(2014) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E2634	(2011) Standard Specification for Flat Wall Insulating Concrete Form (ICF) Systems
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E90	(2009) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

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)

1.2 SUBMITTALS

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

SD-03 Product Data

Insulating Concrete Form; G
Local/Regional Materials; LEED BD+C
Environmental Data
Accessories

SD-04 Samples

Mock-Up Installation of ICF; G

SD-05 Design Data

Product Compliance; G

SD-06 Test Reports

ICC ES Evaluation Report; G

SD-07 Certificates

3rd Party Agency Certification

Manufacturer's Qualification
Installer Qualification

SD-08 Manufacturer's Instructions

Installation Manual; G

SD-10 Operation and Maintenance Data

Plastic Identification

1.3 QUALITY ASSURANCE

1.3.1 Insulation Concrete Form (ICF) Manufacturer's Qualification

Certification letter stating manufacturer has been successfully producing ICF products for a period of not less than 5 years and has experience similar to this project in size, scope and complexity. Manufacturer must have an ICC-ES Evaluation Report or certification showing conformance to ASTM E2634 as evidence that the Insulating Concrete Forming (ICF) units are code-compliant.

1.3.2 Installer Qualification

Certification letter stating installer has been trained by the ICF manufacturer or an ICF Technical Advisor to ensure product is installed in accordance with the manufacturer's published installation manual and instructions. Installer must have experience in ICF wall systems and successfully completed at least three projects that are similar to this project in size, scope and complexity.

1.3.3 Product Compliance

Submit relevant laboratory tests or data that validate product compliance with performance criteria specified prior to commencement of work under this section. Submit supporting testing results or design calculations showing sufficient capacity/strength for anticipated loads and stresses, including reactions from masonry ties. See specification Section 04 20 00 for additional information.

1.3.4 Pre-Installation Meetings

Prior to commencement of ICF installation and associated work, conduct a meeting at project site with the Contracting Officer, ICF manufacturer's representative, and trades responsible for installing forms, concrete, and reinforcement.

Coordinate provision of access, storage area and material protection. Coordinate product and spatial requirements for form alignment placement, steel storage and forming.

1.3.5 Mock-Ups

Complete Mock-Up Installation of ICF with full-size erected assemblies with details including at least one window. Provide mock-up to establish that proposed materials and construction techniques provide acceptable visual effect. Use materials for mock-up that are proposed for actual construction and meet the following requirements:

a. Locate mock-up installation in the location as directed by the Contracting Officer.

b. Demonstrate the required concrete thickness, insulation and workmanship.

c. Demonstrate window openings with sill, head and jambs.

d. Do not proceed with the remaining work until mock-up is approved by the Contracting Officer.

e. When directed, demolish and remove the mock-up from the site.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver products in original factory packaging, bearing listing and labeling identification of product, manufacturer and lot number. Handle and store products in location to prevent physical damage and soiling. Ensure that UV protection is provided for material stored on site beyond 30 days.

1.5 FIELD/SITE CONDITIONS

Conform to ACI 305R and ACI 306R for hot and cold weather concreting requirements.

Use appropriate measures for protection and supplementary heating when required to ensure proper curing conditions in accordance with manufacturer's recommendations if installation is carried out during periods of weather where temperatures are below minimum specified by governing Building Code for concrete and masonry.

1.6 SUSTAINABLE DESIGN REQUIREMENTS

1.6.1 Local/Regional Materials

Use materials or products extracted, harvested, or recovered, as well as manufactured, within a 500 mile radius from the project site, if available from a minimum of three sources. See Section 01 33 29 SUSTAINABILITY REPORTING for cumulative total local material requirements. Insulating Concrete Forming 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.

1.6.2 Environmental Data

Submit manufacturer's descriptive data. Documentation indicating percentage of post-industrial and post-consumer recycled content per unit of product. Indicate relative dollar value of recycled content products to total dollar value of products included in project.

1.6.3 Plastic Identification

Verify that plastic products to be incorporated into the project are labeled in accordance with ASTM D7611/D7611M. Where products are not labeled, provide product data indicating polymeric information in the Operation and Maintenance Manual and in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

Type 1	Polyethylene Terephthalate (PET, PETE)
Type 2	High Density Polyethylene (HDPE)

Type 3	Vinyl (Polyvinyl Chloride or PVC)
Type 4	Low Density Polyethylene (LDPE)
Type 5	Polypropylene (PP)
Type 6	Polystyrene (PS)
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. Provide the package make up.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Work this specification with 03 30 00 CAST IN PLACE CONCRETE. Where indicated on contract documents, provide flame-resistant Insulating Concrete Forming "ICF". The ICFwall system consists of two flame-resistant panels of molded expanded polystyrene (EPS) insulation connected by cross ties to act as permanent formwork for cast-in-place reinforced concrete beams, lintels, non-load-bearing walls, load-bearing walls, foundation walls, and retaining walls while provide insulating characteristics.

2.1.1 Design Requirements

Design, engineer, and construct the ICF wall system in accordance with the manufacturer's instructions for anticipated loads, lateral pressures, and stresses, and capable of withstanding the pressures resulting from placement and vibration of concrete. Monitor the adequacy of design and construction prior to and during concrete placement as part of the approved Quality Control Plan.

2.1.2 Performance Requirements

The Insulating Concrete Form (ICF) wall system must provide a minimum nominal wall width indicated on contract drawings. Provide cross ties in the ICF wall system at 8 in on center maximum with a tolerance of plus or minus 1/4-inch. ICF wall system must have vertical fastening strips 1 inch minimum flange width that align vertically within 1/2-inch horizontally between stacked blocks or panels for the full height of the wall to fasten exterior and interior wall finishes. Vertical gap between fastening strips of stacked blocks or panels must not exceed 1-1/2 inches. Space fastening strips at a maximum of 16 inches on center horizontally with a tolerance of plus or minus 1/4-inch. Wall system must provide accurate positioning of concrete reinforcing bars within the form cavity conforming to ACI 318 and as indicated on contract drawing details. Contract drawing details control. Submit manufacturer's literature describing product, materials, installation procedure and accessories.

2.2 MANUFACTURED UNITS

2.2.1 Description

The ICF wall system includes an expanded polystyrene forming unit used to construct a monolithic reinforced concrete wall. The forms remain in place, providing a concrete wall to be finished with conventional interior and exterior wall coverings. Provide form unit types and sizes as determined by the ICF manufacturer to provide walls indicated. Provide form materials in accordance with the manufacturer, other specifications herein, and the following:

2.2.2 Performance/Design Criteria

With the ICF wall system provide a minimum 8 inch or 12 inch concrete "flat" cross section. Use preformed forms with interlocking edges to facilitate course-to-course bonding to prevent uplift and lateral failure. Provide manufacturer form unit types for straight, 90 degree corners, 45 degree corners, brick ledges, and tapered top forms. ICF unit shall provide a minimum R-value of R-24 as tested in accordance with Test Method ASTM C518/ASTM C177. EPS must provide a maximum vapor permeation of 3.5 perm-inch. Finish wall assembly shall have a minimum rating of Sound Transmission Class (STC) 50 sound attenuation performance as tested in accordance with Test Method ASTM E90. The fire resistive-rated construction of the complete ICF wall assembly including EPS, cross tie material, and concrete must be in accordance with Test Methods ASTM E119.

Conform the Insulating Concrete Forming System to the following minimum requirements:

TABLE 1 - PROPERTIES

Properties	ASTM Test	Value
Density	ASTM D1622/D1622M	1.5 lbs/ft3
Thermal Resistance	ASTM C177	4.0 F.ft2.h/Btu per in (min)
Compressive Strength	ASTM D1621	15.0 psi
Flexural Strength	ASTM C203	40.0 psi (min)
Flame Spread	ASTM E84	25 maximum
Smoke Developed	ASTM E84	450 maximum

2.3 MATERIALS

Submit 3rd party agency certification stating that product supplied meets the requirements of ASTM E2634.

2.3.1 Expanded Polystyrene (EPS)

Expanded Polystyrene must conform to ASTM C578. Provide Type II EPS panels, Flame Resistant with 2-1/2 inch thick minimum EPS panels.

2.3.2 Cross Ties and Fastening Strips

Use plastic or metal cross ties spaced at 8 inches on center maximum with a tolerance of plus or minus 1/4-inch. Cross ties must allow for multiple reinforcement placement positions to meet the structural design. Provide fastening strips with 1 inch minimum flange width that align vertically within 1/2-inch horizontally between stacked blocks or panels for the full height of the wall to fasten exterior and interior wall finishes. Vertical gap between fastening strips of stacked blocks or panels must not exceed 1-1/2 inches. Space fastening strips at a maximum of 16 inches on center horizontally with a tolerance of plus or minus 1/4-inch. Recess the fastening strips 1/2 inch below the outside surface of the panels. Clearly mark the flanges on the surface of the EPS panels. Provide a fastening strip in the corners of corner forms.

2.4 ACCESSORIES

2.4.1 Concrete

Concrete supplied under Section 03 30 00 shall be of strength as specified by the design engineer (measured at 28 days). Recommended maximum aggregate size to be 1/2 inch aggregate for 4 inch and 6 inch cavity forms and 3/4 inch aggregate for the 8 inch cavity forms and higher.

Recommended concrete slump is 4 inch to 6 inch +/-1 inch.

2.4.2 Reinforcing Steel

Reinforcing steel shall be as specified and shall be supplied under that section for placement by the ICF installer.

2.4.3 Bracing, Scaffolding, and Wall Alignment

Support ICF wall system prior to the attachment of permanent structural elements to protect the ICF components from damage during construction.

2.4.4 Door and Window Bucks

Use extruded vinyl, pressure treated wood, or metal buck material to frame door and window openings.

2.4.5 Waterproofing

Waterproofing material must be compatible with EPS system and as specified in Section 07 13 53 ELASTOMERIC SHEET WATERPROOFING.

2.4.6 Fasteners

Fasteners of interior and exterior wall finishes to ICF wall system must conform to ASTM E2634. Use corrosion-resistant fasteners of sufficient length to penetrate the flanges of the fastening strips.

PART 3 EXECUTION

3.1 EXAMINATION

a. Verify that site conditions are as set out in Part 1 General.

b. Examine footings installed under Section 03 30 00 are within +/-1/4 inch

of level and that steps footing increments are 18 inches in height. Where partial or half course is intended for starting course elevation, ensure step footing increment is equal to cut form unit less 1/2 inch.

c. If specified, ensure reinforcing steel dowels are in place at specified centers along footing lengths.

3.2 PREPARATION

Clean top of footings and slabs of all foreign substances, frost, ice, and standing or running water prior to starting installation of ICF wall system. Use methods and materials approved by ICF manufacturer.

3.3 INSTALLATION

Install ICF wall system in accordance with the manufacturer's installation and technical manual; submit a copy of the manual. In accordance with ACI 301, provide bracing and shoring to ensure stability of formwork to prevent overstressing of ICF units due to construction loads. Install ICF wall system in running bond pattern. Anchor formwork to supporting surfaces to prevent lateral movement of the ICF units during concrete placement. Place sleeves, inserts, masonry anchors, and embedded items required for adjoining work or for support of adjoining work before concrete placement. Align fastener strips to facilitate interior and exterior wall finishes. Install concrete reinforcement according to the structural drawings at all walls, lintels, beams, and around openings. Install window and door bucks at each location where an opening is required. Install the first ICF course on the footing in accordance with the manufacturer's instructions to ensure that base of wall does not become misaligned during concrete placement. Install alignment bracing around the entire wall of the structure to ensure the ICF wall system is straight and plumb before and during concrete placement.

3.3.1 Service Penetrations

a. Service penetrations (e.g.-electrical service conduits, water service pipes, air supply and exhaust ducts, etc.) shall be installed at the required locations as indicated by the appropriate trade.

b. Service penetrations exceeding 16" x 16" in area shall be reinforced.

c. Prior to concrete placement, install service penetration sleeves (supplied by others) at designated locations to create voids where services can be passed through at a later date.

3.3.2 ICF Wall System Length

Within plus or minus 0.05 inches per foot of the intended length.

3.3.3 ICF Wall System Height

Within plus or minus 0.06 inches per foot of the intended height.

3.4 CONCRETE PLACEMENT

Before placing concrete, verify that installation of formwork, reinforcement, and embedded items, including masonry anchors, is complete and that required inspections have been performed. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures. If

concrete cannot be placed in continuous pour, provide construction joints as approved by the Designer of Record . Consolidate placed concrete in accordance with the manufacturer's instructions. Where no guidance is provided, consolidate placed concrete with mechanical vibrating equipment conforming to ACI 301. Variations from plumb and designated building lines cannot exceed the tolerances specified in ACI 117.

3.5 FIELD QUALITY CONTROL

The ICF manufacturer's representative or technical advisor must provide on-site training to installer to ensure familiarity of ICF manufacturer's installation procedures and technical manual. Inspect erected formwork, reinforcement placement, door and window opening construction, concrete placement, and alignment and bracing system to ensure that work is in accordance with drawings. Installer to ensure that the cast-in-place concrete walls are level, plumb, square, and straight and that all dimensions conform to the drawings and are within required tolerances. Notify the Contracting Officer in writing of defective forms within 7 working days of the date of ICF inspection.

3.6 CLEANING

Clean formed cavities, within ICF units, of debris and foreign matter prior to concrete placement. Clean up and properly dispose of all debris remaining on job site related to the installation of the ICF wall system, recycling materials as required.

3.7 PROTECTION

Provide temporary coverage of installation of ICF wall system to reduce exposure to ultraviolet light should final finish application be delayed longer than 60 days.

-- End of Section --

SECTION 03 30 00

CAST-IN-PLACE CONCRETE
05/14

PART 1 GENERAL

1.1 LUMP SUM CONTRACT

Under this type of contract, concrete items will be paid for by lump sum and will not be measured. The work covered by these items consists of furnishing all concrete materials, reinforcement, miscellaneous embedded materials, and equipment, and performing all labor for the forming, manufacture, transporting, placing, finishing, curing, and protection of concrete in these structures.

1.2 REFERENCES

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

AMERICAN CONCRETE INSTITUTE INTERNATIONAL (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 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 213R	(2014) Guide for Structural Lightweight-Aggregate Concrete
ACI 301	(2010; Errata 2011) Specifications for Structural Concrete
ACI 302.1R	(2004; Errata 2006; Errata 2007) Guide for Concrete Floor and Slab Construction
ACI 304.2R	(1996; R 2008) 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 308.1	(2011) Specification for Curing Concrete
ACI 318	(2014; Errata 1-2 2014; Errata 3 2015) Building Code Requirements for Structural Concrete and Commentary
ACI 347	(2004; Errata 2008; Errata 2012) Guide to Formwork for Concrete
ACI SP-15	(2011) Field Reference Manual: Standard Specifications for Structural Concrete ACI 301-05 with Selected ACI References
ACI SP-2	(2007; Abstract: 10th Edition) ACI Manual of Concrete Inspection
ACI SP-66	(2004) ACI Detailing Manual

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 A1064/A1064M	(2015) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A47/A47M	(1999; R 2014) Standard Specification for Ferritic Malleable Iron Castings
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A615/A615M	(2014) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A653/A653M	(2015) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A706/A706M	(2014) Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A767/A767M	(2009) Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement

ASTM A780/A780M	(2009) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A934/A934M	(2013) Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A955/A955M	(2014) Standard Specification for Deformed and Plain Stainless-Steel Bars for Concrete Reinforcement
ASTM C1017/C1017M	(2013) Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1028	(2007; E 2010) Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method
ASTM C1064/C1064M	(2011) Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
ASTM C1077	(2014) Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM C109/C109M	(2013) Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens)
ASTM C1107/C1107M	(2014) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C1157/C1157M	(2011) Standard Specification for Hydraulic Cement
ASTM C1260	(2014) Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C143/C143M	(2012) Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150/C150M	(2012) Standard Specification for Portland Cement
ASTM C1602/C1602M	(2012) Standard Specification for Mixing Water Used in Production of Hydraulic Cement Concrete
ASTM C172	(2010) Standard Practice for Sampling Freshly Mixed Concrete

ASTM C173/C173M	(2014) Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C192/C192M	(2014) Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
ASTM C219	(2014) Standard Terminology Relating to Hydraulic Cement
ASTM C231/C231M	(2014) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260/C260M	(2010a) Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C295/C295M	(2012) Petrographic Examination of Aggregates for Concrete
ASTM C31/C31M	(2012) Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C311/C311M	(2013) Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland-Cement Concrete
ASTM C33/C33M	(2013) Standard Specification for Concrete Aggregates
ASTM C330	(2009) Standard Specification for Lightweight Aggregates for Structural Concrete
ASTM C330/C330M	(2014) Standard Specification for Lightweight Aggregates for Structural Concrete
ASTM C39/C39M	(2015a) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C42/C42M	(2013) Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C494/C494M	(2013) Standard Specification for Chemical Admixtures for Concrete
ASTM C552	(2014) Standard Specification for Cellular Glass Thermal Insulation
ASTM C567/C567M	(2014) Determining Density of Structural Lightweight Concrete
ASTM C578	(2014a) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation

ASTM C591	(2013) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C595/C595M	(2014) Standard Specification for Blended Hydraulic Cements
ASTM C618	(2012a) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C78/C78M	(2012; E 2013) Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C920	(2014a) Standard Specification for Elastomeric Joint Sealants
ASTM C94/C94M	(2015) Standard Specification for Ready-Mixed Concrete
ASTM C989/C989M	(2014) Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM D1752	(2004a; R 2013) Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion
ASTM D2628	(1991; R 2011) Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements
ASTM D2835	(1989; R 2012) Lubricant for Installation of Preformed Compression Seals in Concrete Pavements
ASTM D412	(2006a; R 2013) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D5759	(2012) Characterization of Coal Fly Ash and Clean Coal Combustion Fly Ash for Potential Uses
ASTM D6690	(2012) Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM E1155	(2014) Standard Test Method for Determining Floor Flatness and Floor Levelness Numbers
ASTM E1643	(2011) 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	(2011) Standard Specification for Water

	Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs
ASTM E1993/E1993M	(1998; R 2013; E 2013) Standard Specification for Bituminous Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs
ASTM E329	(2014a) Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
ASTM E96/E96M	(2014) Standard Test Methods for Water Vapor Transmission of Materials

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

CRSI 10MSP	(2009; 28th Ed) Manual of Standard Practice

FOREST STEWARDSHIP COUNCIL (FSC)

FSC STD 01 001	(2000) Principles and Criteria for Forest Stewardship

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST PS 1	(2009) DOC Voluntary Product Standard PS 1-07, Structural Plywood

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC	(2009) Leadership in Energy and Environmental Design(tm) New Construction Rating System

1.3 DEFINITIONS

a. "Cementitious material" as used herein must include all portland cement, pozzolan, fly ash, ground granulated blast-furnace slag, 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, granulated blast-furnace slag, 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).

1.4 SYSTEM DESCRIPTION

Work this specification with 03 11 19.00 10 INSULATING CONCRETE FORMING. Provide concrete composed of portland cement, other cementitious and pozzolanic materials, aggregates, water and admixtures as specified herein.

1.5 SUBMITTALS

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

SD-01 Preconstruction Submittals

Concrete Curing Plan
Quality Control Plan; G
Quality Control Personnel Certifications; G
Quality Control Organizational Chart
Laboratory Accreditation; G
Form Removal Schedule; G
Special Inspection Procedures; G

SD-02 Shop Drawings

Construction and Contraction Joints; G
Formwork
Leave in Place Form; G
Reinforcing steel; G
Sleeves and openings; G

SD-03 Product Data

Joint sealants; (LEED NC)
Joint filler; (LEED NC)
Recycled Aggregate Materials; (LEED NC); G
Materials for Forms
Cementitious Materials; (LEED NC); G
Vapor barrier; G

Concrete Curing Materials; G
In addition to certification of compliance with the contract documents submit written certification signed by the finish and adhesive/setting material manufacturer, that the proposed curing compound will not have a detrimental effect on the bond of the finish to the concrete or otherwise damage the finish.

Reinforcement; (LEED NC); G
Liquid Chemical Floor Hardener
Admixtures; G
Mechanical Reinforcing Bar Connectors; G
Waterstops; G
Accessories; G
Repair Materials; G
Local/Regional Materials; (LEED NC); G
Biodegradable Form Release Agent
Pumping Concrete
Finishing Plan

SD-05 Design Data

Concrete mix design; G

SD-06 Test Reports

Concrete mix design; G
Fly ash
Pozzolan
Ground granulated blast-furnace slag
Aggregates
Tolerance report
Compressive strength tests; G
Air Content; G
Water
Field Quality Control Reports; G
Unit Weight; G
Slump Test; G

SD-07 Certificates

Reinforcing Bars
Welder Qualifications
Concrete Supplier Qualifications; G
Concrete Installer Qualifications; G
Silica fume manufacturer's representative
VOC Content for form release agents, curing compounds, and concrete penetrating sealers
Material Safety Data Sheets
Forest Stewardship Council (FSC) Certification

Field Testing Technician and Testing Agency

SD-08 Manufacturer's Instructions

Liquid Chemical Floor Hardener
Curing Compound

1.6 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.

1.7 DELIVERY, STORAGE, AND HANDLING

Follow ACI 301, ACI 304R and ASTM A934/A934M requirements and recommendations. Do not deliver concrete until vapor barrier, 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.

1.7.1 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.

1.8 QUALITY ASSURANCE

1.8.1 Concrete Supplier Qualifications

a. A firm experienced in ready-mixed concrete that complies with ASTM C94/C94M requirements for production facilities and equipment. Supplier shall be certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

b. Evidence that the plant has regular inspection of scales, gauges and other instruments at the maximum interval of 3 months for the past two years.

c. Copy of the Certificate of Conformance issued by the National Ready Mix Concrete Association (NRMCA) showing the plant currently meets the requirements of NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

1.8.2 Concrete Installer Qualifications

a. A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

b. Certification that all personnel working on the Project are qualified according as ACI-certified Flatwork Technicians and Finishers and the Project Supervisor is an ACI-certified Flatwork Technician.

c. Certification that installer has at least 5 year's experience in placing and finishing high-quality concrete floors with a metallic hardener finish. In addition, show evidence of ability to apply metallic hardener in quantities per square foot called for herein.

1.8.3 Design Data

1.8.3.1 Formwork Calculations

ACI 347. 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.

1.8.3.2 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, complementary cementitious materials, and admixtures; and applicable reference specifications. Submit mill test and all other test for cement, complementary 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.

1.8.4 Shop Drawings

1.8.4.1 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 capable of supporting without failure all vertical and lateral loads that may reasonably be anticipated to be applied to the formwork.

a. Drawings shall be prepared by or under the supervision and signed and

sealed by a qualified Professional Engineer.

b. Formwork submittals will not be reviewed by the Architect for structural integrity or any items related to means and methods of construction or safety.

1.8.4.2 Reinforcing Steel

a. Drawings shall be prepared by or under the supervision and signed and sealed by a qualified Professional Engineer.
b. Detail fabrication, bending, and placement. Indicate bar and wire fabric sizes, spacings, locations lengths, material, grade, bar schedules, bent bar diagrams, bar arrangement, splices and laps, stirrup spacing, tie spacing, and supports for concrete reinforcement.
c. Wall elevations shall be drawn to a minimum scale of 1/4 inch=1 foot.
d. 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". Do not renumber drawings that have already been submitted. Drawings that have been renumbered will be rejected. Refer to specification section 01 33 00 for more information.

1.8.4.3 Sleeves and Openings

a. Drawings indicating the size and dimensioned location of all sleeves and openings through structural members that are required by mechanical, electrical, plumbing, or other trades.
b. Provide one coordinated drawing for each floor or wall showing the penetrations requested by all trades.
c. Drawings shall be drawn to a minimum scale of 1/8 inch=1 foot .

1.8.4.4 Construction and Contraction Joints

Drawings showing location of all construction, expansion, and contraction joints.

1.8.5 Control Submittals

1.8.5.1 Concrete Curing Plan

Submit proposed materials, methods and duration for curing concrete elements in accordance with ACI 308.1.

1.8.5.2 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.

1.8.5.3 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. Representative to attend and advise at finishing of sample slab.

1.8.5.4 Finishing Plan

Submit proposed material and procedures to be used in obtaining the finish for the exposed areas. Include qualification of person to be used for obtaining floor tolerance measurement, description of measuring equipment to be used, and a sketch showing lines and locations the measuring equipment will follow.

1.8.5.5 VOC Content for form release agents, curing compounds, and concrete penetrating sealers

Submit certification for the form release agent, curing compounds, and concrete penetrating sealers that indicate the VOC content of each product.

1.8.5.6 Material Safety Data Sheets

Submit Material Safety Data Sheets (MSDS) for all materials that are regulated for hazardous health effects. MSDS must be readily accessible during each work shift to employees when they are at the construction site.

1.8.6 Test Reports

1.8.6.1 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.

1.8.6.2 Ground Granulated Blast-Furnace Slag

Submit test results in accordance with ASTM C989/C989M for ground granulated blast-furnace slag. Submit test results performed within 6 months of submittal date.

1.8.6.3 Aggregates

ASTM C1260 for potential alkali-silica reactions, ASTM C295/C295M for petrographic analysis.

1.8.7 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.

1.8.8 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.

1.8.8.1 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 (5) similar projects. Evidence of extraordinary proven experience may be considered by the Contracting Officer as sufficient to act as the Quality Manager.

1.8.8.2 Field Testing Technician and Testing Agency

Submit data on qualifications of independent 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.

1.8.9 Field Quality Control Reports

Surveys performed and certified by a registered Surveyor as follows:

a. Concrete frame formwork prior to placing concrete to verify compliance with formwork tolerances.
b. Floor surface flatness and levelness after concrete placement and with shores in place to verify compliance with specified tolerances.
c. Anchor rods, leveling plates, base plates and bearing plates.

Field quality control testing and inspection reports.

Provide certification of ADA slip resistance compliance for all walking surfaces along with test data from an independent testing laboratory in accordance with ASTM C1028. Test shall be performed on the completed installed floor surface.

1.8.10 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.

1.8.11 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 the state or Commonwealth where work is being performed. Engineer must be 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.

1.8.12 Special Inspection Procedures

Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-barrier installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.9 ENVIRONMENTAL REQUIREMENTS

Provide space ventilation according to 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.

1.9.1 Submittals for Environmental Performance

a. Provide data indication the percentage of post-industrial pozzolan (fly ash, blast furnace slag) cement substitution as a percentage of the full product composite by weight.

b. Provide data indicating the percentage of post-industrial and post-consumer recycled content aggregate.

c. Provide product data indicating the percentage of post-consumer recycled steel content in each type of steel reinforcement as a percentage of the full product composite by weight.

d. Provide product data stating the location where all products were manufactured

e. For projects using FSC certified formwork, provide chain-of-custody documentation for all certified wood products.

f. For projects using reusable formwork, provide data showing how formwork is reused.

g. Provide MSDS product information data showing that form release agents meet any environmental performance goals such as using vegetable and soy based products.

h. Provide MSDS product information data showing that concrete adhesives meet any environmental performance goals including low emitting, low volatile organic compound products.

1.10 SUSTAINABLE DESIGN REQUIREMENTS

1.10.1 Local/Regional Materials and Recycled Aggregate Materials

Use materials or products extracted, harvested, or recovered, as well as manufactured, within a 500 mile radius from the project site, if available from a minimum of three sources. See Section 01 33 29 LEED(tm) DOCUMENTATION 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.

1.10.2 Forest Stewardship Council (FSC) Certification

Use FSC-certified wood where specified. Provide letter of certification signed by lumber supplier. Indicate compliance with FSC STD 01 001 and identify certifying organization. Submit FSC certification numbers; identify each certified product on a line-item basis. Submit copies of invoices bearing the FSC certification numbers.

1.11 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 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 MATERIALS FOR FORMS

Provide wood, plywood, plastic, carton, or steel. Use plywood or steel forms where a smooth form finish is required.

2.1.1 Ribbed Expanded Metal In-Place Form

For forming beam pockets, provide galvanized carbon sheet steel, minimum 26 gage.

2.1.2 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. Submit data verifying that composite wood products contain no urea formaldehyde resins. Virgin wood used must be FSC-certified.

2.1.2.1 Concrete Form Plywood (Standard Rough)

Provide plywood that conforms to NIST PS 1, B-B, concrete form, not less than 5/8-inch thick.

2.1.2.2 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.

2.1.3 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.

2.1.4 Carton Forms

Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete until initial set. Provide carton forms that contain a minimum of 10 percent post-consumer recycled content, or a minimum of 20 percent post-industrial recycled content.

2.1.5 Steel Forms

Provide steel form surfaces that do not contain irregularities, dents, or sags.

2.1.6 Leave in Place Form

Ribbed expanded metal leave in place form. Minimum thickness 0.0217 in. (26 gage) galvanized sheet steel. Yield strength 27.6 ksi; ASTM A653/A653M. Basis of Design: Stay-Form by AMICO or approved equivalent.

2.2 FORM TIES AND ACCESSORIES

Provide a form tie system that does not leave mild steel after break-off or

removal any closer than 2 inches from the exposed surface. Do not use wire alone. Form ties and accessories must not reduce the effective cover of the reinforcement.

2.2.1 Waterstops

2.2.1.1 Hydrophilic Waterstop

Swellable strip type compound of polymer modified chloroprene rubber that swells upon contact with water must conform to ASTM D412 as follows: Tensile strength 420 psi minimum; ultimate elongation 600 percent minimum. Hardness must be 50 minimum on the type A durometer and the volumetric expansion ratio in distilled water at 70 degrees F must be 3 to 1 minimum.

2.2.2 Dovetail Anchor Slot

Preformed metal slot approximately 1 inch by 1 inch of not less than 22 gage galvanized steel cast in concrete. Coordinate actual size and throat opening with dovetail anchors and provide with removable filler material.

2.2.3 Wedge Insert and Askew Head Bolt

Malleable iron wedge insert conforming to ASTM A47/A47M Grade 32510. Provide a minimum of 1-1/2 inch concrete below bottom of insert. Ultimate capacity for shear load = 16,650 lbs. and ultimate capacity for tension load = 13,093 lbs. Use with 3/4 inch diameter Askew Head Bolt + washer. Bolt shall be plain carbon steel with a 60,000 psi minimum tensile strength.

2.2.4 Perimeter Insulation

Perimeter insulation must be polystyrene conforming to ASTM C578, Type II; polyurethane conforming to ASTM C591, Type II; or cellular glass conforming to ASTM C552, Type I or IV. Comply with EPA requirements in accordance with Section 01 33 29 SUSTAINABILITY REPORTING.

2.3 CONCRETE MIX DESIGN

2.3.1 Contractor-Furnished Mix Design

ACI 211.1, ACI 301, ACI 318, ACI 304.2R and ACI 213R except as otherwise specified. Indicate the compressive strength (f'c) of the concrete for each portion of the structure(s) as specified below. Where faster set time is required, use Type III cement before using calcium chloride with approval from the contracting officer.

a. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
b. Mix proportions shall be based on compressive strength as determined by test specimens fabricated in accordance with ASTM C192/C192M and tested in accordance with ASTM C39/C39M.

    1. Samples of all materials used in mixture proportioning studies shall be representative of those proposed for use on the project.
    2. Laboratory trial mixtures shall be proportioned with the maximum permitted slump and air content.

c. Prepare alternate design mixes when the characteristics of materials, Project conditions, weather, test results, or other circumstances

warrant adjustments.

2.3.1.1 Concrete Mixtures for Building Elements

Interior Footings and Pedestals (Not exposed to freeze/thaw conditions): Proportion normal-weight concrete mixture as follows:

a. Minimum Compressive Strength: 4000 psi at 28 days.
b. Maximum Water-Cementitious Materials Ratio: 0.50.
c. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch or 3/4-inch nominal maximum aggregate size.

Exterior Footings and Pedestals (Exposed to freeze/thaw conditions): Proportion normal-weight concrete mixture as follows:

a. Minimum Compressive Strength: 4500 psi at 28 days.
b. Maximum Water-Cementitious Materials Ratio: 0.45
c. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch or 3/4-inch nominal maximum aggregate size.

Foundation Walls: Proportion normal-weight concrete mixture as follows:

a. Minimum Compressive Strength: 4500 psi at 28 days.
b. Maximum Water-Cementitious Materials Ratio: 0.45.
c. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch or 3/4-inch nominal maximum aggregate size.

Interior Slabs-on-Grade (Not exposed to freeze/thaw conditions): Proportion normal-weight concrete mixture as follows:

a. Minimum Compressive Strength: 3000 psi at 28 days.
b. Minimum Cementitious Materials Content: 540 lb/cu. yd.

Exterior Slabs-on-Grade (Exposed to freeze/thaw conditions): Proportion normal-weight concrete mixture as follows:

a. Minimum Compressive Strength: 4500 psi at 28 days.
b. Maximum Water-Cementitious Materials Ratio: 0.45.
c. Minimum Cementitious Materials Content: 540 lb/cu. yd..
d. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch or 3/4-inch nominal maximum aggregate size.

Suspended Slabs, including Slabs on Metal Deck: Proportion normal-weight concrete mixture as follows:

a. Minimum Compressive Strength: 3500 psi at 28 days.
b. Maximum Water-Cementitious Materials Ratio: 0.50.
c. Minimum Cementitious Materials Content: 540 lb/cu. yd.
d. Air Content

    1. All finishes except troweled: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch or 3/4-inch nominal maximum aggregate size.
    2. Do not allow air content of troweled finished floors to exceed 3 percent.

Suspended Slabs, including Slabs on Metal Deck: Proportion structural lightweight concrete mixture as follows:

a. Minimum Compressive Strength: 3000 psi at 28 days.
b. Air Dry Unit Weight: 110 lb/cu. ft., plus or minus 3 lb/cu. ft. as determined by ASTM C567/C567M.
c. Air Content:

1. 6 percent, plus or minus 2 percent at point of delivery for nominal maximum aggregate size greater than 3/8 inch.
2. 7 percent, plus or minus 2 percent at point of delivery for nominal maximum aggregate size 3/8 inch or less.

2.3.1.2 Building Frame Members

Proportion normal-weight concrete mixture as follows:

a. Minimum Compressive Strength: 4000 psi at 28 days.

b. Maximum Water-Cementitious Materials Ratio: 0.50.

c. Slump Limit: 4 inches to 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

d. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2 inch nominal maximum aggregate size.

e. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1 inch nominal maximum aggregate size.

2.3.1.3 Building Walls

Proportion normal-weight concrete mixture as follows:

a. Minimum Compressive Strength: 4000 psi at 28 days.

b. Maximum Water-Cementitious Materials Ratio: 0.50.

c. Slump Limit: 4 inches, 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.

d. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2 inch nominal maximum aggregate size.

e. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1 inch nominal maximum aggregate size.

Provide air entrainment using air-entraining admixture.

2.3.1.4 Mix Proportionse

Trial design batches, mixture proportioning studies, and testing requirements for various classes and types of concrete specified are the responsibility of the Contractor. Base mixture proportions on compressive strength as determined by test specimens fabricated in accordance with ASTM C192/C192M and tested in accordance with ASTM C39/C39M. Samples of all materials used in mixture proportioning studies must be representative of those proposed for use in the project and must be accompanied by the manufacturer's or producer's test report indicating compliance with these specifications. Base trial mixtures having proportions, consistencies, and

air content suitable for the work on methodology described in ACI 211.1. In the trial mixture, use at least three different water-cementitious material ratios for each type of mixture, which must produce a range of strength encompassing those required for each class and type of concrete required on the project. The maximum water-cementitious material ratio allowed must be based on equivalent water-cementitious material ratio calculations as determined by the conversion from the weight ratio of water to cement plus pozzolan by weight equivalency method. Design laboratory trial mixture for maximum permitted slump and air content. Each combination of material proposed for use must have separate trial mixture. Report the temperature of concrete in each trial batch. For each water-cementitious material ratio, at least three test cylinders for each test age must be made and cured in accordance with ASTM C192/C192M and tested in accordance with ASTM C39/C39M for 7, 28, 56, 90 days. From these results, plot a curve showing the relationship between water-cementitious material ratio and strength for each set of trial mix studies. In addition, plot a curve showing the relationship between 7, 28 and 56 day strengths.

2.3.1.5 Lightweight Concrete Proportion

ACI 211.2, using weight method. Provide ASTM C330/C330M aggregates for concrete.

2.3.1.6 Required Average Strength of Mix Design

The selected mixture must produce an average compressive strength exceeding the specified strength by the amount indicated in ACI 301, but may not exceed the specified strength at the same age by more than 20 percent. When a concrete production facility has a record of at least 15 consecutive tests, the standard deviation must be calculated and the required average compressive strength must be determined in accordance with ACI 301.

2.3.2 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:

Type and brand cement

Cement and complementary cementitious materials content in 94-pound bags per cubic yard of concrete

Maximum size of aggregate

Amount and brand name of admixtures

Total water content expressed by water cementitious material ratio

2.3.3 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 MATERIALS

2.4.1 Cementitious Materials

For exposed concrete, use one manufacturer and one source for each type of cement, ground slag, fly ash, and pozzolan.

2.4.1.1 Fly Ash

ASTM C618, Class F, except that the maximum allowable loss on ignition must not exceed 3 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.

Add with cement. Fly ash content must be a minimum of 20 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.

2.4.1.2 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.

2.4.1.3 Ground Granulated Blast-Furnace Slag

ASTM C989/C989M, Grade 120. Slag content must be a minimum of 25 percent by weight of cementitious material.

2.4.1.4 Portland Cement

Provide cement that conforms to ASTM C150/C150M, Type I,II, or III low alkali 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.

2.4.1.5 Blended Cements

Blended cement must conform to ASTM C595/C595M and ASTM C1157/C1157M, Type IP or IS, including the optional requirement for mortar expansion and sulfate soundness and consist of a mixture of ASTM C150/C150M Type I, or Type II cement and a complementary cementing material. The slag added to the Type IS blend must be ASTM C989/C989M ground granulated blast-furnace slag. The pozzolan added to the Type IP blend must be ASTM C618 Class F and must be interground with the cement clinker. The manufacturer must state in writing that the amount of pozzolan in the finished cement will not vary more than plus or minus 5 mass percent of the finished cement from

lot-to-lot or within a lot. The percentage and type of mineral admixture used in the blend must not change from that submitted for the aggregate evaluation and mixture proportioning.

2.4.2 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.

2.4.3 Aggregates

General: Store fine and coarse aggregates separately off ground on wooden platforms in such manner as to maintain segregation of size and avoid inclusion of dirt and other foreign materials.

Normal Weight Aggregate: ASTM C33, class 3M or better, well graded within prescribed limits. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

a. Coarse aggregate size: Maximum 3/4 inch or as indicated nominal.
b. Fine aggregate: Free of materials that will have a harmful reaction with the alkali in the cement. White for all exposed concrete on the exterior and interior.

Lightweight Aggregate: ASTM C330, 3/4 inch nominal maximum aggregate size.

2.4.3.1 Aggregates/Combined Aggregate Gradation (Floor Slabs Only)

ASTM C33/C33M, uniformly graded and as follows: Nominal maximum aggregate size of 3/4 inch. A combined sieve analysis must indicate a well graded aggregate from coarsest to finest with not more than 18 percent and not less than 8 percent retained on an individual sieve, except that less than 8 percent may be retained on coarsest sieve and on No. 50 (0.3mm) sieve, and less than 8 percent may be retained on sieves finer than No. 50 (0.3mm). Provide sand that is at least 50 percent natural sand.

2.4.4 Nonshrink Grout (premixed)

Minimum compressive strength of 6,000 psi at 28 days.

Nonmetallic, Shrinkage-Resistant Grout: For general use. ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.4.5 Admixtures

ASTM C494/C494M: Type A, water reducing; Type B, retarding; Type C, accelerating; Type D, water-reducing and retarding; and Type E, water-reducing and accelerating admixture. Do not use calcium chloride admixtures. Submit product data for admixtures used in concrete.

Submit certification of compliance with the specified requirements, including, that admixtures do not contain calcium chloride or thyrocyanates and that admixtures are compatible with each other must be included in the mix design.

Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride or thyrocyanates.

2.4.5.1 Air-Entraining

ASTM C260/C260M.

2.4.5.2 High Range Water Reducer (HRWR) (Superplasticizers)

ASTM C494/C494M, Type F and Type G (HRWR retarding admixture) and ASTM C1017/C1017M.

Use admixtures according to manufacturer's written instructions.

a. Use water-reducing or high-range water-reducing admixture in concrete.
b. Use high range water-reducing admixture in pumped concrete, architectural concrete, concrete for heavy-use industrial slabs, parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
c. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
d. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.4.6 Vapor Barrier

ASTM E1745 Class A polyethylene sheeting, minimum 15 mil thickness or ASTM E1993/E1993M bituminous membrane or other equivalent material with a maximum permeance rating of 0.01 perms per ASTM E96/E96M.

Consider plastic vapor retarders and adhesives with a high recycled content, low toxicity low VOC (Volatile Organic Compounds) levels.

2.4.7 Expansion/Contraction Joint Filler

Expansion joint filler strips at interior and exterior joints shall consist of preformed strips of a durable, elastic sponge rubber compound, using synthetic rubber or natural rubber as a base and containing no reclaim rubber. Filler strips shall be gray in color and shall conform to requirements of ASTM D1752, Type I.

2.4.8 Joint Sealants

Submit manufacturer's product data, indicating VOC content.

2.4.8.1 Horizontal Surfaces, 3 Percent Slope, Maximum

ASTM D6690 or ASTM C920, Type M, Class 25, Use T.

2.4.8.2 Vertical Surfaces Greater Than 3 Percent Slope

ASTM C920, Type M, Grade NS, Class 25, Use T.

2.4.8.3 Preformed Polychloroprene Elastomeric Type

ASTM D2628.

2.4.8.4 Lubricant for Preformed Compression Seals

ASTM D2835.

2.4.9 Biodegradable Form Release Agent

Provide form release agent that is colorless, biodegradable, and with a zero VOC content. A minimum of 85 percent of the total product must be biobased material. Provide product that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces. Provide form release agent that 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.

2.5 REINFORCEMENT

2.5.1 Reinforcing Bars

ACI 301 unless otherwise specified. Use deformed steel. ASTM A615/A615M with the bars marked A, Grade 60. See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total recycled content requirements. Reinforcing bars may contain post-consumer or post-industrial recycled content. Submit documentation indicating percentage of post-industrial and post-consumer recycled content per unit of product. Indicate relative dollar value of recycled content products to total dollar value of products included in project. Submit mill certificates for reinforcing bars.

2.5.1.1 Galvanized Reinforcing Bars

Provide galvanized reinforcing bars that conform to ASTM A767/A767M, Class II with galvanizing after fabrication.

2.5.1.2 Weldable Reinforcing Bars

Provide weldable reinforcing bars that conform to ASTM A706/A706M and ASTM A615/A615M and Supplement S1, Grade 60, except that the maximum carbon content must be 0.55 percent.

2.5.1.3 Epoxy-Coated Reinforcing Bars

Provide epoxy-coated reinforcing bars that conform to ASTM A934/A934M, Grade 60.

2.5.1.4 Stainless Steel Reinforcing Bars

ASTM A955/A955M.

2.5.2 Mechanical Reinforcing Bar Connectors

ACI 301. Provide 125 percent minimum yield strength of the reinforcement bar.

2.5.3 Wire

2.5.3.1 Welded Wire Reinforcement

ASTM A1064/A1064M. See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total recycled content requirements. Wire reinforcement may contain post-consumer or post-industrial recycled content. Provide flat sheets of welded wire reinforcement for slabs and toppings.

2.5.3.2 Steel Wire

Wire must conform to ASTM A1064/A1064M.

2.5.4 Reinforcing Bar Supports

Supports include bolsters, chairs, spacers, and other devices necessary for proper spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place.

Provide wire bar type supports of coated or non-corrodible material conforming to ACI SP-66 and CRSI 10MSP. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar support. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer coated wire bar supports.

Legs of supports in contact with formwork must be hot-dip galvanized, or plastic coated after fabrication, or stainless-steel bar supports.

See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total recycled content requirements. Plastic and steel may contain post-consumer or post-industrial recycled content.

2.5.5 Dowels for Load Transfer in Floors

Provide greased dowels for load transfer in floors of the type, design, weight, and dimensions indicated. Provide dowel bars that are plain-billet steel conforming to ASTM A615/A615M, Grade 40. Provide dowel pipe that is steel conforming to ASTM A53/A53M.

2.6 FLOOR FINISH MATERIALS

2.6.1 Liquid Chemical Floor Hardener

Hardener must be a colorless aqueous solution containing a blend of inorganic silicate or siliconate material and proprietary components combined with a wetting agent; that penetrates, hardens, and densifies concrete surfaces. Submit manufactures instructions for placement of liquid chemical floor hardener.

Use concrete penetrating sealers with a low (maximum 100 grams/liter, less water and less exempt compounds) VOC content.

2.6.2 Abrasive Aggregate for Nonslip Aggregate Finish

Aggregate must be packaged, factory-graded fused aluminum oxide grits, or it may be crushed emery containing not less than 40-percent aluminum oxide and not less than 25-percent ferric oxide. Aggregate must be rust proof and nonglazing and must be unaffected by freezing, moisture, and cleaning materials.

Aggregate must be packaged, factory-graded, silicon carbide grits. Aggregate must be rust proof and must be unaffected by freezing, moisture, and cleaning materials.

Aggregate must be well-graded in size from particles retained on No. 30 sieve 0.0236 inch to particles passing No. 8 sieve 0.0929 inch.

2.6.3 Dry Materials for Colored Wear-Resistant Finish

Provide materials that are packaged, dry, and a combination of materials formulated for producing colored and wear-resistant monolithic surface treatments; they must include portland cement, graded-quartz aggregate, coloring pigments, and dispersing agents. Provide coloring pigments that are finely ground, nonfacing mineral oxides prepared especially for the purpose and interground with the cement.

2.6.4 Aggregate for Heavy-Duty Wear-Resistant Finish

Provide aggregate that is traprock or emery, as follows:

Traprock must be packaged, crushed, natural, fine-to-medium-grained, igneous rock, such as diabase, basalt, or black granite. Traprock aggregate must be well-graded in size from particles retained on No. 4 sieve 0.187 inch to particles passing 3/8-inch sieve.

Emery must be packaged, factory-graded, crushed, natural-emery ore, cubical or polyhedral in form, containing not less than 35-percent aluminum oxide and not less than 24-percent ferric oxide. Emery aggregate must be well graded in size from particles retained on No. 50 sieve 0.0118 inch to particles passing No. 8 sieve 0.0929 inch.

Provide iron aggregate, as follows:

Iron must be packaged, ground and graded cubicle iron particles with dispersing agents, formulated to blend with portland cement for producing wear-resistant monolithic surface treatments. Provide aggregate that is free of nonferrous metals, oil, grease, soluble alkaline compounds, rust, and impurities and must be well-graded in size from particles retained on No. 50 sieve 0.0118 inch to particles passing No. 8 sieve 0.0929 inch.

2.6.5 Aggregate for Heavy-Duty Floor Topping

Provide emery (or may be traprock or traprock-screenings) fine aggregates, as specified.

Provide emery that is packaged, factory-graded, crushed natural emery ore containing not less than 35-percent aluminum oxide and not less than 24-percent ferric oxide. Provide aggregate that is cubical or polyhedral in form and does not change its physical or chemical nature in the presence of moisture. Grade aggregate to a fineness modulus of 3.9 to 4.0, with 100 percent passing 3/8-inch sieve and not less than 95 percent retained on No. 100 sieve. Deliver emery in moisture-resistant bags.

Provide traprock that is packaged, crushed, natural, fine- to medium-grained igneous rock such as diabase, basalt, or black granite. Uniformly grade coarse aggregate with 100 percent passing 1/2-inch sieve, 30 to 50 percent passing 3/8-inch sieve, 0 to 15 percent passing No. 4 sieve, and 0 to 5 percent passing No. 8 sieve.

Provide fine aggregate using traprock that conforms to ASTM C33/C33M, except gradation. Grade fine aggregate within the following limits:

SIEVE	PERCENT PASSING
3/8 in.	100
No. 4	95 to 100
No. 8	65 to 80
No. 16	45 to 65
No. 30	25 to 45
No. 50	5 to 15
No. 100	0 to 5

Deliver traprock coarse aggregate and fine aggregate in moisture-resistant bags.

2.6.6 Repair Materials

Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

a. Cement Binder: ASTM C150/C150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219.
b. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
c. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
d. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C109/C109M.

Repair Topping: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

a. Cement Binder: ASTM C150/C150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219.
b. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
c. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
d. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C109/C109M.

Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color.

a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.

PART 3 EXECUTION

3.1 EXAMINATION

Do not begin installation until substrates have been properly constructed; verify that substrates are level.

If substrate preparation is the responsibility of another installer, notify Contracting Officer of unsatisfactory preparation before processing.

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

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.

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

When subgrade material is semiporous 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. When subgrade material is porous, seal subgrade surface by covering surface with specified vapor retarder.

3.2.3 Subgrade Under Slabs on Ground

Before construction of slabs on ground, have underground work on pipes and conduits completed and approved.

Previously constructed subgrade or fill must be cleaned of foreign materials.

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.

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

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. 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

Secure reinforcement, joint materials, and other embedded materials in position, inspected, and approved before start of concrete placing.

3.3 FORMS

Work this section with Section 03 11 19.00 10 INSULATING CONCRETE FORMING; refer to contract documents for locations where ICF is used. Provide forms, shoring, and scaffolding for concrete placement in accordance with ACI 301 Section 2 and 5 and ACI 347. Set forms mortar-tight and true to line and grade. Chamfer above grade exposed joints, edges, and external corners of concrete 0.75 inch unless otherwise indicated. Provide formwork with clean-out openings to permit inspection and removal of debris.

3.3.1 Coating

Before concrete placement, coat the contact surfaces of forms with a form release agent.

3.3.2 Reshoring

Reshore concrete elements in accordance with ACI 301 Section 2.

3.3.3 Reuse

Reuse forms providing the structural integrity of concrete and the aesthetics of exposed concrete are not compromised. Wood forms must not be clogged with paste and must be capable of absorbing high water-cementitious material ratio paste.

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

Provide ties in accordance with ACI 301 section 2.

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

Construct formwork to ensure that after removal of forms and prior to patching and finishing of formed surfaces, provide concrete surfaces in accordance with tolerances specified in ACI 301 Section 5 and ACI 117.

3.3.9 Removal of Forms and Supports

After placing concrete, removal of forms must be in accordance with ACI 301 Section 2 except as modified by approved form removal schedule.

3.4 WATERSTOP INSTALLATION AND SPLICES

Provide self-expanding strip waterstops in construction joints as indicated, according to manufacturer's written instructions.

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. Install in longest lengths practicable.

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. Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
b. Minimum concrete cover over reinforcing shall be as indicated, but not less than the requirements of ACI 318.
c. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
d. Reinforcement reduced in section shall not be used.
e. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain true alignment and minimum concrete cover. Do not tack weld crossing reinforcing bars.
f. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
g. Place additional reinforcing around all openings with an area greater than one square foot as indicated on the Drawings.
h. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets to provide a full tension splice conforming to ACI 318. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
i. Lap splice reinforcing bars as indicated and in accordance with ACI 318 (ACI 318M).
j. Welding of reinforcing bars is not permitted unless specifically indicated on the Drawings. Where required, welded reinforcing shall conform to ASTM A706/A706M and welding shall be performed in accordance with AWS D1.4.
k. If reinforcement is not shown, provide as shown in similar cases, but not less than #4 @ 12 inches (#13 @ 300 mm) each way in each face or minimum temperature steel in accordance with ACI 318, whichever is greater.
l. Do not cut or puncture vapor barrier. Repair damage and reseal vapor

barrier before placing concrete.

3.5.1 Vapor Barrier

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. Remove torn, punctured, or damaged vapor barrier material and provide with new vapor barrier prior to placing concrete. Concrete placement must not damage vapor barrier material. Turn film up vertical surfaces a distance equal to the slab thickness.

3.5.2 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.

3.5.3 Reinforcement Supports

Support reinforcement in accordance with ACI 301 Section 3. 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.

3.5.4 Splicing

As indicated. For splices not indicated ACI 301. Do not splice at points of maximum stress. Overlap welded wire reinforcement the spacing of the cross wires, plus 2 inches. AWS D1.4/D1.4M. Approve welded splices prior to use. Repair the cut ends of hot-dipped galvanized reinforcement steel to completely coat exposed steel, ASTM A780/A780M.

3.5.5 Future Bonding

Plug exposed, threaded, mechanical reinforcement bar connectors with a greased bolt. Provide bolt threads that match the connector. Countersink the connector in the concrete. Caulk the depression after the bolt is installed.

3.5.6 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:

Provide fabrication tolerances that are in accordance with ACI 318 and ACI SP-66.

Provide hooks and bends that are in accordance with ACI 318 and ACI SP-66.

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.

Tolerance on nominally square-cut, reinforcing bar ends must be in accordance with ACI SP-66.

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 and ACI SP-66.

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:

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 318, ACI SP-66 and CRSI 10MSP. Do not use supports to support runways for concrete conveying equipment and similar construction loads.

Equip supports on ground and similar surfaces with sand-plates.

Support welded wire reinforcement as required for reinforcing bars.

Secure reinforcements to supports by means of tie wire. Wire must be black, soft iron wire, not less than 16 gage.

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 ACI SP-66.

Bending of reinforcing bars partially embedded in concrete is permitted only as specified in ACI SP-66 and ACI 318.

3.5.9 Spacing of Reinforcing Bars

Spacing must be as indicated. If not indicated, spacing must be in accordance with the ACI 318 and ACI SP-66.

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

Concrete protection must be in accordance with the ACI 318 and ACI SP-66.

3.6 BATCHING, MEASURING, MIXING, AND TRANSPORTING CONCRETE

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

ASTM C94/C94M, ACI 301 and ACI 304R. 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. 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 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. 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.

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

Do not add water to concrete during delivery, after adding high-range water-reducing admixtures, at Project site, or during placement. Place concrete in accordance with ACI 301 Section 5.

Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated.

a. Deposit concrete to avoid segregation.
b. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
c. Do not splash forms or reinforcement of adjacent areas with concrete at the time of pouring. Deposit concrete in forms as nearly as practicable in final position.
d. Where pumping of concrete is employed for placement, provide the proper size equipment for the operation, including any backup equipment.

Free fall shall not exceed 10 feet for concrete containing the High Range Water Reducing Admixture or 5 feet for other concrete, unless noted otherwise. Not more than 8 feet and 3 feet respectively for exposed concrete work. Where greater drops are required, employ a trunk, tremie or other means in accordance with ACI standards to reduce the free fall.

Consolidate placed concrete with internal mechanical vibrating equipment according to ACI 301.

a. Do not use form vibrators.
b. Maintain at least one spare vibrator as a relief.
c. Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in concrete.
d. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

a. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
b. Maintain reinforcement in position on chairs during concrete placement.
c. Screed slab surfaces with a straightedge and strike off to correct elevations.
d. Slope surfaces uniformly to drains where required.
e. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on

the surface. Do not further disturb slab surfaces before starting finishing operations.

Allow at least 24 hours to elapse between beginning concrete placement in vertical elements and placing concrete for members supported thereon.

Allow at least 48 hours to elapse between beginning concrete placements for adjacent sections of horizontal Work.

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

ACI 213R. Presoak or presaturate aggregates. Cement content must be minimum of 564 pounds per cubic yard and be sufficient to accommodate a 4 to 6 inch slump. Make field trial run in accordance with ACI 213R. Do not pump lightweight concrete when temperature is below 40 degrees F.

3.7.3 Cold Weather

ACI 306.1. 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

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:

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.

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.

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 or on-site area to be paved later in project 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. Return excess cement to supplier. Institute deconstruction and construction waste separation and recycling for use in manufacturer's programs. When such a program is not available, seek local recyclers to reclaim the materials.

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, also see 03 11 19.00 00 "INSULATING CONCRETE FORMING for designated ICF on contract documents.

3.9.3.1 Tolerances

ACI 117 and as indicated.

3.9.3.2 As-Cast Rough Form

Provide for surfaces not exposed to public view a surface finish SF-1.0. Patch holes and defects in accordance with ACI 301.

3.9.3.3 Standard Smooth Finish

Provide for surfaces exposed to public view a surface finish SF-3.0. Patch holes and defects in accordance with ACI 301.

3.9.4 Smooth-Rubbed, Grout-Cleaned Rubbed, Cork-Floated, or Exposed Aggregate Finish

Provide a smooth-rubbed finish per ACI 301 Section 5 in the locations indicated. Provide a grout-cleaned rubbed finish per ACI 301 Section 5 in the locations indicated. Provide a cork-floated finish per ACI 301 Section 5 in the locations indicated. Provide an exposed aggregate finish per ACI 301 Section 5 in the locations indicated.

3.10 FLOOR, SLAB, AND PAVEMENT FINISHES AND MISCELLANEOUS CONSTRUCTION

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, or 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 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.

3.10.1.4 Nonslip Finish

Use on surfaces of exterior platforms, steps, and landings; and on exterior and interior pedestrian ramps. Finish concrete in accordance with ACI 301 Section 5 for a dry-shake finish. After the selected material has been embedded by the two floatings, complete the operation with a broomed finish.

3.10.1.5 Broomed

Use on surfaces of exterior walks, platforms, patios, and ramps, unless otherwise indicated. Finish concrete in accordance with ACI 301 Section 5 for a broomed finish.

3.10.1.6 Pavement

Screed the concrete with a template advanced with a combined longitudinal and crosswise motion. Maintain a slight surplus of concrete ahead of the template. After screeding, float the concrete longitudinally. Use a straightedge to check slope and flatness; correct and refloat as necessary. Obtain final finish by belting. Lay belt flat on the concrete surface and advance with a sawing motion; continue until a uniform but gritty nonslip surface is obtained. Round edges and joints with an edger having a radius of 1/8 inch.

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 Value:

Floor Flatness (Ff) 45
Floor Levelness (FL) 35

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 one inch deep with a jointing tool after the surface has been finished. Provide 0.5 inch thick transverse expansion joints at changes in direction where sidewalk abuts curb, steps, rigid pavement, or other similar structures; space expansion joints every 50 feet maximum. Give walks a broomed finish. Unless indicated otherwise, provide a transverse slope of 1/48. Limit variation in cross section to 1/4 inch in 5 feet.

3.10.4 Pits and Trenches

Place bottoms and walls monolithically or provide waterstops and keys.

3.10.5 Curbs

Provide contraction joints spaced every 10 feet maximum unless otherwise indicated. Cut contraction joints 3/4 inch deep with a jointing tool after the surface has been finished. Provide expansion joints 1/2 inch thick and spaced every 100 feet maximum unless otherwise indicated. Perform pavement finish.

3.10.6 Splash Blocks

Provide at outlets of downspouts emptying at grade. Splash blocks may be precast concrete, and must be 24 inches long, 12 inches wide and 4 inches thick, unless otherwise indicated, with smooth-finished countersunk dishes sloped to drain away from the building.

3.11 JOINTS

3.11.1 Construction Joints

Make and locate joints not indicated so as not to impair strength and appearance of the structure, as approved. Joints must be perpendicular to main reinforcement. Reinforcement must be continued and developed across construction joints.

3.11.2 Expansion and Isolation Joints in Slabs-on-Grade

Install joint-filler strips at slab junctions with vertical surfaces where indicated on the plans, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

a. Joints shall be 1/2 inch wide, unless otherwise shown on the Drawings.

Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 7 Section Joint Sealants, are indicated.

Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

Finish edges of concrete slabs along joints neatly with a slightly rounded edging tool.

In no case shall reinforcement, corner protection angles, or other fixed items embedded in or bonded to concrete, be continuous through an expansion or isolation joint.

3.11.3 Contraction Joints in Slabs-on-Grade

Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

a. Coordinate location of slab-on-grade contraction joints with the location of joints in the floor finish.
b. The maximum dimension of a slab-on-grade panel without contraction joints shall be 15 feet in each direction.

    1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
    2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8 inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

3.11.4 Construction Joints

Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

a. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated.
b. Coordinate location of slab-on-grade construction joints with the location of joints in the floor finish.
c. Locate construction joints in exposed concrete as indicated and approved by Architect.
d. Form keyed joints as indicated. Unless noted otherwise, embed keys at least 1-1/2 inches into concrete.
e. Locate joints for continuous foundations, grade beams, framed beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
f. Locate horizontal joints in walls and columns at underside of deepest, slab, beam, or girder framing thereto and at the top of footings or floor slabs.
g. Space vertical joints in walls no greater than 40 feet apart. Locate joints beside piers integral with walls, near corners, and in concealed

locations where possible.

h. Space construction joints in floor framing, supported slabs, slabs on metal deck, beams, and girders no greater than 80 feet apart.

i. Each concrete placement for slab-on-grade shall not exceed 8,000 sq. ft. with a maximum distance between construction joints of 90 feet. Allow a minimum of 48 hours between adjacent concrete placements.

j. Fill all joints with sealant.

Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.11.5 Sealing Joints in Slabs on Ground

Contraction and control joints which are to receive finish flooring material must be sealed with joint sealing compound after concrete curing period. Slightly underfill groove with joint sealing compound to prevent extrusion of compound. Remove excess material as soon after sealing as possible.

Sealed groove must be left ready to receive filling material that is provided as part of finish floor covering work.

a. Placing: Spread heavy-duty topping mixture evenly on previously prepared base slab, and bring to correct level with a straight edge, and strike off. Provide topping that is consolidated, floated, and checked for trueness of surface as specified for float finish, except that additional power-driven floats are the impact type.

b. Finishing: Give trowel finish heavy-duty floor topping surfaces. Provide trowel finish as specified, except that additional troweling after first power troweling must be not less than three hand-troweling operations.

3.12 CURING AND PROTECTION

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

Accomplish initial curing of unformed surfaces, such as monolithic slabs, floor topping, and other flat surfaces, by membrane curing.

Unless otherwise specified, accomplish final curing of unformed surfaces by any of curing methods specified, as applicable.

Accomplish final curing of concrete surfaces to receive liquid floor hardener of finish flooring by moisture-retaining cover 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 General

a. Government will engage a special inspector and qualified Testing and Inspecting Agency to perform field tests and inspections and prepare test reports.
b. Cooperate with Testing and Inspection Agency in supplying materials and means of access to permit testing and inspection of concrete work.
c. Provide an adequate storage box with a minimum/maximum reading thermometer for initial field curing of concrete specimens.
d. Notify Inspection and Testing Agency a minimum of 48 hours in advance of the work being completed and ready for the required tests and inspections.

3.13.2 Inspections

a. Steel reinforcement placement.
b. Steel reinforcement welding.
c. Headed bolts and studs.
d. Verification of use of required design mixture.
e. Sampling and testing of fresh concrete.
f. Formwork for compliance with formwork design drawings and procedures.
g. Concrete placement, including conveying and depositing.
h. Curing procedures and maintenance of curing temperature.
i. Verification of concrete strength before removal of shores and forms from beams and slabs.
j. Post installed anchors in hardened concrete.

3.13.2.1 Concrete Tests

Testing of composite samples of fresh concrete obtained according to ASTM C172 shall be performed according to the following requirements:

a. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
b. Slump Test: ASTM C143/C143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
c. Air Content: ASTM C231/C231M, pressure method, for normal-weight concrete; ASTM C173/C173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
d. Concrete Temperature: ASTM C1064/C1064M; one test hourly when air temperature is 40 deg F. and below and when 80 deg F. and above, and one test for each composite sample.
e. Unit Weight: ASTM C567/C567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
f. Compression Test Specimens: ASTM C31/C31M. Cast five sets of two standard cylinders for each composite sample.

    1. Laboratory cure three sets of two standard cylinder specimens.
    2. Field cure two sets of two standard cylinder specimens.

a) Remove test specimens from molds at end of 24 hours and store in structure as near point of placement as possible; maintain conditions similar to those portions of structure that they represent.
b) Do not remove from structure for transmittal to laboratory prior to expiration of three-fourths of proposed period before removal of forms.

g. Compressive-Strength Tests: ASTM C39/C39M

1. Test laboratory-cured specimens as follows:

a) One set of two specimens at 7 days.
b) One set of two specimens at 28 days.
c) Hold one set of two specimens in reserve. Test when directed by the Architect.

2. Test field-cured specimens as follows:

a) One set of two specimens at an age determined by the Contractor for form stripping, but not later than 7 days.
b) One set of two specimens at 28 days.

3. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

h. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
i. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi .
j. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
k. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
l. Additional Tests: Testing and inspecting agency shall make additional tests of concrete as directed by Architect when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met; and when Work is repaired or replaced. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect. Additional testing and inspecting shall be performed at the Contractor's expense.
m. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.

3.13.2.2 Surveys

Obtain surveys prepared by a Surveyor registered in the Commonwealth of Virginia.

a. Survey concrete formwork prior to placing concrete to verify compliance with formwork tolerances.
b. Measure floor and slab flatness and levelness according to ASTM E1155 within 24 hours of finishing.
c. Upon completion of setting anchor rods, leveling plates, base plates, and bearing plates determine the following:

    1. Location and elevation of anchor rods.
    2. Levelness and elevation of leveling plates, base plates.
    3. Location, levelness, and elevation of bearing plates.

d. Survey floor surface elevations after concrete has attained its design ultimate strength and the shores have been removed. At a minimum determine elevation at all vertical supports, mid-point of column bays, mid-span of beams and slab edges.

3.13.2.3 Strength of Concrete Structure

The strength of the concrete structure will be considered to be deficient if any of the following conditions are identified:

Failure to meet compressive strength tests as evaluated

Reinforcement not conforming to requirements specified

Concrete which differs from required dimensions or location in such a manner as to reduce strength

Concrete curing and protection of concrete against extremes of temperature during curing, not conforming to requirements specified

Concrete subjected to damaging mechanical disturbances, particularly load stresses, heavy shock, and excessive vibration

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.

3.13.2.4 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.

3.13.2.5 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:

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.

Test cores after moisture conditioning in accordance with ASTM C42/C42M if concrete they represent is more than superficially wet under service.

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.

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.

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 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.

3.14.2 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 --

SECTION 04 20 00

MASONRY
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.

AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)

ACI 318	(2014; Errata 1-2 2014; Errata 3 2015) Building Code Requirements for Structural Concrete and Commentary
ACI 530/530.1	(2013) Building Code Requirements and Specification for Masonry Structures and Related Commentaries
ACI SP-66	(2004) ACI Detailing Manual

ASTM INTERNATIONAL (ASTM)

ASTM A153/A153M	(2009) 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 A615/A615M	(2014) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A641/A641M	(2009a; R 2014) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM A82/A82M	(2007) Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
ASTM B370	(2012) Standard Specification for Copper Sheet and Strip for Building Construction
ASTM B633	(2013) Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
ASTM C1019	(2014) Standard Test Method for Sampling and Testing Grout
ASTM C1072	(2013; E 2014) Standard Test Method for

	Measurement of Masonry Flexural Bond Strength
ASTM C129	(2014a) Standard Specification for Nonloadbearing Concrete Masonry Units
ASTM C140	(2012a) Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
ASTM C144	(2011) Standard Specification for Aggregate for Masonry Mortar
ASTM C150/C150M	(2012) Standard Specification for Portland Cement
ASTM C207	(2006; R 2011) Standard Specification for Hydrated Lime for Masonry Purposes
ASTM C216	(2015) Facing Brick (Solid Masonry Units Made from Clay or Shale)
ASTM C270	(2014a) Standard Specification for Mortar for Unit Masonry
ASTM C476	(2010) Standard Specification for Grout for Masonry
ASTM C494/C494M	(2013) Standard Specification for Chemical Admixtures for Concrete
ASTM C62	(2013a) Building Brick (Solid Masonry Units Made from Clay or Shale)
ASTM C641	(2009) Staining Materials in Lightweight Concrete Aggregates
ASTM C67	(2014) Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile
ASTM C780	(2014b) Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
ASTM C90	(2014) Loadbearing Concrete Masonry Units
ASTM C91/C91M	(2012) Standard Specification for Masonry Cement
ASTM C94/C94M	(2015) Standard Specification for Ready-Mixed Concrete
ASTM C989/C989M	(2014) Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM D1972	(1997; R 2005) Standard Practice for Generic Marking of Plastic Products
ASTM D2000	(2012) Standard Classification System for

	Rubber Products in Automotive Applications
ASTM D2240	(2005; R 2010) Standard Test Method for Rubber Property - Durometer Hardness
ASTM D2287	(2012) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
ASTM E119	(2014) Standard Test Methods for Fire Tests of Building Construction and Materials

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2012) International Building Code

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC	(2009) Leadership in Energy and Environmental Design(tm) New Construction Rating System

1.2 SYSTEM DESCRIPTION

1.2.1 Local/Regional Materials

See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total local material requirements. Masonry materials may be locally available. Submit documentation indicating distance between manufacturing facility and the project site, and 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 the project.

1.2.2 Environmental Data

Submit manufacturer's descriptive data. Documentation indicating percentage of post-industrial and post-consumer recycled content per unit of product. Indicate relative dollar value of recycled content products to total dollar value of products included in project.

1.2.3 Plastic Identification

Verify that plastic products to be incorporated into the project are labeled in accordance with ASTM D1972. Where products are not labeled, submit product data indicating polymeric information in the 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.

1.2.4 Design Requirements

1.2.4.1 Unit Strength Method

Compute compressive strength of masonry system "Unit Strength Method", ACI 530/530.1. Submit calculations and certifications of unit and mortar strength.

1.2.4.2 Seismic Requirement

In addition to design requirements of ICC IBC, provide additional seismic reinforcement as detailed on the drawings. The total minimum reinforcing percentage for structural walls shall be 0.20 percent and non-structural walls shall be 0.15 percent. The maximum spacing of reinforcing bars shall be as follows:

Wall Type	Vertical	Horizontal
Structural	24 inches	48 inches
Non-structural	48 inches	80 inches

Bond beams are required at the top of footings, at the bottom and top of openings at roof and floor levels, and at the top of parapet walls. Bond beam spacing shall not exceed 10'-0" o.c.

1.2.4.3 Masonry Strength

Determine masonry strength in accordance with ACI 530/530.1; submit test reports on three prisms as specified in ACI 530/530.1. The cost of testing shall be paid by the Contractor.

1.2.4.4 Veneer Anchor Engineering Analysis

Provide analysis performed by the manufacturer's professional Engineer indicating that the veneer anchors are in compliance with the structural design criteria and applicable codes. Analysis will bear the seal and signature of the manufacturer's professional Engineer. Design calculation submission must be concurrent with the submission of corresponding fabrication/detail drawings. Design calculations shall be submitted for information only. Also refer to Section 3.17 ANCHORAGE TO CONCRETE AND STRUCTURAL STEEL.

1.2.5 Additional Requirements

a. Maintain at least one spare vibrator on site at all times.

b. Provide bracing and scaffolding necessary for masonry work. Design bracing to resist wind pressure as required by local code.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control

approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G,

SD-03 Product Data

Local/Regional Materials; (LEED NC)
Environmental Data
Clay Brick; G; (LEED NC)
Cement; G; (LEED NC)
Cold Weather Installation; G

SD-04 Samples

Concrete Masonry Units (CMU); G
Clay Brick; G
Anchors, Ties, and Bar Positioners; G
Expansion-Joint Materials; G
Joint Reinforcement; G

SD-05 Design Data

Unit Strength Method; G, FIO
Veneer Anchor Engineering Analysis; G, FIO
Precast Lintel Design; G, FIO

SD-06 Test Reports

Efflorescence Test; G
Field Testing of Mortar; G
Field Testing of Grout; G
Fire-rated CMU; G

SD-07 Certificates

Clay Brick
Concrete Masonry Units (CMU)
Anchors, Ties, and Bar Positioners
Expansion-Joint Materials
Joint Reinforcement
Admixtures for Grout
Contamination
Engineer's Certification Letter; G, FIO

SD-10 Operation and Maintenance Data

Plastic Identification
Take-Back Program

1.4 QUALITY ASSURANCE

1.4.1 Engineer's Certification Letter

A. Submit a letter of certification prepared by a Professional Structural Engineer (registered in the Commonwealth of Virginia) employed by the manufacturer certifying the following:

1. The aforementioned Engineer is fully experienced in the design of Masonry Systems.

2. All shop drawings (including all supports, connections and components) shall be prepared under the direction of the aforementioned engineer, in compliance with the Contract Document requirements and applicable building codes.

   His seal and signature shall appear on all shop drawings. The aforementioned shop drawings shall include sufficient information to enable the Contracting Officer to confirm that design loads, support points and tie backs are in compliance with the design criteria.

   This engineer's certification letter must be received by the Contracting Officer prior to the submission of the Shop Drawings and shall bear the seal and signature of the aforementioned engineer.

B. The aforementioned engineer shall submit a letter to the Contracting Officer stating that the fabrication and installation of the masonry has been performed in accordance with his design. This letter shall be signed and sealed by the aforementioned engineer as part of "Project Closeout".

C. All design calculations (which shall bear the seal and signature of the aforementioned engineer), indicating compliance with the requirements of the design criteria and appropriate codes shall be provided to the Contracting Officer prior to fabrication for record purposes.

D. The calculations provided to the Contracting Officer shall be part of "Project Closeout".

Manufacture bricks at one time and from the same batch. Blend all brick to produce a uniform appearance when installed. An observable "banding" or "layering" of colors or textures caused by improperly mixed brick is unacceptable.

1.4.2 Contamination

When using bricks containing contaminated soil, supplier shall certify that the hazardous waste is neutralized by the manufacturing process and that no additional pollutants will be released, or that the product is free from hazardous contaminants.

1.4.3 Sample Masonry Panels

After material samples are approved and prior to starting masonry work, construct a portable panel of clay brick and sample masonry panels for each type and color of masonry required. At least 48 hours prior to constructing the sample panel or panels, submit written notification to the Contracting Officer. Submit one panel of clay brick, 2 by 2 feet, containing approximately 24 brick facings of the two selected brick colors and mortar to establish range of color and texture. Sample panels shall not be built in, or as part of the structure, but shall be located where directed.

1.4.3.1 Configuration

Panels shall be L-shaped or otherwise configured to represent all of the wall elements. Panels shall be of the size necessary to demonstrate the

acceptable level of workmanship for each type of masonry represented on the project. The minimum size of a straight panel or a leg of an L-shaped panel shall be 8 feet long by 4 feet high.

1.4.3.2 Composition

Panels shall show full color range, texture, and bond pattern of the masonry work and include all exposed masonry elements. The Contractor's method for mortar joint tooling; grouting of reinforced vertical cores, collar joints, bond beams, and lintels; positioning, securing, and lapping of reinforcing steel; positioning and lapping of joint reinforcement (including prefabricated corners); and cleaning of masonry work shall be demonstrated during the construction of the panels. Installation or application procedures for anchors, wall ties, CMU control joints, brick expansion joints, insulation, flashing, brick soldier, row lock courses and weep holes shall be shown in the sample panels. The panels shall contain a masonry bonded corner that includes a bond beam corner. Panels shall show installation of electrical boxes and conduit. Panels that represent reinforced masonry shall contain a 2 by 2 foot opening placed at least 2 feet above the panel base and 2 feet away from all free edges, corners, and control joints. Required reinforcing shall be provided around this opening as well as at wall corners and control joints.

1.4.3.3 Construction Method

Where anchored veneer walls are required, demonstrate and receive approval for the method of construction; i.e., either bring up the two wythes together or separately, with the insulation and appropriate ties placed within the specified tolerances across the cavity. Temporary provisions shall be demonstrated to preclude mortar or grout droppings in the cavity and to provide a clear open air space of the dimensions shown on the drawings. Where masonry is to be grouted, demonstrate and receive approval on the method that will be used to bring up the masonry wythes; support the reinforcing bars; and grout cells, bond beams, lintels, and collar joints using the requirements specified herein. If sealer is specified to be applied to the masonry units, sealer shall be applied to the sample panels. Panels shall be built on a properly designed concrete foundation.

1.4.3.4 Usage

The completed panels shall be used as the standard of workmanship for the type of masonry represented. Masonry work shall not commence until the sample panel for that type of masonry construction has been completed and approved. Panels shall be protected from the weather and construction operations until the masonry work has been completed and approved. After completion of the work, the sample panels, including all foundation concrete, shall become the property of the Contractor and shall be removed from the construction site.

1.4.4 Detail Drawings

Submit detail drawings showing reinforcement size and spacing and bar splice locations. Bent bars shall be identified on a bending diagram and shall be referenced and located on the drawings. Wall dimensions, bar clearances, and wall openings greater than one masonry unit in area shall be shown. 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, the approved shop drawings shall be resubmitted with

the additional openings shown along with the proposed changes. Location of these additional openings shall be clearly highlighted. The minimum scale for wall elevations shall be 1/4 inch per foot. Reinforcement bending details shall conform to the requirements of ACI SP-66. 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. Resubmitted shop drawings shall indicate changes by clouding the change. Shop drawings resubmitted without clouds will be rejected.

1.5 DELIVERY, STORAGE, AND HANDLING

Materials shall be delivered, stored, handled, and protected 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.

1.5.1 Masonry Units

Cover and protect moisture-controlled concrete masonry units and cementitious materials from precipitation. Conform to all handling and storage requirements of ASTM C90. Mark prefabricated lintels on top sides to show either the lintel schedule number or the number and size of top and bottom bars.

1.5.2 Reinforcement, Anchors, and Ties

Steel reinforcing bars, coated anchors, ties, and joint reinforcement shall be stored above the ground. Steel reinforcing bars and uncoated ties shall be free of loose mill scale and rust.

1.5.3 Cementitious Materials, Sand and Aggregates

Cementitious and other packaged materials shall be delivered in unopened containers, plainly marked and labeled with manufacturers' names and brands. Cementitious material shall be stored in dry, weathertight enclosures or be completely covered. Cement shall be handled 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 or segregation.

1.6 PROJECT/SITE CONDITIONS

Conform to ACI 530/530.1 for hot and cold weather masonry erection.

1.6.1 Hot Weather Installation

Take the following precautions if masonry is erected when the ambient air temperature is more than 99 degrees F in the shade and the relative humidity is less than 50 percent or the ambient air temperature exceeds 90 degrees F and the wind velocity is more than 8 mph. All masonry materials shall be shaded from direct sunlight; mortar beds shall be spread no more than 4 feet ahead of masonry; masonry units shall be set within one minute of spreading mortar; and after erection, masonry shall be protected from direct exposure to wind and sun for 48 hours.

1.6.2 Cold Weather Installation

Before erecting masonry when ambient temperature or mean daily air

temperature falls below 40 degrees F or temperature of masonry units is below 40 degrees F, submit a written statement of proposed cold weather construction procedures for approval.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

The source of materials which will affect the appearance of the finished work shall not be changed after the work has started except with Contracting Officer's approval. Submit sample of colored mortar with applicable masonry unit and color samples of three stretcher units and one unit for each type of special shape. Units shall show the full range of color and texture. Submit test reports from an approved independent laboratory. Test reports on a previously tested material shall be certified as the same as that proposed for use in this project. Submit certificates of compliance stating that the materials meet the specified requirements.

2.2 CLAY BRICK

Submit brick samples as specified. Color range and texture of clay brick shall be as indicated and shall conform to the approved sample. Brick shall conform to ASTM C62; Grade SW shall be used for brick in contact with earth or grade and for all exterior work and for all nonvertical surfaces. Grade SW or MW shall be used in other brickwork. Average dimensions of brick shall be 3-5/8 inches thick, 2-1/4 inches high, and 8 inches long (standard) or 4 inches thick, 2-2/3 inches high, and 8 inches long (nominal), subject to the tolerances specified in ASTM C62. Brick shall be tested for efflorescence. Clay brick units shall be delivered factory-blended to provide a uniform appearance and color range in the completed wall. See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total recycled content requirements. Clay units may contain post-consumer or post-industrial recycled content.

2.2.1 Solid Clay Brick

Solid clay brick shall conform to ASTM C216, Type FBS. Brick size shall be modular and the nominal size of the brick used shall be 3-5/8 inches thick, 2-1/4 inches high, and 8 inches long (nominal) or 4 inches thick, 2-2/3 inches high and 8 inches long (nominal). Minimum compressive strength of the brick shall be 3,000 psi.

2.2.2 ACCEPTABLE MANUFACTURERS

Solid Clay Brick: Facing brick complying with ASTM C216.

a. Basis of Design Products:

    1. Base Brick: McAvoy Brick - Smooth Full Range Valley Forge (Type 1)
    2. Field Brick: Lee Brick and Tile - Smooth 200F (Type 2)
    3. Accent Brick: GlenGery Brick - W181 Dolomite Grey (Type 3)

b. Other Acceptable Manufacturers: Subject to compliance with requirements, equivalent products manufactured by the following may be provided.
c. Grade: SW
d. Type: FBX
d. Unit Compressive Strength: Provide units with minimum average net-area

compressive strength of 3000 psi.

e. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C67.
f. Efflorescence: Provide brick that has been tested according to ASTM C67 and is rated "not effloresced."
g. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing per ASTM C67 with no observable difference in the applied finish when viewed from 10 feet or shall have a history of successful use in Project's area.
h. Size (Actual Dimension): Modular units; 3-/58 inches wide by 2-1/4 inches high by 7-5/8 inches long to provide 3 courses per 8 inches.
i. Color and Texture: As selected by Architect.

2.3 CONCRETE MASONRY UNITS (CMU)

Submit samples and certificates as specified. Cement shall have a low alkali content and be of one brand. See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total recycled content requirements. Units may contain post-consumer or post-industrial recycled content. Units shall be of modular dimensions and air, water, or steam cured.

a. Hollow Non-Load-Bearing Units: ASTM C129, made with lightweight, medium weight or normal weight aggregate. Load-bearing units may be provided in lieu of non-load-bearing units.

2.3.1 Aggregates

Lightweight aggregates and blends of lightweight and heavier aggregates in proportions used in producing the units, shall comply with the following requirements when tested for stain-producing iron compounds in accordance with ASTM C641: by visual classification method, the iron stain deposited on the filter paper shall not exceed the "light stain" classification. Use industrial waste by-products (air-cooled slag, cinders, or bottom ash), ground waste glass and concrete, granulated slag, and expanded slag in aggregates. Slag shall comply with ASTM C989/C989M; Grade 80.

2.3.2 Kinds and Shapes

Units shall be modular in size and shall include closer, jamb, header, lintel, and bond beam units and special shapes and sizes to complete the work as indicated. In exposed interior masonry surfaces, units having a bullnose shall be used for vertical external corners except at door, window, and louver jambs. Radius of the bullnose shall be 1 inch. Units used in exposed masonry surfaces in any one building shall have a uniform fine to medium texture and a uniform color.

2.3.3 Fire-Rated CMU

Concrete masonry units used in fire-rated construction shown on the drawings shall be 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 on the aggregate requiring the greater minimum equivalent thickness to produce the required fire rating. Construction shall conform to ASTM E119.

TABLE I FIRE-RATED CONCRETE MASONRY UNITS See note (a) in Table III			
	Minimum equivalent thickness in inches for fire rating of:		
Aggregate Type	4 hours	3 hours	2 hours
Pumice	4.7	4.0	3.0
Expanded slag	5.0	4.2	3.3
Expanded clay, shale, or slate	5.7	4.8	3.7
Limestone, scoria, cinders or unexpanded slag	5.9	5.0	4.0
Calcareous gravel	6.2	5.3	4.2
Siliceous gravel	6.7	5.7	4.5

Minimum equivalent thickness shall equal net volume as determined in conformance with ASTM C140 divided by the product of the actual length and height of the face shell of the unit in inches. Where walls are to receive plaster or be faced with brick, or otherwise form an assembly; the thickness of plaster or brick or other material in the assembly will be included in determining the equivalent thickness. Submit calculation results.

2.4 PRECAST CONCRETE ITEMS

Trim, lintels, copings, splashblocks and door sills shall be factory-made units from a plant regularly engaged in producing precast concrete units. Unless otherwise indicated, concrete shall be 4,000 psi minimum conforming to Section 03 30 00 CAST-IN-PLACE CONCRETE using 1/2 inch to No. 4 nominal-size coarse aggregate, and minimum reinforcement shall be the reinforcement required for handling of the units. Clearance of 3/4 inch shall be maintained between reinforcement and faces of units. Unless precast-concrete items have been subjected during manufacture to saturated-steam pressure of at least 120 psi for at least 5 hours, the items, after casting, shall be either damp-cured for 24 hours or steam-cured and shall then be aged under cover for 28 days or longer. Cast-concrete members weighing over 80 pounds shall have built-in loops of galvanized wire or other approved provisions for lifting and anchoring. Units shall have beds and joints at right angles to the face, with sharp true arises and shall be cast with drip grooves on the underside where units overhang walls. Exposed-to-view surfaces shall be free of surface voids, spalls, cracks, and chipped or broken edges. Precast units exposed-to-view shall be of uniform appearance and color. Unless otherwise specified, units shall have a smooth dense finish. Prior to use, each item

shall be wetted and inspected for crazing. Items showing evidence of dusting, spalling, crazing, or having surfaces treated with a protective coating will be rejected. Submit specified factory certificates.

2.4.1 Precast Lintel Design

Provide design analysis performed by manufacturer's professional engineer. Precast lintels, unless otherwise shown, shall be of a thickness equal to the wall and reinforced with a minimum of two No. 4 bottom bars for the full length. Top of lintels shall be labeled "TOP" or otherwise identified and each lintel shall be clearly marked to show location in the structure. In reinforced masonry, lintels shall conform to ACI 318 for flexural and shear strength and shall have at least 8 inches bearing at each end. Concrete shall have a minimum 28 day compressive strength of 4,000 psi using 1/2 inch to No. 4 nominal-size coarse aggregate. Reinforcement shall conform to ASTM A615/A615M Grade 60,000 psi. Limit lintel deflection due to dead plus live load to L/600 or 0.3 inches. Provide top and bottom bars for lintels over 36 inches in length.

2.4.2 Sills and Copings

Sills and copings shall be cast with washes. Sills for windows having mullions shall be cast in sections with head joints at mullions and a 1/4 inch allowance for mortar joints. The ends of sills, except a 3/4 inch wide margin at exposed surfaces, shall be roughened for bond. Treads of door sills shall have rounded nosings. Reinforce sills with not less than two No. 4 bars.

2.4.3 Splash Blocks

Splash blocks shall be as detailed. Reinforcement shall be the manufacturer's standard.

2.5 MASONRY MORTAR

Type M mortar shall conform to ASTM C270 and shall be used for foundation walls. Mortar Type S shall conform to the proportion specification of ASTM C270 except Type S cement-lime mortar proportions shall be 1 part cement, 1/2 part lime and 4-1/2 parts aggregate; Type N cement-lime mortar proportions shall be 1 part cement, 1 part lime and 6 parts aggregate. Type N or S mortar shall be used for non-load-bearing, non-shear-wall interior masonry; and Type S for remaining masonry work; except where higher compressive strength is indicated on structural drawings. When masonry cement ASTM C91/C91M is used the maximum air content shall be limited to 12 percent and performance equal to cement-lime mortar shall be verified. Verification of masonry cement performance shall be based on ASTM C780 and ASTM C1072. Pointing mortar in showers and kitchens shall contain ammonium stearate, or aluminum tri-stearate, or calcium stearate in an amount equal to 3 percent by weight of cement used. Cement shall have a low alkali content and be of one brand. Aggregates shall be from one source.

2.5.1 Colored Mortar

Mortar coloring shall be added to the mortar used for exposed masonry surfaces to produce a uniform color matching Architect's sample. Quantity of pigment to cementitious content of the masonry cement shall not exceed 5 by weight; carbon black shall not exceed 1 percent by weight. Quantity of pigment to cementitious content of cement-lime mix shall not exceed 10

percent by weight, carbon black no more than 2 percent by weight. Mortar coloring shall be chemically inert, of finely ground limeproof pigment, and furnished in accurately pre-measured and packaged units that can be added to a measured amount of cement. Compressive strength of colored mortar shall equal 3,000 psi.

2.5.2 Hydrated Lime and Alternates

Hydrated lime shall conform to ASTM C207, Type S.

2.5.3 Cement

Portland cement shall conform to ASTM C150/C150M, Type I, II, or III. Containers shall bear complete instructions for proportioning and mixing to obtain the required types of mortar. Incorporate to the maximum extent, without conflicting with other requirements of this section, up to 40 percent fly ash, up to 70 percent slag, up to 10 percent cenospheres, and up to 10 percent silica fume. Additives shall conform to requirements in Section 03 30 00 CAST-IN-PLACE CONCRETE.

2.5.4 Sand and Water

Sand shall conform to ASTM C144. Water shall be clean, potable, and free from substances which could adversely affect the mortar.

2.6 GROUT AND READY-MIXED GROUT

Grout shall conform to ASTM C476, fine. Cement used in grout shall have a low alkali content. Grout slump shall be between 8 and 10 inches. Minimum grout strength shall be 2000 psi in 28 days, as tested by ASTM C1019. Use grout subject to the limitations of Table III. 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 the grout meets the specified requirements. Ready-Mixed grout shall conform to ASTM C94/C94M. See Section 3.15 "Anchorage to Concrete and Structural Steel.

2.6.1 Admixtures for Grout

In cold weather, a non-chloride based accelerating admixture may be used subject to approval; accelerating admixture shall be non-corrosive, shall contain less than 0.2 percent chlorides, and shall conform to ASTM C494/C494M, Type C. In general, air-entrainment, anti-freeze or chloride admixtures shall not be used except as approved by the Contracting Officer. Submit required certifications.

2.6.2 Grout Barriers

Grout barriers for vertical cores shall consist of fine mesh wire, fiberglass, or expanded metal.

2.7 ANCHORS, TIES, AND BAR POSITIONERS

Anchors and ties shall be fabricated without drips or crimps and shall be zinc-coated in accordance with ASTM A153/A153M, Class B-2. Steel wire used for anchors and ties shall be fabricated from steel wire conforming to ASTM A82/A82M. Wire ties or anchors in exterior walls shall conform to ASTM A641/A641M. Joint reinforcement in interior walls, and in exterior or interior walls exposed to moist environment shall conform to ASTM A641/A641M;

coordinate with paragraph JOINT REINFORCEMENT below. Anchors and ties shall be sized to provide a minimum of 5/8 inch mortar cover from either face. Submit two anchors, ties and bar positioners of each type used, as samples. See Section 3.15 Anchorage to Concrete and Stainless Steel.

2.7.1 Wire Mesh Ties

Wire mesh for tying 4 inch thick concrete masonry unit partitions to other intersecting masonry partitions shall be 1/2 inch mesh of minimum 16 gauge steel wire. Minimum lengths shall be not less than 12 inches.

2.7.2 Wall Ties

Provide wall ties rectangular-shaped or Z-shaped fabricated of 3/16 inch diameter zinc-coated steel wire. Rectangular wall ties shall be no less than 4 inches wide. Wall ties may also be of a continuous type conforming to paragraph JOINT REINFORCEMENT. Adjustable type wall ties, if approved for use, shall consist of two essentially U-shaped elements fabricated of 3/16 inch diameter zinc-coated steel wire. Adjustable ties shall be of the double pintle to eye type and shall allow a maximum of 1/2 inch eccentricity between each element of the tie. Play between pintle and eye opening shall be not more than 1/16 inch. The pintle and eye elements shall be formed so that both can be in the same plane.

2.7.3 Adjustable Anchors

Adjustable anchors shall be 3/16 inch diameter steel wire, triangular-shaped. Anchors attached to steel shall be 5/16 inch diameter steel bars placed to provide 1/16 inch play between flexible anchors and structural steel members. Spacers shall be welded to rods and columns. Equivalent welded-on steel anchor rods or shapes standard with the flexible-anchor manufacturer may be furnished when approved. Welds shall be cleaned and given one coat of zinc-rich touch up paint.

2.7.4 Bar Positioners

Bar positioners, used to prevent displacement of reinforcing bars during the course of construction, shall be factory fabricated from 9 gauge steel wire or equivalent, and coated with a hot-dip galvanized finish. Not more than one wire shall cross the cell. Telescoping bar positioner shall be manufactured from AISI 1065 spring steel and coated in accordance with ASTM B633.

2.8 JOINT REINFORCEMENT

Joint reinforcement shall be factory fabricated from steel wire conforming to ASTM A82/A82M, welded construction. Tack welding will not be acceptable in reinforcement used for wall ties. Wire shall have zinc coating conforming to ASTM A153/A153M, Class B-2. All wires shall be a minimum of 9 gauge. Reinforcement shall be ladder type design, having one longitudinal wire in the mortar bed of each face shell for hollow units and one wire for solid units. Joint reinforcement shall be placed a minimum of 5/8 inch cover from either face. The distance between crosswires shall not exceed 16 inches. Joint reinforcement for straight runs shall be furnished in flat sections not less than 10 feet long. Joint reinforcement shall be provided 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.

2.9 REINFORCING STEEL BARS AND RODS

Reinforcing steel bars and rods shall conform to ASTM A615/A615M, Grade 60.

2.10 CONTROL JOINT KEYS

Control joint keys shall be a factory fabricated solid section of natural or synthetic rubber (or combination thereof) conforming to ASTM D2000or polyvinyl chloride conforming to ASTM D2287. The material shall be resistant to oils and solvents. The control joint key shall be provided with a solid shear section not less than 5/8 inch thick and 3/8 inch thick flanges, with a tolerance of plus or minus 1/16 inch. The control joint key shall fit neatly, but without forcing, in masonry unit jamb sash grooves. The control joint key shall be flexible at a temperature of minus 30 degrees F after five hours exposure, and shall have a durometer hardness of not less than 70 when tested in accordance with ASTM D2240.

2.11 EXPANSION-JOINT MATERIALS

Backer rod and sealant shall be adequate to accommodate joint compression equal to 50 percent of the width of the joint. The backer rod shall be compressible rod stock of polyethylene foam, polyurethane foam, butyl rubber foam, or other flexible, nonabsorptive material as recommended by the sealant manufacturer. Sealant shall conform to Section 07 92 00 JOINT SEALANTS, and shall be penetrating with a maximum volatile organic compound (VOC) content of 600 grams/liter. Submit one piece of each type of material used.

2.12 THROUGH WALL FLASHING

Provide Through Wall Flashing as specified in Section 07 60 00 FLASHING AND SHEET METAL. Provide one of the following types except that flashing indicated to terminate in reglets shall be metal or coated-metal flashing and except that the material shall be one which is not adversely affected by dampproofing material.

a. Coated-Copper Flashing: 7 ounce, electrolytic copper sheet, uniformly coated on both sides with acidproof, alkaliproof, elastic bituminous compound. Factory apply coating to a weight of not less than 6 ounces/square foot (approximately 3 ounces/square foot on each side).

b. Copper or Stainless Steel Flashing: Copper, ASTM B370, minimum 16 ounce weight; stainless steel, ASTM A167, Type 301, 302, 304, or 316, 0.015 inch thick, No. 2D finish. Provide with factory-fabricated deformations that mechanically bond flashing against horizontal movement in all directions. Deformations shall consist of dimples, diagonal corrugations, or a combination of dimples and transverse corrugations.

2.13 WEEP HOLE VENTILATORS

Weep hole ventilators shall be prefabricated aluminum, plastic or wood blocking sized to form the proper size opening in head joints. Provide aluminum and plastic inserts with grill or screen-type openings designed to allow the passage of moisture from cavities and to prevent the entrance or insects. Ventilators shall be sized to match modular construction with a standard 3/8 inch mortar joint.

PART 3 EXECUTION

3.1 PREPARATION

Prior to start of work, masonry inspector shall verify the applicable conditions as set forth in ACI 530/530.1, inspection. The Contracting Officer will serve as inspector or will select a masonry inspector.

3.1.1 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 and 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 and mixing water shall be heated to provide 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 and mixing water shall be heated to provide mortar temperatures between 40 and 120 degrees F. Enclosure and auxiliary heat shall be provided to maintain air temperature above 32 degrees F. Temperature of units when laid shall not be less than 20 degrees F.

3.1.2 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 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 lamps, or other approved methods.

3.1.3 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.

3.1.4 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.

3.1.5 Surfaces

Clean surfaces on which masonry is to be placed 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 LAYING MASONRY UNITS

a. Coordinate masonry work with the work of other trades to accommodate built-in items and to avoid cutting and patching. Masonry units shall be laid in the indicated bond patterns. Each unit shall be adjusted to its final position while mortar is still soft and plastic.

b. Units that have been disturbed after the mortar has stiffened shall be removed, cleaned, and relaid with fresh mortar. Air spaces, cavities, chases, expansion joints, and spaces to be grouted shall be kept free from mortar and other debris. Units used in exposed masonry surfaces shall be selected from those having the least amount of chipped edges or other imperfections detracting from the appearance of the finished work. Vertical joints shall be kept plumb.

c. Units being laid and surfaces to receive units shall be free of water film and frost. Solid units shall be laid in a nonfurrowed full bed of mortar. Mortar for veneer wythes shall be beveled and sloped toward the center of the wythe from the cavity side. Units shall be shoved into place so that the vertical joints are tight. Vertical joints of brick and the vertical face shells of concrete masonry units, except where indicated at control, expansion, and isolation joints, shall be completely filled with mortar. Mortar will be permitted to protrude up to 1/2 inch into the space or cells to be grouted. Means shall be provided to prevent mortar from dropping into the space below.

d. In double wythe construction, the inner wythe may be brought up not more than 16 inches ahead of the outer wythe. Collar joints shall be filled with mortar or grout during the laying of the facing wythe, and filling shall not lag the laying of the facing wythe by more than 8 inches.

3.2.1 Forms and Shores

Provide bracing and scaffolding as required. Design bracing to resist wind pressure as required by local codes. Forms and shores shall be sufficiently rigid to prevent deflections which may result in cracking or other damage to supported masonry and sufficiently tight to prevent leakage of mortar and grout. Supporting forms and shores shall not be removed in less than 10 days.

3.2.2 Reinforced Concrete Masonry Units Walls

Where vertical reinforcement occurs, fill cores solid with grout. Lay units in such a manner as to preserve the unobstructed vertical continuity

of cores to be filled. Embed the adjacent webs in mortar to prevent leakage of grout. Remove mortar fins protruding from joints before placing grout. Minimum clear dimensions of vertical cores shall be 2 by 3 inches. Position reinforcing accurately as indicated before placing grout. As masonry work progresses, secure vertical reinforcing in place at vertical intervals not to exceed 160 bar diameters. Use puddling rod or vibrator to consolidate the grout. Minimum clear distance between masonry and vertical reinforcement shall be not less than 1/2 inch. Unless indicated or specified otherwise, form splices by lapping bars not less than 40 bar diameters and wire tying them together.

3.2.3 Concrete Masonry Units

Units in piers, pilasters, columns, starting courses on footings, solid foundation walls, lintels, and beams, and where cells are to be filled with grout shall be full bedded in mortar under both face shells and webs. Other units shall be full bedded under both face shells. Head joints shall be filled solidly with mortar for a distance in from the face of the unit not less than the thickness of the face shell. Foundation walls below grade shall be grouted solid. Jamb units shall be 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. Double walls shall be stiffened 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 the double wall. Walls and partitions shall be adequately reinforced for support of wall-hung plumbing fixtures when chair carriers are not specified.

3.2.4 Clay Brick Units

Lay brick facing with the better face exposed. Lay brick in soldier bond or running bond as indicated; bond each course at corners, unless otherwise indicated. Lay molded brick with the frog side down. Brick that is cored, recessed, or has other deformations may be used in sills, treads, soldier courses, except where deformations will be exposed to view.

3.2.4.1 Wetting of Units

Wetting of clay brick units having an initial rate of absorption of more than 1 gram per minute per square inch of bed surface shall be in conformance with ASTM C67. The method of wetting shall ensure that each unit is nearly saturated but surface dry when laid. Test clay brick daily on the job, prior to laying, as follows: Using a wax pencil, draw a circle the size of a quarter on five randomly selected bricks. Apply 20 drops of water with a medicine dropper to the surface within the circle on each brick. If the average time that the water is completely absorbed in the five bricks is less than 1-1/2 minutes, wet bricks represented by the five bricks tested.

3.2.4.2 Solid Units

Completely fill bed, head, and collar joints with mortar.

3.2.4.3 Brick-Faced Walls

For brick-faced walls bond brick in the pattern as indicated on the drawings. Provide additional bonding ties spaced not more than 3 feet apart around the perimeter of and within 12 inches of all openings.

a. Collar Joints: Fill collar joints solid with mortar as each course of brick is laid. Do not disturb units in place.

3.2.4.4 Cavity Walls

Provide a continuous cavity as indicated. Securely tie the brick veneer to the ICF system specified in Section 03 11 19.00 10 INSULATING CONCRETE FORMING with horizontal joint reinforcement. Bevel mortar beds away from cavity to prevent projection into cavity when bricks are shoved in place. Keep cavities clear and clean of mortar droppings. At the bottom of cavity walls, in the course immediately above the through-wall flashing, temporarily omit one brick every 4 feet. With a hose and clean water, wash all mortar droppings and debris out of the cavity through the temporary openings at least twice each day masonry is laid, and more often when required to keep the cavities clean. Fill in the openings with bricks and mortar after the wall is complete and the cavity has been inspected and found clean. Provide weep holes of open head joints spaced 24 inches o.c. at base of wall and vertical obstructions (e.g. lintels).

3.2.4.5 Brick Veneer

Provide a continuous cavity as indicated. Install brick veneer after sheathing, masonry anchors, and flashing have been installed to the ICF or cold-formed steel framing system. Care shall be provided to avoid damaging the moisture barrier. Damaged moisture barrier and flashing shall be repaired or replaced before brick veneer is installed. Means shall be provided to keep cavities clean and clear of mortar droppings.

3.2.5 Tolerances

Lay masonry plumb, true to line, with courses level. Keep bond pattern plumb throughout. Square corners unless noted otherwise. Except for walls constructed of prefaced concrete masonry units, lay masonry within the following tolerances (plus or minus unless otherwise noted):

TABLE II TOLERANCES	
Variation from the plumb in the lines and surfaces of columns, walls and arises	
In adjacent masonry units	1/8 inch
In 10 feet	1/4 inch
In 20 feet	3/8 inch
In 40 feet or more	1/2 inch
Variations from the plumb for external corners, expansion joints, and other conspicuous lines	
In 20 feet	1/4 inch
In 40 feet or more	1/2 inch
Variations from the level for exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines	

TABLE II TOLERANCES	
In 20 feet	1/4 inch
In 40 feet or more	1/2 inch
Variation from level for bed joints and top surfaces of bearing walls	
In 10 feet	1/4 inch
In 40 feet or more	1/2 inch
Variations from horizontal lines	
In 10 feet	1/4 inch
In 20 feet	3/8 inch
In 40 feet or more	1/2 inch
Variations in cross sectional dimensions of columns and in thickness of walls	
Minus	1/4 inch
Plus	1/2 inch

3.2.6 Cutting and Fitting

Full units of the proper size shall be used wherever possible, in lieu of cut units. Cutting and fitting, including that required to accommodate the work of others, shall be done by masonry mechanics using power masonry saws. Concrete masonry units may be wet or dry cut. Wet cut units, before being placed in the work, shall be dried to the same surface-dry appearance as uncut units being laid in the wall. Cut edges shall be clean, true and sharp. Openings in the masonry shall be made carefully 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. Reinforced masonry lintels shall be provided above openings over 12 inches wide for pipes, ducts, cable trays, and other wall penetrations, unless steel sleeves are used.

3.2.7 Jointing

Joints shall be tooled when the mortar is thumbprint hard. Horizontal joints shall be tooled last. Joints shall be brushed to remove all loose and excess mortar. Mortar joints shall be finished as follows:

3.2.7.1 Flush Joints

Joints in concealed masonry surfaces and joints at electrical outlet boxes in wet areas shall be flush cut. Flush cut joints shall be made by cutting off the mortar flush with the face of the wall. Joints in unparged masonry walls below grade shall be pointed tight. Flush joints for architectural units, such as fluted units, shall completely fill both the head and bed joints.

3.2.7.2 Tooled Joints

Joints in exposed exterior and interior masonry surfaces shall be tooled slightly concave. Joints shall be tooled with a jointer slightly larger than the joint width so that complete contact is made along the edges of the unit. Tooling shall be performed so that the mortar is compressed and the joint surface is sealed. Jointer of sufficient length shall be used to obtain a straight and true mortar joint.

3.2.7.3 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.

3.2.8 Joint Widths

Joint widths shall be as follows:

3.2.8.1 Concrete Masonry Units

Concrete masonry units shall have 3/8 inch joints, except for prefaced concrete masonry units.

3.2.8.2 Brick

Brick joint widths shall be the difference between the actual and nominal dimensions of the brick in either height or length. Brick expansion joint widths shall be as shown.

3.2.9 Embedded 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.

3.2.10 Unfinished Work

Step back unfinished work for joining with new work. Toothing may be resorted to only when specifically approved. Remove loose mortar and thoroughly clean the exposed joints before laying new work.

3.2.11 Masonry Wall Intersections

Masonry bond each course at corners and elsewhere as shown. Masonry walls shall be anchored or tied together at corners and intersections with bond beam reinforcement and prefabricated corner or tee pieces of joint reinforcement as shown.

3.2.12 Partitions

Partitions shall be continuous from floor to underside of floor or roof deck where shown. Openings in firewalls around joists or other structural members shall be filled as indicated or approved. Where suspended ceilings on both sides of partitions are indicated, the partitions other than those

shown to be continuous may be stopped approximately 4 inches above the ceiling level. An isolation joint shall be placed in the intersection between partitions and structural or exterior walls as shown. Interior partitions having 4 inch nominal thick units shall be tied to intersecting partitions of 4 inch units, 5 inches into partitions of 6 inch units, and 7 inches into partitions of 8 inch or thicker units. Cells within vertical plane of ties shall be filled solid with grout for full height of partition or solid masonry units may be used. Interior partitions having masonry walls over 4 inches thick shall be tied together with joint reinforcement. Partitions containing joint reinforcement shall be provided with prefabricated pieces at corners and intersections or partitions.

3.3 WEEP HOLES

Wherever through-wall flashing occurs, provide weep holes to drain flashing to exterior at acceptable locations as indicated on drawings. Weep holes shall be full open head joints 20 inches o.c. for brick faced walls and minimum 2-inch open head joints 32 inches o.c. for concrete masonry unit construction. Weep holes shall be provided not more than 24 inches on centers in mortar joints of the exterior wythe above wall flashing, over foundations, bond beams, and any other horizontal interruptions of the cavity. Weep holes shall be perfectly horizontal or slightly canted downward to encourage water drainage outward and not inward. Weep holes shall be constructed using weep hole ventilators. Other approved methods may be used for providing weep holes. Weep holes shall be kept free of mortar and other obstructions.

3.4 MORTAR MIX

Mix mortar in a mechanically operated mortar mixer for at least 3 minutes, but not more than 5 minutes. Measure ingredients for mortar by volume. Ingredients not in containers, such as sand, shall be accurately measured by the use of measuring boxes. Mix water with the dry ingredients in sufficient amount to provide a workable mixture which will adhere to the vertical surfaces of masonry units. Retemper mortar that has stiffened because of loss of water through evaporation by adding water to restore the proper consistency and workability. Discard mortar that has reached its initial set or that has not been used within 2.5 hours after mixing.

3.5 REINFORCING STEEL

Clean reinforcement of loose, flaky rust, scale, grease, mortar, grout, or other coating which might destroy or reduce its bond prior to placing grout. Bars with kinks or bends not shown on the drawings shall not be used. Reinforcement shall be placed prior to grouting. Unless otherwise indicated, vertical wall reinforcement shall extend to within 2 inches of tops of walls.

3.5.1 Positioning Bars

Vertical bars shall be accurately placed 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. Minimum clearance between parallel bars shall be one diameter of the reinforcement. Vertical reinforcing 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. Column and pilaster ties shall be wired in position around the vertical steel. Ties shall be in contact with the vertical reinforcement and shall not be placed in horizontal bed joints.

3.5.2 Splices

Bars shall be lapped a minimum of 48 diameters of the reinforcement. Welded or mechanical connections shall develop at least 125 percent of the specified yield strength of the reinforcement.

3.6 JOINT REINFORCEMENT INSTALLATION

Joint reinforcement shall be installed at 16 inches on center or as indicated. Reinforcement shall be lapped not less than 6 inches. Prefabricated sections shall be installed at corners and wall intersections. The longitudinal wires of joint reinforcement shall be placed to provide not less than 5/8 inch cover to either face of the unit.

3.7 PLACING GROUT

Fill cells containing reinforcing bars with 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 shall be filled solid with grout. Cells under lintel bearings on each side of openings shall be filled solid with grout for full height of openings. Walls below grade, lintels, and bond beams shall be filled solid with grout. Units other than open end units may require grouting each course to preclude voids in the units. Grout not in place within 1-1/2 hours after water is first added to the batch shall be discarded. Sufficient time shall be allowed between grout lifts to preclude displacement or cracking of face shells of masonry units. If blowouts, flowouts, misalignment, or cracking of face shells should occur during construction, the wall shall be torn down and rebuilt.

3.7.1 Vertical Grout Barriers for Fully Grouted Walls

Provide grout barriers not more than 30 feet apart, or as required, to limit the horizontal flow of grout for each pour.

3.7.2 Horizontal Grout Barriers

Embed grout barriers in mortar below cells of hollow units receiving grout.

3.7.3 Grout Holes and Cleanouts

3.7.3.1 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 all hollow unit masonry is indicated. Openings shall not be 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.

3.7.3.2 Cleanouts for Hollow Unit Masonry Construction

Provide cleanout holes at the bottom of every pour in cores containing vertical reinforcement when the height of the grout pour exceeds 5 feet. 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. Cleanouts shall not be less than 3 by 4 inch openings cut from one face shell. Manufacturer's standard cutout units may be used at the Contractor's option. Cleanout holes shall not be closed 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.

3.7.3.3 Cleanouts for Solid Unit Masonry Construction

Provide cleanouts for construction of walls consisting of a grout filled cavity between solid masonry wythes 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.

3.7.4 Grouting Equipment

3.7.4.1 Grout Pumps

Pumping through aluminum tubes will not be permitted. Operate pumps to produce a continuous stream of grout without air pockets, segregation, or contamination. Upon completion of each day's pumping, remove waste materials and debris from the equipment, and dispose of outside the masonry.

3.7.4.2 Vibrators

Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in the grout. Maintain at least one spare vibrator at the site at all times. 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.

3.7.5 Grout Placement

Lay masonry to the top of a pour before placing grout. Do no place grout in two-wythe solid unit masonry cavity until mortar joints have set for at least 3 days during hot weather and 5 days during cold damp weather. Grout shall not be placed in hollow unit masonry until mortar joints have set for at least 24 hours. Grout shall be placed using a hand bucket, concrete hopper, or grout pump to completely fill the grout spaces without segregation of the aggregates. Vibrators shall not be inserted into lower pours that are in a semi-solidified state. The height of grout pours and type of grout used shall be limited by the dimensions of grout spaces as indicated in Table III. Low-lift grout methods may be used on pours up to and including 5 feet in height. High-lift grout methods shall be used on pours exceeding 5 feet in height.

3.7.5.1 Low-Lift Method

Grout shall be placed at a rate that will not cause displacement of the masonry due to hydrostatic pressure of the grout. Mortar protruding more than 1/2 inch into the grout space shall be removed before beginning the

grouting operation. Grout pours 12 inches or less in height shall be consolidated by mechanical vibration or by puddling. Grout pours over 12 inches in height shall be consolidated by mechanical vibration and reconsolidated by mechanical vibration after initial water loss and settlement has occurred. Vibrators shall not be inserted into lower pours that are in a semi-solidified state. Low-lift grout shall be used subject to the limitations of Table III.

3.7.5.2 High-Lift Method

Mortar droppings shall be cleaned from the bottom of the grout space and from reinforcing steel. Mortar protruding more than 1/4 inch into the grout space shall be removed by dislodging the projections with a rod or stick as the work progresses. Reinforcing, bolts, and embedded connections shall be rigidly held in position before grouting is started. CMU units shall not be pre-wetted. Grout, from the mixer to the point of deposit in the grout space shall be placed as rapidly as practical by pumping and placing methods which will prevent segregation of the mix and cause a minimum of grout splatter on reinforcing and masonry surfaces not being immediately encased in the grout lift. The individual lifts of grout shall be limited to 4 feet in height. The first lift of grout shall be placed to a uniform height within the pour section and vibrated thoroughly to fill all voids. This first vibration shall follow immediately behind the pouring of the grout using an approved mechanical vibrator. After a waiting period sufficient to permit the grout to become plastic, but before it has taken any set, the succeeding lift shall be poured and vibrated 12 to 18 inches into the preceding lift. If the placing of the succeeding lift is going to be delayed beyond the period of workability of the preceding, each lift shall be reconsolidated by reworking with a second vibrator as soon as the grout has taken its settlement shrinkage. The waiting, pouring, and reconsolidation steps shall be repeated until the top of the pour is reached. The top lift shall be reconsolidated after the required waiting period. The high-lift grouting of any section of wall between vertical grout barriers shall be completed to the top of a pour in one working day unless a new series of cleanout holes is established and the resulting horizontal construction joint cleaned. High-lift grout shall be used subject to the limitations in Table III.

TABLE III
POUR HEIGHT AND TYPE OF GROUT FOR VARIOUS GROUT SPACE DIMENSIONS

			Minimum Dimensions of the Total Clear Areas Within Grout Spaces and Cells in inches (1,2)	
Maximum Grout Pour Height feet (4)	Grout Type	Grouting Procedure	Multiwythe Masonry (3)	Hollow-unit Masonry
1	Fine	Low Lift	3/4	1-1/2 x 2
5	Fine	Low Lift	2	2 x 3
8	Fine	High Lift	2	2 x 3

TABLE III
POUR HEIGHT AND TYPE OF GROUT FOR VARIOUS GROUT SPACE DIMENSIONS

			Minimum Dimensions of the Total Clear Areas Within Grout Spaces and Cells in inches (1,2)	
Maximum Grout Pour Height feet (4)	Grout Type	Grouting Procedure	Multiwythe Masonry (3)	Hollow-unit Masonry
12	Fine	High Lift	2-1/2	2-1/2 x 3
24	Fine	High Lift	3	3 x 3
1	Coarse	Low Lift	1-1/2	1-1/2 x 3
5	Coarse	Low Lift	2	2-1/2 x 3
8	Coarse	High Lift	2	3 x 3
12	Coarse	High Lift	2-1/2	3 x 3
24	Coarse	High Lift	3	3 x 4

Notes:

(1) The actual grout space or cell dimension shall be larger than the sum of the following items:

(a) The required minimum dimensions of total clear areas given in the table above;

(b) The width of any mortar projections within the space;

(c) The horizontal projections of the diameters of the horizontal reinforcing bars within a cross section of the grout space or cell.

(2) The minimum dimensions of the total clear areas shall be made up of one or more open areas, with at least one area being 3/4 inch or greater in width.

(3) For grouting spaces between masonry wythes.

(4) Where only cells of hollow masonry units containing reinforcement are grouted, the maximum height of the pour shall not exceed the distance between horizontal bond beams.

3.8 BOND BEAMS

Bond beams shall be filled with grout and reinforced as indicated on the drawings. Grout barriers shall be installed under bond beam units to retain the grout as required. Reinforcement shall be continuous, including around corners, except through control joints or expansion joints, unless otherwise indicated on the drawings. Where splices are required for continuity, reinforcement shall be lapped 48 bar diameters. A minimum clearance of 1/2 inch shall be maintained between reinforcement and interior faces of units. Provide Bond Beams where indicated on S002.

3.9 CONTROL JOINTS

Control joints shall be provided as indicated and shall be constructed by using special control-joint units in accordance with the details shown on the drawings. The vertical mortar joint at control joint locations shall be continuous, including through all bond beams. This shall be accomplished by utilizing half blocks in alternating courses on each side of the joint. The control joint key shall be interrupted in courses containing continuous bond beam steel. In single wythe exterior masonry walls, the exterior control joints shall be raked to a depth of 3/4 inch; backer rod and sealant shall be installed in accordance with Section 07 92 00 JOINT SEALANTS. Exposed interior control joints shall be raked to a depth of 1/4 inch. Concealed control joints shall be flush cut.

3.10 JOINTS SHOWN ON THE DRAWINGS

a. Brick expansion joints will be located, detailed, and constructed as shown on the architectural drawings. Keep joints free of mortar and other debris.

3.11 SHELF ANGLES

Adjust shelf angles as required to keep the masonry level and at the proper elevation. Shelf angles shall be galvanized and provided in sections not longer than 10 feet and installed with a 1/4 inch gap between sections. Shelf angles shall be mitered and welded at building corners with each angle not shorter than 4 feet, unless limited by wall configuration.

3.12 LINTELS

3.12.1 Masonry Lintels

Construct masonry lintels with lintel units filled solid with grout in all courses and reinforced with a minimum of two No. 4 bars in the bottom course unless otherwise indicated on the drawings. Lintel reinforcement shall extend beyond each side of masonry opening 40 bar diameters or 24 inches, whichever is greater. Reinforcing bars shall be supported in place prior to grouting and shall be located 1/2 inch above the bottom inside surface of the lintel unit.

3.12.2 Precast Concrete and Steel Lintels

Construct precast concrete and steel lintels as shown on the drawings. Lintels shall be set in a full bed of mortar with faces plumb and true. Steel and precast lintels shall have a minimum bearing length of 8 inches unless otherwise indicated on the drawings.

3.13 SILLS AND COPINGS

Sills and copings shall be set in a full bed of mortar with faces plumb and true.

3.14 ANCHORED VENEER CONSTRUCTION

Completely separate the back-up ICF system construction and outer wythes by a continuous airspace as indicated. Through-wall flashings shall be protected from damage until they are fully enclosed in the wall. The airspace between the wythes shall be kept clear and free of mortar droppings by temporary wood strips laid on the wall ties and carefully

lifted out before placing the next row of ties. A coarse gravel or drainage material shall be placed behind the weep holes in the cavity to a minimum depth of 4 inches of coarse aggregate or 10 inches of drainage material to keep mortar droppings from plugging the weep holes.

3.15 ANCHORAGE TO CONCRETE AND STRUCTURAL STEEL

3.15.1 Anchorage to Concrete through Rigid Insulation

Provide one of the following options:

a. Veneer curtainwall anchors and ties for attachment to fastening strips on edges of spacing webs of insulated concrete form system (ICF). These anchors and ties shall be used only if the ICF system manufacturer provides calculations demonstrating compliance with the structural design criteria and applicable codes. Vee, triangular shaped ties of 3/16-inch diameter smooth steel wire. Anchor plate shall be 12 ga. minimum by 5-1/2 inches long with tab 3 inches for vertical adjustability and prepunched with 9/32-inch holes top and bottom. All components shall be hot-dipped galvanized in accordance with ASTM A153/A153M, Class B2 (1.5 oz/ft^2 min.); Hohmann & Barnard type DW-10HS or approved equal.

or

b. Veneer curtainwall anchors and ties for attachment to concrete through rigid insulation. These anchors and ties shall be used if the ICF system manufacturer does not provide calculations demonstrating compliance with structural design criteria and applicable codes. Vee, triangular shaped ties of 3/16-inch diameter smooth steel wire. Anchor plate shall be 12 ga. minimum by 5-1/2 inches long with tab for 3-inch vertical adjustability with stiffened legs to bridge the insulation and engage the concrete wall. Tie and anchor system to withstand a minimum 100 lb. working load in tension and compression without deforming or developing play in excess of 0.05 inch. Provide adhesive backed sealing tape between insulation and anchor plate to minimize air infiltration. All components shall be hot-dipped galvanized in accordance with ASTM A153/A153M, Class B2 (1.5 oz./ft.^{2} min.); Hohmann & Barnard X-seal Anchor or approved equal.

3.15.2 Anchorage to Structural Steel

Masonry shall be anchored to vertical structural steel framing with adjustable steel wire anchors spaced not over 16 inches on centers vertically, and if applicable, not over 24 inches on centers horizontally.

3.16 SPLASH BLOCKS

Locate splash blocks as indicated.

3.17 POINTING AND CLEANING

After mortar joints have attained their initial set, but prior to hardening, completely remove mortar and grout daubs or splashings from masonry-unit surfaces that will be exposed or painted. Before completion of the work, defects in joints of masonry to be exposed or painted shall be raked out as necessary, filled with mortar, and tooled to match existing joints. Immediately after grout work is completed, scum and stains which have percolated through the masonry work shall be removed using a high

pressure stream of water and a stiff bristled brush. Masonry surfaces shall not be cleaned, other than removing excess surface mortar, until mortar in joints has hardened. Masonry surfaces shall be left clean, free of mortar daubs, dirt, stain, and discoloration, including scum from cleaning operations, and with tight mortar joints throughout. Metal tools and metal brushes shall not be used for cleaning.

3.17.1 Dry-Brushing

a. Exposed concrete brick surfaces

b. shall be dry-brushed at the end of each day's work and after any required pointing, using stiff-fiber bristled brushes.

3.17.2 Clay Brick Surfaces

Clean exposed clay or shale brick masonry surfaces as necessary to obtain surfaces free of stain, dirt, mortar and grout daubs, efflorescence, and discoloration or scum from cleaning operations. After cleaning, examine the sample panel of similar material for discoloration or stain as a result of cleaning. If the sample panel is discolored or stained, change the method of cleaning to ensure that the masonry surfaces in the structure will not be adversely affected. The exposed masonry surfaces shall be water-soaked and then cleaned with a solution proportioned 1/2 cup trisodium phosphate and 1/2 cup laundry detergent to one gallon of water or cleaned with a proprietary masonry cleaning agent specifically recommended for the color and texture by the clay products manufacturer. The solution shall be applied with stiff fiber brushes, followed immediately by thorough rinsing with clean water. Proprietary cleaning agents shall be used in conformance with the cleaning product manufacturer's printed recommendations. Efflorescence shall be removed in conformance with the brick manufacturer's recommendations.

3.18 PROTECTION

Protect facing materials against staining. Cover top of walls with nonstaining waterproof covering or membrane when work is not in progress. Covering of the top of the unfinished walls shall continue until the wall is waterproofed with a complete roof or parapet system. Covering shall extend a minimum of 2 feet down on each side of the wall and shall be held securely in place. Before starting or resuming, top surface of masonry in place shall be cleaned of loose mortar and foreign material.

3.19 WASTE MANAGEMENT

Manage waste according to the Waste Management Plan and as follows. Minimize water used to wash mixing equipment. Use trigger operated spray nozzles for water hoses.

3.19.1 Separate and Recycle Waste

Place materials defined as hazardous or toxic waste in designated containers. Fold up metal banding, flatten, and place in designated area for recycling. Collect wood packing shims and pallets and place in designated area. Use leftover mixed mortar as cavity fill at grade where lower strength mortar meets the requirements for bulk fill. Separate masonry waste and place in designated area for use as structural fill. Separate selected masonry waste and excess for landscape uses, either whole or crushed as ground cover.

3.19.2 Take-Back Program

Collect information from manufacturer for take-back program options. Set aside masonry units, full and partial scrap to be returned to manufacturer for recycling into new product. When such a service is not available, local recyclers shall be sought after 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.

3.20 TEST REPORTS

3.20.1 Field Testing of Mortar

Take at least three specimens of mortar each day. Spread a layer of mortar 1/2 to 5/8 inch thick on the masonry units and allowed to stand for one minute. Prepare and test the specimens for compressive strength in accordance with ASTM C780. Submit test results.

3.20.2 Field Testing of Grout

Field sampling and testing of grout shall be in accordance with the applicable provisions of ASTM C1019. A minimum of three specimens of grout per day shall be sampled and tested. Each specimen shall have a minimum ultimate compressive strength of 2000 psi at 28 days. Submit test results.

3.20.3 Efflorescence Test

Test brick, which will be exposed to weathering, for efflorescence. Schedule tests far enough in advance of starting masonry work to permit retesting if necessary. Sampling and testing shall conform to the applicable provisions of ASTM C67. Units meeting the definition of "effloresced" will be subject to rejection. Submit test results.

-- End of Section --

SECTION 05 05 23.16

STRUCTURAL WELDING
05/14

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.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 360	(2010) Specification for Structural Steel Buildings

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ANSI/ASNT CP-189	(2011) ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel (ANSI/ASNT CP-105-2006)

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(2012) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS D1.1/D1.1M	(2010; Errata 2011) Structural Welding Code - Steel
AWS D1.3/D1.3M	(2008; Errata 2008) Structural Welding Code - Sheet Steel
AWS D1.4/D1.4M	(2011) Structural Welding Code - Reinforcing Steel
AWS D1.8/D1.8M	(2009) Structural Welding Code—Seismic Supplement
AWS D14.4/D14.4M	(2012) Specification for Welded Joints for Machinery and Equipment
AWS Z49.1	(2012) Safety in Welding and Cutting and Allied Processes

ASTM INTERNATIONAL (ASTM)

ASTM E165/E165M	(2012) Standard Practice for Liquid Penetrant Examination for General Industry
ASTM E709	(2014) Standard Guide for Magnetic Particle Examination

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2012) International Building Code

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Welding Quality Assurance Plan; G

SD-03 Product Data

Welding Procedure Qualifications; G
Welder, Welding Operator, and Tacker Qualification
Inspector Qualification
Previous Qualifications
Pre-qualified Procedures
Welding Electrodes and Rods

SD-06 Test Reports

Nondestructive Testing

SD-07 Certificates

Certified Welding Procedure Specifications (WPS)
Certified Brazing Procedure Specifications (BPS)
Certified Procedure Qualification Records (PQR)
Certified Welder Performance Qualifications (WPQ)
Certified Brazer Performance Qualifications (BPQ)

1.3 QUALITY ASSURANCE

Except for pre-qualified (in accordance with AWS D1.1/D1.1M) and previously qualified procedures, each Contractor performing welding must record in detail and qualify the welding procedure specification for any welding procedure followed in the fabrication of weldments. Conform welding procedure qualifications to AWS D1.1/D1.1M, AWS D1.8/D1.8M and to the specifications in this section. Submit for approval copies of the welding procedure specification and the results of the procedure qualification test records for each type of welding which requires procedure qualification and the welder, welding operator, or tacker qualification test records.. Approval of any procedure, however, does not relieve the Contractor of the sole responsibility for producing a finished structure meeting all the specified requirements. Submit this information on the forms in Annex M of AWS D1.1/D1.1M. Individually identify and clearly reference on the detail drawings and erection drawings all welding procedure specifications, or suitably key them to the contract drawings. In case of conflict between this specification and AWS D1.1/D1.1M, this specification governs.

1.3.1 General Requirements

Fabricate work in an AISC Certified Fabrication Plant, Category Std. Work must be erected by an AISC Certified Erector, Category CSE.

a. For Structural Projects, provide documentation of the following:

(1) Component Thickness 1/8 inch and greater: Qualification documents (WPS, PQR, and WPQ) in accordance with AWS D1.1/D1.1Mand AWS D1.8/D1.8M.

(2) Component Thickness Less than 1/8 inch: Qualification documents (WPS, PQR, and WPQ) in accordance with AWS D1.3/D1.3M.

(3) Reinforcing Steel: Qualification documents (WPS, PWR, and WPQ) in accordance with AWS D1.4/D1.4M.

b. For other applications, provide documentation of the following:

(1) Submit two copies of the Certified Welding Procedure Specifications (WPS), Certified Brazing Procedure Specifications (BPS) and Certified Procedure Qualification Records (PQR) to the Contracting Officer for approval.

(2) Submit two copies of the Certified Welder Performance Qualifications (WPQ)and Certified Brazer Performance Qualifications (BPQ) to the Contracting Officer for approval within fifteen calendar days prior to any employee welding on the project material.

(3) Machinery: Qualification documents (WPS, PQR, and WPQ) in accordance with AWS D14.4/D14.4M.

1.3.2 Previous Qualifications

Welding procedures previously qualified by test may be accepted for this contract without re-qualification, upon receipt of the test results, if the following conditions are met:

a. Testing was performed by an approved testing laboratory, technical consultant, or the Contractor's approved quality control organization.

b. The qualified welding procedure conforms to the requirements of this specification and is applicable to welding conditions encountered under this contract.

c. The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.

1.3.3 Pre-qualified Procedures

Welding procedures which are considered pre-qualified as specified in AWS D1.1/D1.1M will be accepted without further qualification. Submit for approval a listing or an annotated drawing to indicate the joints not pre-qualified. Procedure qualification is mandatory for these joints.

1.3.4 Retests

If welding procedure fails to meet the requirements of AWS D1.1/D1.1M, revise and re-qualify the procedure specification, or at the Contractor's option, welding procedure may be retested in accordance with AWS D1.1/D1.1M. If the welding procedure is qualified through retesting, submit all test

results, including those of test welds that failed to meet the requirements, with the welding procedure.

1.3.5 Welder, Welding Operator, and Tacker Qualification

Each welder, welding operator, and tacker assigned to work on this contract must be qualified in accordance with the applicable requirements of AWS D1.1/D1.1M, AWS D1.8/D1.8M and as specified in this section. Welders, welding operators, and tackers who make acceptable procedure qualification test welds will be considered qualified for the welding procedure used.

1.3.5.1 Previous Personnel Qualifications

At the discretion of the Contracting Officer, welders, welding operators, and tackers qualified by test within the previous 6 months may be accepted for this contract without re-qualification if all the following conditions are met:

a. Copies of the welding procedure specifications, the procedure qualification test records, and the welder, welding operator, and tacker qualification test records are submitted and approved in accordance with the specified requirements for detail drawings.

b. Testing was performed by an approved testing laboratory, technical consultant, or the Contractor's approved quality control organization.

c. The previously qualified welding procedure conforms to the requirements of this specification and is applicable to welding conditions encountered under this contract.

d. The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.

1.3.5.2 Certificates

Before assigning any welder, welding operator, or tacker to work under this contract, submit the names of the welders, welding operators, and tackers to be employed, and certification that each individual is qualified as specified. State in the certification the type of welding and positions for which the welder, welding operator, or tacker is qualified, the code and procedure under which the individual is qualified, the date qualified, and the name of the firm and person certifying the qualification tests. Keep the certification current, on file, and furnish 3 copies.

1.3.5.3 Renewal of Qualification

Re-qualification of a welder or welding operator is required under any of the following conditions:

a. It has been more than 6 months since the welder or welding operator has used the specific welding process for which he is qualified.

b. There is specific reason to question the welder or welding operator's ability to make welds that meet the requirements of these specifications.

c. The welder or welding operator was qualified by an employer other than those firms performing work under this contract, and a qualification

test has not been taken within the past 12 months. Submit as evidence of conformance all records showing periods of employment, name of employer where welder, or welding operator, was last employed, and the process for which qualified.

d. A tacker who passes the qualification test is considered eligible to perform tack welding indefinitely in the positions and with the processes for which he/she is qualified, unless there is some specific reason to question the tacker's ability. In such a case, the tacker is required to pass the prescribed tack welding test.

1.3.6 Inspector Qualification

Submit inspector qualifications that are in accordance with AWS D1.1/D1.1M and AWS D1.8/D1.8M. Qualify all nondestructive testing personnel in accordance with the requirements of ANSI/ASNT CP-189 for Levels I or II in the applicable nondestructive testing method. The inspector may be supported by assistant welding inspectors who are not qualified to AWS D1.1/D1.1M, and assistant inspectors may perform specific inspection functions under the supervision of the qualified inspector, as allowed by AWS D1.1/D1.1M. Cooordinate requirements with Specification Section 01 45 35 SPECIAL INSPECTIONS.

1.3.7 Symbols and Safety

Use symbols in accordance with AWS A2.4, unless otherwise indicated. Follow safe welding practices and safety precautions during welding in conformance with AWS Z49.1.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Conform the design of welded connections to AISC 360, unless otherwise indicated or specified. Material with welds will not be accepted unless the welding is specified or indicated on the drawings or otherwise approved. Perform welding as specified in this section, except where additional requirements are shown on the drawings or are specified in other sections. Do not commence welding until welding procedures, inspectors, nondestructive testing personnel, welders, welding operators, and tackers have been qualified and the submittals approved by the Contracting Officer. Perform all testing at or near the work site. Maintain records of the test results obtained in welding procedure, welder, welding operator, and tacker performance qualifications.

2.1.1 Pre-erection Conference

Hold a pre-erection conference prior to the start of the field welding, to bring all affected parties together and to gain a naturally clear understanding of the project and the Welding Procedure Specifications (WPS) (submitted for all welding, including welding done using pre-qualified procedures). Mandatory attendance is required by all Contractor's welding production and inspection personnel and appropriate Government personnel. Include as items for discussion: responsibilities of various parties; welding procedures and processes to be followed; welding sequence (both within a joint and joint sequence within the building); inspection requirements and procedures, both visual and nondestructive testing; welding schedule; and other items deemed necessary by the attendees.

2.2 WELDING EQUIPMENT AND MATERIALS

Provide all welding equipment, welding electrodes and rods, welding wire, and fluxes capable of producing satisfactory welds when used by a qualified welder or welding operator performing qualified welding procedures. Provide welding equipment and materials that comply with the applicable requirements of AWS D1.1/D1.1M and AWS D1.8/D1.8M. Submit product data on welding electrodes and rods.

PART 3 EXECUTION

3.1 WELDING OPERATIONS

3.1.1 Requirements

Conform workmanship and techniques for welded construction to the requirements of AWS D1.1/D1.1M, AWS D1.8/D1.8M and AISC 360. When AWS D1.1/D1.1M, AWS D1.8/D1.8M and the AISC 360 specification conflict, the requirements of AWS D1.1/D1.1M, AWS D1.8/D1.8M govern.

3.1.2 Identification

Identify all welds in one of the following ways:

a. Submit written records to indicate the location of welds made by each welder, welding operator, or tacker.

b. Identify all work performed by each welder, welding operator, or tacker with an assigned number, letter, or symbol to identify welds made by that individual. The Contracting Officer may require welders, welding operators, and tackers to apply their symbol next to the weld by means of rubber stamp, felt-tipped marker with waterproof ink, or other methods that do not cause an indentation in the metal. Place the identification mark for seam welds adjacent to the weld at 3 foot intervals. Identification with die stamps or electric etchers is not allowed.

3.2 QUALITY CONTROL

Perform testing using an approved inspection or testing laboratory or technical consultant; or if approved, the Contractor's inspection and testing personnel may be used instead of the commercial inspection or testing laboratory or technical consultant. Perform visual and ultrasonic, magnetic particle, or liquid penetrant, dye penetrant inspections to determine conformance with paragraph STANDARDS OF ACCEPTANCE. Conform procedures and techniques for inspection with applicable requirements of AWS D1.1/D1.1M, AWS D1.8/D1.8M, ASTM E165/E165M, and ASTM E709. Submit a Welding Quality Assurance Plan and records of tests and inspections.

3.3 STANDARDS OF ACCEPTANCE

Conform dimensional tolerances for welded construction, details of welds, and quality of welds with the applicable requirements of AWS D1.1/D1.1M, AWS D1.8/D1.8M and the contract drawings. Perform nondestructive testing by visual inspection and ultrasonic, magnetic particle, or dye penetrant methods. The minimum extent of nondestructive testing must be as required by ICC IBC. Submit all records of nondestructive testing.

3.3.1 Nondestructive Testing

The welding is subject to inspection and tests in the mill, shop, and field. Inspection and tests in the mill or shop do not relieve the Contractor of the responsibility to furnish weldments of satisfactory quality. When materials or workmanship do not conform to the specification requirements, the Government reserves the right to reject material or workmanship or both at any time before final acceptance of the structure containing the weldment. Any indication of a defect is regarded as a defect, unless re-evaluation by nondestructive methods or by surface conditioning shows that no unacceptable defect is present. Submit all records of nondestructive testing in accordance with paragraph STANDARDS OF ACCEPTANCE.

3.3.2 Destructive Tests

Make all repairs when metallographic specimens are removed from any part of a structure. Employ only qualified welders or welding operators, and use the proper joints and welding procedures, including peening or heat treatment if required, to develop the full strength of the members and joints cut and to relieve residual stress.

3.4 GOVERNMENT INSPECTION AND TESTING

In addition to the inspection and tests performed by the Contractor for quality control, the Government will perform inspection and testing for acceptance to the extent determined by the Contracting Officer. The costs of such inspection and testing will be borne by the Contractor if unsatisfactory welds are discovered, or by the Government if the welds are satisfactory. The work may be performed by the Government's own forces or under a separate contract for inspection and testing. The Government reserves the right to perform supplemental nondestructive and destructive tests to determine compliance with paragraph STANDARDS OF ACCEPTANCE.

3.5 CORRECTIONS AND REPAIRS

If inspection or testing indicates defects in the weld joints, repair defective welds using a qualified welder or welding operator as applicable. Conduct corrections in accordance with the requirements of AWS D1.1/D1.1M, AWS D1.8/D1.8M and the specifications. Repair all defects in accordance with the approved procedures. Repair defects discovered between passes before additional weld material is deposited. Wherever a defect is removed and repair by welding is not required, blend the affected area into the surrounding surface to eliminate sharp notches, crevices, or corners. After a defect is thought to have been removed, and before re-welding, examine the area by suitable methods to ensure that the defect has been eliminated. Repaired welds must meet the inspection requirements for the original welds.

-- End of Section --

SECTION 05 12 00

STRUCTURAL STEEL
05/14

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.

AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)

ACI 318	(2014; Errata 1-2 2014; Errata 3-5 2015; Errata 6 2016) Building Code Requirements for Structural Concrete and Commentary

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 201	(2006) AISC Certification Program for Structural Steel Fabricators
AISC 303	(2010) Code of Standard Practice for Steel Buildings and Bridges
AISC 325	(2011) Steel Construction Manual
AISC 326	(2009) Detailing for Steel Construction
AISC 341	(2010) Seismic Provisions for Structural Steel Buildings
AISC 360	(2010) Specification for Structural Steel Buildings

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(2012) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS D1.1/D1.1M	(2015; Errata 2015) Structural Welding Code - Steel
AWS D1.8/D1.8M	(2009) Structural Welding Code—Seismic Supplement

ASTM INTERNATIONAL (ASTM)

ASTM A108	(2013) Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A143/A143M	(2007; R 2014) Standard Practice for

	Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
ASTM A325	(2014) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A490	(2014a) Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
ASTM A500/A500M	(2013) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A563	(2007a; R2014) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A572/A572M	(2015) Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A6/A6M	(2014) Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A615/A615M	(2015a; E 2015) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A780/A780M	(2009) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A992/A992M	(2011) Standard Specification for Structural Steel Shapes
ASTM B695	(2004; R 2009) Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
ASTM C1107/C1107M	(2014) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C827/C827M	(2010) Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures
ASTM E164	(2013) Ultrasonic Contact Examination of

	Weldments
ASTM E165	(2009) Standard Test Method for Liquid Penetrant Examination
ASTM E709	(2014) Standard Guide for Magnetic Particle Examination
ASTM E94	(2004; R 2010) Radiographic Examination
ASTM F1554	(2007a; E 2011) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
ASTM F1852	(2014) Standard Specification for "Twist Off" Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM F2329	(2013) Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners
ASTM F436	(2011) Hardened Steel Washers
ASTM F844	(2007a; R 2013) Washers, Steel, Plain (Flat), Unhardened for General Use
ASTM F959	(2013) Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PA 1	(2000; E 2004) Shop, Field, and Maintenance Painting of Steel
SSPC Paint 20	(2002; E 2004) Zinc-Rich Primers (Type I, Inorganic, and Type II, Organic)
SSPC Paint 29	(2002; E 2004) Zinc Dust Sacrificial Primer, Performance-Based
SSPC SP 3	(1982; E 2004) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-301-01	(2013; Change 1) Structural Engineering
UFC 3-310-04	(2013) Seismic Design for Buildings

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

29 CFR 1926.756	Steel Erection; Beams and Columns

1.2 1.3 PERFORMANCE REQUIREMENTS

a. Connections: Provide details of connections as outlined below:

1. Shop and field connections shall be bolted using high strength bolts (3/4 inch diameter bearing type) or by welding, unless otherwise noted or indicated. Connections listed below shall be used unless otherwise noted on Drawings. Connections shall be double angle (3x3x5/16 minimum) framed connections with a minimum number of rows of bolts as follows:

W36 - 10 rows
W33 - 9 rows
W30 - 8 rows
W27 - 7 rows
W24 - 6 rows
W21 - 5 rows
W18 & W16 - 4 rows
W14 & W12 - 3 rows
W10 & W8 - 2 rows
W6 - 1 row

2. Connections other than standard bolted framed connections shall be equivalent in capacity to those listed above. If for any reason, the capacity of the connection is reduced by beam copes, eccentricities or other modifications required for constructability, the capacity of the entire connection including the member shall be calculated. The following criteria shall be checked:

(a) Non-composite beams: Check against a reaction calculated using 60 percent of the total maximum uniform load as indicated in Table 3-6 Maximum Total Uniform Load in the AISC Steel Construction Manual (13th Edition) for the span of the member.
(b) Non-composite girders: Check against a reaction calculated using 75 percent of the total maximum uniform load as indicated in Table 3-6 Maximum Total Uniform Load in the AISC Steel Construction Manual (13th Edition) for the span of the member.
(c) Composite beams and girders: Check against a reaction calculated using 100 percent of the total maximum uniform load as indicated in Table 3-6 Maximum Total Uniform Load in the AISC Steel Construction Manual (13th Edition) for the span of the member.
(d) Where it is impractical to meet the capacities listed above, clearly indicate the connection capacity on the shop drawing piece detail for the Architect's review and approval.

3. Where connections are indicated on the Contract Drawings, no deviation from the type and method thereof shall be made without the review of the Contracting Officer. Where final connections are not specifically indicated on the Contract Drawings, design and detail connections to properly transmit the total reactions, moments and axial forces either indicated on the Contract Drawings, or reasonably inferred from the information furnished, without exceeding the allowable unit stresses. Web stiffeners or other detail material required in beams, columns, girders and truss chords shall be provided at points of concentrated loads. The characteristics of stiffened joint details for truss panel point connections and the characteristics of truss end connection details indicated on Contract Drawings shall be considered as a guide only and the subcontractor shall be responsible

for developing, detailing and providing all connections as required for the work.

4. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural calculations for structural-steel connections.

b. Construction: Type FR, fully restrained.

1.3 SUBMITTALS

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

SD-01 Preconstruction Submittals

Erection Drawings; G

SD-02 Shop Drawings

Fabrication drawings including description of connections; G

SD-03 Product Data

Shop primer

Welding electrodes and rods

Direct Tension Indicator Washers

Non-Shrink Grout; G

Tension control bolts

SD-04 Samples

Architecturally Exposed Steel Mockup; G

SD-05 Design Data

Calculations; G

SD-06 Test Reports

Class B coating

Bolts, nuts, and washers

Weld Inspection Reports; G

Direct Tension Indicator Washer Inspection Reports

Bolt Testing Reports

Embrittlement Test Reports

SD-07 Certificates

Steel

Bolts, nuts, and washers

Galvanizing

Professional Engineer's Certification Letter; G, FIO

AISC Fabrication Plant Quality Certification; G, FIO

AISC Erector Quality Certification; G

Welding procedures and qualifications; G

Welding electrodes and rods

1.4 AISC QUALITY CERTIFICATION

a. Work must be fabricated in an AISC Certified Fabrication Plant, Category Std. Submit AISC fabrication plant quality certification.
b. Work must be erected by an AISC Certified Erector, Category CSE. Submit AISC erector quality certification.
c. Provide evidence that the structural steel fabricator has a minimum of five (5) years of experience in designing, detailing and fabricating projects constructed in the USA.
d. Provide evidence that the structural steel erector has a minimum of five (5) years of experience in the installation of structural steel for similar projects constructed in the USA.
e. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1, P2, P3, or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
f. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
g. 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. If the qualification date of the welding operator is more than one-year old, the welding operator's qualification certificate shall be accompanied by a current certificate by the welder attesting to the fact that he has been engaged in welding since the date of certification, with no break in welding service greater than 6 months.
h. Comply with applicable provisions of the following specifications and documents:

1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. AISC's "Seismic Provisions for Structural Steel Buildings" and "Supplement No. 2."
3. AISC's "Specification for Structural Steel Buildings."
4. AISC's "Specification for the Design of Steel Hollow Structural Sections."
5. AISC's "Specification for Allowable Stress Design of Single-Angle Members or Specification for Load and Resistance Factor Design of Single-Angle Members."
6. RCSC's "Specification for Structural Joints Using ASTM A325 or

ASTM A490 Bolts."

1.5 SEISMIC PROVISIONS

The structural steel system must be provided in accordance with AISC 341, Chapter J as amended by UFC 3-310-04.

1.6 QUALITY ASSURANCE

1.6.1 Preconstruction Submittals

1.6.1.1 Erection Drawings

Submit for record purposes. Indicate the sequence of erection, temporary shoring and bracing. The erection drawings must conform to AISC 303. Erection drawings must be reviewed, stamped and sealed by a registered professional engineer.

1.6.2 Fabrication Drawing Requirements

Submit fabrication drawings for approval prior to fabrication. Prepare in accordance with AISC 326 and AISC 325. Fabrication drawings shall not be reproductions of contract drawings. Double connections that require an erection seat to comply with OSHA 29 CFR 1926.756(c)(1) shall be shown on the shop drawings, reviewed and approved by the structural engineer of record. Use AWS A2.4 standard welding symbols. Shoring and temporary bracing shall be designed and sealed by a registered professional engineer and submitted for record purposes, with calculations, as part of the drawings. Member substitutions of details shown on the contract drawings shall be clearly highlighted on the fabrication drawings. Explain the reasons for any deviations from the contract drawings.

a. Indicate sizes, spacing and locations of structural members.
b. Include details of cuts, connections, splices, camber, shear studs, attachments, holes, and other pertinent data.
c. Include embedment drawings.
d. 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.
e. Provide erection details of all field welded connections.
f. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
g. Detail material required for the connection of other work such as precast plank, metal deck, exterior building skin, etc.
h. Use of the Architect's drawings as erection plans and details is not permitted. It is mandatory that the fabricator/detailer independently prepare erection drawings. Electronic files will not be provided by the Contracting Officer.
i. Professional Structural Engineer's signature and seal shall appear on all structural steel shop drawings (including erection drawings, piece drawings and connection calculations).
j. All revisions on resubmitted shop drawings shall be clouded. Non-clouded shop drawings will be rejected.

1.6.3 Calculations

Prepare and submit structural design calculations for connections meeting

the requirements of this specification. Calculations shall be signed and sealed by the Contractor's Professional Engineer responsible for their preparation. Submit calculations concurrent with accompanying shop drawings.

1.6.4 Certifications

1.6.4.1 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. If the qualification date of the welding operator is more than one-year old, the welding operator's qualification certificate must be accompanied by a current certificate by the welder attesting to the fact that he has been engaged in welding since the date of certification, with no break in welding service greater than 6 months.

Conform to all requirements specified in AWS D1.1/D1.1M and AWS D1.8/D1.8M.

1.6.5 Professional Engineer's Certification Letter

The Contractor's Professional Structural Engineer shall submit a certification letter to the Contracting Officer prior to the submission of the Shop Drawings for the structural steel. information only No shop drawings will be reviewed by the Contracting Officer prior to the submission and acceptance of this certification letter. The certification letter shall include the following:

a. Signature and seal of the registered Professional Structural Engineer (registered in the Commonwealth of Virginia).
b. Statement that all structural steel shop drawings (including erection drawings, piece drawings and connection calculations) have been prepared in accordance with the Contract Document requirements and under the direction of the Professional Structural Engineer.
c. Statement that the Professional Structural Engineer's signature and seal shall appear on all structural steel shop drawings (including erection drawings, piece drawings and connection calculations).

1.6.6 Architecturally Exposed Steel Mockup

Build mockups of architecturally exposed steel to set quality standards for fabrication and installation.

a. Build mockup of typical portion of exterior canopy framing.
b. Coordinate finish painting requirements with Division 09 painting sections.
c. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide the structural steel system, including shop primer and galvanizing, complete and ready for use. Structural steel systems including design, materials, installation, workmanship, fabrication, assembly, erection, inspection, quality control, and testing must be provided in accordance with AISC 360, AISC 341, UFC 3-301-01 and UFC 3-310-04 except as modified

in this contract.

2.2 STEEL

2.2.1 Structural Steel

Wide flange and WT shapes, ASTM A992/A992M.

Angles, Channels and Plates, ASTM A36/A36M (unless noted otherwise).

Base plates, web plates, column cap plates, gusset plates, lateral moment plates, splice plates, and web doubler plates - ASTM A572/A572M, Gr. 50.

2.2.2 Structural Steel Tubing

ASTM A500/A500M, Grade B.

2.2.3 Steel Pipe

ASTM A53/A53M, Type E or S, Grade B, weight class STD (Standard).

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

2.3.1.1 Bolts

ASTM A325, Type 1 ASTM A490, Type 1 or 2.

2.3.1.2 Nuts

ASTM A563, Grade and Style as specified in the applicable ASTM bolt standard.

2.3.1.3 Direct Tension Indicator Washers

ASTM F959. Provide ASTM B695, Class 50, Type 1 galvanizing.

2.3.1.4 Washers

ASTM F436, plain carbon steel.

2.3.2 Tension Control Bolts

ASTM F1852, Type 1, heavy-hex or round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon steel nuts, and hardened carbon steel washers. Assembly finish must be plain or mechanically deposited zinc coating where indicated.

2.3.3 Foundation Anchorage

2.3.3.1 Anchor Rods

ASTM F1554, grade as indicated on drawings.

2.3.3.2 Anchor Nuts

ASTM A563, Grade A, hex style.

2.3.3.3 Anchor Washers

ASTM F844.

2.3.3.4 Anchor Plate Washers

ASTM A572/A572M, Gr. 50.

2.4 STRUCTURAL STEEL ACCESSORIES

2.4.1 Weldable Rebar Couplers

Mechanical connectors consisting of smooth, shaped, steel sleeve with converging sides. Must be compatible with ASTM A615/A615M reinforcement and meet ACI 318 strength requirement of 125% yield strength of Grade 60 deformed bars.

2.4.2 Welding Electrodes and Rods

AWS D1.1/D1.1M and AWS D1.8/D1.8M.

2.4.3 Non-Shrink Grout

ASTM C1107/C1107M, with no ASTM C827/C827M shrinkage, 5,000 psi minimum compressive strength. Grout must be nonmetallic.

2.4.4 Welded Shear Stud Connectors

ASTM A108 Grade 1015 through 1020, headed-stud type, cold finished carbon steel. AWS D1.1/D1.1M, Type B.

2.5 GALVANIZING

ASTM F2329 for threaded parts or ASTM A123/A123M for structural steel members, as applicable, unless specified otherwise galvanize after fabrication where practicable.

Galvanize structural steel members exposed to weather, excluding the exterior canopy, but including members for trash enclosures, concession buildings and mechanical equipment supports. Exterior canopy shall be painted in accordance with requirements for architecturally exposed steel.

2.6 FABRICATION

a. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Load and Resistance Factor Design Specification for Structural Steel Buildings."

1. Camber structural-steel members where indicated.
2. Identify high-strength structural steel according to ASTM A6/A6M and maintain markings until structural steel has been erected.
3. Mark and match-mark materials for field assembly.
4. Complete structural-steel assemblies, including welding of units, before starting shop priming operations.

b. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

c. Bolt Holes: Cut, drill or punch standard bolt holes perpendicular to metal surfaces.

d. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

e. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

g. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.

1. Cut, drill or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

h. For Architecturally Exposed Steel at Exterior Canopy:

1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, and roughness.
2. Grind sheared, punched, and flame-cut edges to remove burrs and provide smooth surfaces and edges.
3. Fabricate free of mill marks, including rolled trade names and stamped or raised identification.
4. Fabricate free of seams to maximum extent possible.
5. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.
6. Fabricate with piece marks fully hidden in the completed structure or made with media that permits full removal after erection.
7. Fabricate to the tolerances specified in AISC 303 for steel that is designated AESS.
8. Seal-weld open ends of hollow structural sections with 3/8-inch closure plates.
9. Field Measurements: Where indicated to fit against other construction, verify actual dimensions by field measurements before fabrication.

2.6.1 Markings

Prior to erection, members must be identified 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 Shop Primer

SSPC Paint 20 or SSPC Paint 29, (zinc rich primer). Shop prime structural steel, except as modified herein, in accordance with SSPC PA 1. Shop prime gymnasium and commons roof steel. Shop prime exterior canopy steel framing. Do not prime steel surfaces embedded in concrete, galvanized surfaces, surfaces to receive sprayed-on fireproofing, or surfaces within 0.5 inch of the toe of the welds prior to welding (except surfaces on which metal decking is to be welded). If flash rusting occurs, re-clean the surface prior to application of primer. Apply primer in accordance with endorsement "P1" for interior building framing and "P3" for exterior canopy family of AISC 201.

Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 2.0 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

Slip critical surfaces must be primed with a Class B coating in accordance with AISC 325. Submit test report for Class B coating.

Do not apply primer in foggy or rainy weather; when the ambient temperature is below 45 degrees F or over 95 degrees F; or when the primer may be exposed to temperatures below 40 degrees F within 48 hours after application, unless approved otherwise by the Contracting Officer. Repair damaged primed surfaces with an additional coat of primer. Primer must be compatible with finish paint system. See Division 09 for more information.

2.6.2.1 Cleaning

SSPC SP 6/NACE No.3 or SSPC SP 3 when recommended by the shop primer manufacturer. Maintain steel surfaces free from rust, dirt, oil, grease, and other contaminants through final assembly.

2.6.3 Fireproofing Coated Surfaces

Surfaces to receive sprayed-on fireproofing coatings must be cleaned and prepared in accordance with the manufacturer's recommendations, and as specified in Section 07 81 00 SPRAY-APPLIED FIREPROOFING.

2.7 DRAINAGE HOLES

Adequate drainage holes must be drilled to eliminate water traps. Hole diameter must be 1/2 inch and location must be indicated on the detail drawings. Hole size and location must not affect the structural integrity.

PART 3 EXECUTION

3.1 ERECTION

a. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Load and Resistance Factor Design Specification for Structural Steel Buildings."

b. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of base plate.
3. Pretension anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

c. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

d. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

e. Splice members only where indicated on structural drawings.

f. Remove erection bolts, seats and/or lifting pads on exposed structural steel; fill any open holes with plug welds; and grind smooth at exposed surfaces.

g. Do not use thermal cutting during erection.

h. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts only after approval by Architect.

i. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

j. All shims or combinations of shims resulting in a thickness greater than 1/4 inch shall be welded to one another and to the base material.

Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports only after all final connections of structural steel and metal deck have been completed, and concrete slabs have been installed and achieved full design strength. The Contractor is responsible for the

stability of the structure until these conditions have been met.

3.1.1 STORAGE

Material must be stored out of contact with the ground in such manner and location as will minimize corrosion, distortion or deterioration.

3.2 CONNECTIONS

Except as modified in this section, connections not detailed must be designed 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 High-Strength Bolts

Install high-strength bolts or tension control bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts" for type of bolt and type of joint specified. Bolts shall be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, pretensioned and/or slip critical bolts shall then be fully tensioned, progressing from the most rigid part of a connection to the free edges.

Joint Type:

1. Snug tightened at simple beam to girder infill framing connections.
2. Pretensioned at all beam, girder, and truss to column connections, unless noted otherwise.
3. Slip critical:

    (a) Braced frame connections, including column splices.
    (b) Connection of truss members and splices.

3.2.1.1 Installation of Direct Tension Indicator Washers (DTIW)

Where possible, the DTIW must be installed under the bolt head and the nut must be tightened. 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 A490 bolts are used.

3.3 GAS CUTTING

Use of gas-cutting torch in the field for correcting fabrication errors will not be 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 and AWS D1.8/D1.8M. Grind exposed welds smooth as indicated. 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. Prequalified procedures may be submitted for information only; however, procedures that are not prequalified must be submitted for approval.

For Architecturally Exposed Steel at Exterior Canopy:

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding specified tolerances.
2. Use weld sizes, fabrication sequence, and equipment that limit distortions to allowable tolerances.
3. Provide continuous welds of uniform size and profile.
4. Grind butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16 inch, minus 0 inch for AESS.
5. Remove backing bars or runoff tabs; back-gouge and grind steel smooth.
6. At locations where welding on the far side of an exposed connection occurs, grind distortions and marking of the steel to a smooth profile aligned with adjacent material.
7. Make fillet welds oversize and grind to uniform profile with smooth face and transition.

3.4.1 Removal of Temporary Welds, Run-Off Plates, and Backing Strips

Remove only from finished areas.

Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports only after all final connections of structural steel and metal deck have been completed, and concrete slabs have been installed and achieved full design strength. The Contractor is responsible for the stability of the structure until these conditions have been met.

3.5 SHOP PRIMING

Repair shop primer in accordance with the paint manufacturer's recommendation for surfaces damaged by handling, transporting, cutting, welding, or bolting.

3.5.1 Field Priming

Steel located in building areas without HVAC for control of relative humidity must be field primed. After erection, the field bolt heads and nuts, field welds, and any abrasions in the shop coat must be cleaned and primed with paint of the same quality as that used for the shop coat.

3.5.2 Field Painting

Refer to Division 09. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

3.6 GALVANIZING REPAIR

Repair damage to galvanized coatings using ASTM A780/A780M zinc rich paint for galvanizing damaged by handling, transporting, cutting, welding, or bolting. Do not heat surfaces to which repair paint has been applied.

3.7 FIELD QUALITY CONTROL

Testing Agency: Contractor shall engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

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. The Contracting Officer must be notified in writing of defective welds, bolts, nuts, and washers within 7 working days of the date of the inspection.

Architect will observe Architecturally Exposed Steel at Exterior Canopy in place to determine acceptability relating to aesthetic effect.

3.7.1 Welds

3.7.1.1 Visual Inspection

AWS D1.1/D1.1M. Furnish the services of AWS-certified welding inspectors for fabrication and erection inspection and testing and verification inspections.

The Testing Agency's Independent Welding Inspector shall inspect proper preparation, size, gaging location, and acceptability of welds; identification marking; operation and current characteristics of welding sets in use.

3.7.1.2 Nondestructive Testing

Nondestructive testing must be in accordance with AWS D1.1/D1.1M and AWS D1.8/D1.8M. Test locations shall be selected by the Contracting Officer or Testing Agency's Independent Welding Inspector. If more than 20 percent of welds made by a welder contain defects identified by testing, then all welds made by that welder must be tested by ultrasonic testing, as approved by the Contracting Officer. When all welds made by an individual welder are required to be tested, magnetic particle testing must be used only in areas inaccessible to ultrasonic testing. Retest defective areas after repair. Submit weld inspection reports.

Testing Procedures: Provide the following types of testing as determined by the Independent Welding Inspector:

<u>Test Type</u>

Radiographic (ASTM E94)

Ultrasonic (ASTM E164)

Magnetic Particle (ASTM E709)

Dye Penetrant (ASTM E165)

3.7.2 Direct Tension Indicator Washers

3.7.2.1 Direct Tension Indicator Washer Compression

Direct tension indicator washers must be tested in place to verify that they have been compressed sufficiently to provide the 0.015 inch gap when

the direct tension indicator washer is placed under the bolt head and the nut is tightened, and to provide the 0.005 inch gap when the direct tension indicator washer is placed under the turned element, as required by ASTM F959. Submit direct tension indicator washer inspection reports.

3.7.3 High-Strength Bolts

3.7.3.1 Testing Bolt, Nut, and Washer Assemblies

Test a minimum of 3 bolt, nut, and washer assemblies from each mill certificate batch in a tension measuring device at the job site prior to the beginning of bolting start-up. Demonstrate that the bolts and nuts, when used together, can develop tension not less than the provisions specified in AISC 360, depending on bolt size and grade. The bolt tension must be developed by tightening the nut. A representative of the manufacturer or supplier must be present to ensure that the fasteners are properly used, and to demonstrate that the fastener assemblies supplied satisfy the specified requirements. Submit bolt testing reports.

3.7.3.2 Inspection

Inspection procedures must be in accordance with AISC 360. Confirm and report to the Contracting Officer that the materials meet the project specification and that they are properly stored. Confirm that the faying surfaces have been properly prepared before the connections are assembled. Observe the specified job site testing and calibration, and confirm that the procedure to be used provides the required tension. Monitor the work to ensure the testing procedures are routinely followed on joints that are specified to be fully tensioned.

Inspection by the Independent Testing Agency will include calibration of torque wrenches for high-strength bolts.

3.7.3.3 Testing

The Testing Agency or Government has the option to perform nondestructive tests of the installed bolts to verify compliance with pre-load bolt tension requirements. Provide the required access 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 shall be selected by the Contracting Officer. If more than 10 percent of the bolts tested contain defects identified by testing, then all bolts used from the batch from which the tested bolts were taken, must be tested at the Contractor's expense. Retest new bolts after installation at the Contractor's expense.

3.7.4 Shear Stud Connectors

In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1 for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

3.7.5 Testing for Embrittlement

ASTM A143/A143M for steel products hot-dip galvanized after fabrication. Submit embrittlement test reports.

3.8 DEFICIENCIES

Correct deficiencies in work that test reports and inspections indicate do not comply with Contract Documents.

-- End of Section --

SECTION 05 21 00

STEEL JOIST FRAMING
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	(2015; Errata 2015) Structural Welding Code - Steel

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2012) International Building Code

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PA 1	(2000; E 2004) Shop, Field, and Maintenance Painting of Steel
SSPC Paint 15	(1999; E 2004) Steel Joist Shop Primer
SSPC SP 2	(1982; E 2000; E 2004) Hand Tool Cleaning

STEEL JOIST INSTITUTE (SJI)

SJI LOAD TABLES	(2005; Errata 1 2006; Errata 2 2007; Errata 3 2007) 42nd Edition Catalog of Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders
SJI MANUAL	(2009) 80 Years of Open Web Steel Joist Construction

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

29 CFR 1926	Safety and Health Regulations for Construction
29 CFR 1926.757	Steel Erection; Open Web Steel Joists

1.2 SUBMITTALS

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

SD-01 Preconstruction Submittals

Welder Qualification; G

SD-02 Shop Drawings

Steel Joist Framing; G

SD-05 Design Data

Design Calculations; G, FIO

SD-06 Test Reports

Inspection Reports; G

SD-07 Certificates

Certification of Compliance
Engineer's Certification Letter; G, FIO

SD-11 Closeout Submittals

Engineer's Closeout Certification Letter; G, FIO
Recycled Content of Steel Products; S

1.3 QUALITY ASSURANCE

Perform all work in compliance with the requirements set forth in 29 CFR 1926.

1.3.1 Engineer's Certification Letter

The Manufacturer's Professional Structural Engineer shall submit a certification letter to the Contracting Officer prior to the submission of the Shop Drawings for steel joist framing. No shop drawings will be reviewed by the Contracting Officer prior to the submission and acceptance of this certification letter. The certification letter shall include the following:

a. Signature and seal of the registered Professional Structural Engineer (registered in the State in which the work is being performed).

b. Statement that the Professional Structural Engineer is fully experienced in the design of steel joist framing systems.

c. Statement that all steel joist framing shop drawings (including all supports, connections and components) have been prepared in accordance with the Contract Document requirements and applicable building codes and under the direction of the Professional Structural Engineer.

d. Statement that the Professional Structural Engineer's signature and seal shall appear on all steel joist framing shop drawings (including all supports, connections and components).

1.3.2 Engineer's Closeout Certification Letter

The Manufacturer's Professional Structural Engineer shall submit a letter

to the Contracting Officer stating that the fabrication and installation of the steel joist framing system has been performed in accordance with his design. This letter shall be signed and sealed by the Manufacturer's Engineer as part of "Project Closeout".

1.3.3 Drawing Requirements

Show layout, designation, number, type, location, and spacings of joists. Include joining and anchorage details, bracing, bridging, joist accessories; splice and connection locations and details; and attachments to other construction.

a. Indicate locations and details of bearing plates to be embedded in other construction.

b. Detail material required for the connection of other work such as metal deck, exterior building skin, etc.

c. Use of the Contract drawings as erection plans and details is not permitted. It is mandatory that the fabricator/detailer independently prepare erection drawings. Electronic files will not be provided by the Contracting Officer.

1.3.4 Design Calculations

All design calculations (which shall bear the seal and signature of the Contractor's Professional Structural Engineer), indicating compliance with the requirements of the design criteria and appropriate codes shall be provided to the Contracting Officer concurrent with the submission of shop drawings for record purposes. The Contracting Officer will not approve shop drawings for fabrication without receiving design calculations.

1.3.5 Certification of Compliance

Prior to construction commencement, submit certification for welder qualification, in compliance with AWS D1.1/D1.1M, welding operation, and tacker, stating the type of welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests. Submit certification of compliance for the following:

1. SJI MANUAL

2. Steel Joist Institute Member Fabricator

3. 29 CFR 1926

4. 29 CFR 1926.757

5. Statement from steel joist manufacturer, that work was performed in accordance with approved construction documents and with SJI standard specifications, in accordance with ICC IBC Section 1704.2.5.2.

1.4 DELIVERY, STORAGE, AND HANDLING

Handle, transport, and store joists in a manner to prevent damage affecting their structural integrity. Verify piece count of all joist products upon delivery and inspect all joists products for damage. Report any damage to the joist supplier. Store all items off the ground in a well drained

location protected from the weather and easily accessible for inspection and handling. Store joists with top chord down and with joists in a vertical position. Store deep joists horizontally if they were shipped on their sides.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

2.1.1 Performance Requirements

a. Structural Performance: Provide joists and special joists and all end connections capable of withstanding design loads indicated on Contract Drawings, including gravity, lateral, and blast loading.

b. Delegated Design: Manufacturer's responsibilities include using a qualified professional engineer to prepare comprehensive structural calculations for steel joist framing members and connections, using performance requirements and design criteria indicated.

c. Design joists to withstand design loads with live load deflections no greater than the following:

(1) Roof Joists: Vertical deflection of 1/360 of the span.

Erect joist framing conforming to 29 CFR 1926.757. Secure all joist bridging and anchoring in place prior to the application of any construction loads. Distribute temporary loads so that joist capacity is not exceeded. Do not apply loads to bridging.

2.2 STEEL JOISTS

Provide steel joists conforming to SJI LOAD TABLES. Design joists designated K, KCS, LH and DLH to support the loads given in the applicable standard load tables of SJI LOAD TABLES and loads shown on contract drawings. Submit design calculations for special steel joists, non-SJI standard details, joist seat connections and field splices. Include cover letter signed and sealed by the joist manufacturer's registered design professional.

2.2.1 Steel Joist Camber

Camber joists according to SJI LOAD TABLES.

2.2.2 Special Steel Joists

Provide special joists and connections capable of withstanding the design loads indicated with a live-load deflection less than L/360 for roof joists and L/360 for floor joists.

2.2.3 Steel Joist Substitutes and Outriggers

Provide joist substitutes and outriggers conforming to SJI LOAD TABLES with steel angle or channel members.

2.3 RECYCLED CONTENT

Provide products with an average recycled content of steel products of postconsumer recycled content plus one half of preconsumer recycled content

not less than 25 percent.

2.4 ACCESSORIES AND FITTINGS

a. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

b. Fabricate steel bearing plates with integral anchorages of sizes and thicknesses indicated. Shop prime paint.

c. Steel bearing plates with integral anchorages are specified in Division 05 Section "Metal Fabrications."

d. Supply ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface, unless otherwise indicated.

e. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

Provide other accessories and fittings, including end supports and bridging, in accordance with the standard specifications under which the members were designed.

2.5 SHOP PAINTING

SSPC Paint 15. Shop prime joists, except as modified herein, in accordance with SSPC PA 1. Clean joists in accordance with SSPC SP 2 before priming. Do not prime joists to receive sprayed-on fireproofing. If flash rusting occurs, re-clean the surface prior to application of primer. For joists which require finish painting under Section 09 90 00 PAINTS AND COATINGS, the primer paint must be compatible with the finish paint.

PART 3 EXECUTION

3.1 ERECTION

a. Do not install joists until supporting construction is in place and secured.

b. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads have been applied.

c. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply

with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

d. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

e. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.2 BEARING PLATES

Provide bearing plates to accept full bearing after the supporting members have been plumbed and properly positioned, but prior to placing superimposed loads. The area under the plate must be damp-packed solidly with bedding mortar, except where nonshrink grout is indicated on the drawings. Provide bedding mortar and grout as specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.

3.3 PAINTING

3.3.1 Touch-Up Painting

After erection of joists, touch-up connections and areas of abraded shop coat with paint of the same type used for the shop coat.

3.3.2 Field Painting

Paint joists requiring a finish coat in conformance with the requirements of Section 09 90 00 PAINTS AND COATINGS.

3.4 INSPECTION REPORTS

Contractor shall hire an Independent Testing Agency to inspect field welds and bolted connections in accordance with IBC 2012. Submit inspections results.

3.4 DEFICIENCIES

Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.

-- End of Section --

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 IRON AND STEEL INSTITUTE (AISI)

AISI D100	(1991; R 2008) Cold-Formed Steel Design Manual

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2010; Errata 2011) Structural Welding Code - Steel
AWS D1.3/D1.3M	(2008; Errata 2008) Structural Welding Code - Sheet Steel

ASTM INTERNATIONAL (ASTM)

ASTM A1008/A1008M	(2015) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened
ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A653/A653M	(2013) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A780/A780M	(2009) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A792/A792M	(2010) Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
ASTM C423	(2009a) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

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 D746	(2014) Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide http://www.approvalguide.com/
FM DS 1-28R	(1998) Data Sheet: Roof Systems

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 20	(2002; E 2004) Zinc-Rich Primers (Type I, Inorganic, and Type II, Organic)

STEEL DECK INSTITUTE (SDI)

ANSI/SDI C	(2011; Int 1 2012; Errata 1 2012) Standard for Composite Steel Floor Deck - Slabs
ANSI/SDI NC	(2010) Standard for Non-Composite Steel Floor Deck
ANSI/SDI QA/QC	(2011) Standard for Quality Control and Quality Assurance for Installation of Steel Deck
ANSI/SDI RD	(2010) Standard for Steel Roof Deck
SDI DDMO3	(2004; Errata 2006; Add 2006) Diaphragm Design Manual; 3rd Edition
SDI MOC2	(2006) Manual of Construction with Steel Deck

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-301-01	(2013; Change 1) Structural Engineering

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

29 CFR 1926	Safety and Health Regulations for Construction

UNDERWRITERS LABORATORIES (UL)

UL 209	(2011) Cellular Metal Floor Raceways and Fittings
UL 580	(2006; Reprint Oct 2013) Tests for Uplift Resistance of Roof Assemblies
UL Fire Resistance	(2014) Fire Resistance Directory

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Fabrication Drawings; G

SD-03 Product Data

Accessories

Deck Units; G

Galvanizing Repair Paint

Mechanical Fasteners; G

Touch-up Paint; G

Sound Absorbing Material; G

Welding Equipment

Welding Rods and Accessories

SD-04 Samples

Metal Roof Deck

Flexible Closure Strips

Acoustical Material

SD-05 Design Data

Deck Units; G

Submit manufacturer's design calculations, or applicable published literature for the structural properties of the proposed deck units.

SD-07 Certificates

Powder-Actuated Tool Operator; G

Welder Qualifications; G

Welding Procedures; G

Fire Safety

Wind Storm Resistance; G

Manufacturer's Certificate; G

Professional Engineer's Certification Letter; G

Product Certificates; G

Stud Manufacturer's Certification; G

Stud Manufacturer's Test Reports; G

SD-11 Closeout Submittals

Recycled Content of Steel Products; S

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 certificate 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. Test specimens shall be made in the presence of Contracting Officer and shall be tested by an approved testing laboratory at the Contractor's expense. 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 Professional Engineer's Certification Letter

The Contractor's Professional Structural Engineer shall submit a certification letter to the Contracting Officer prior to the submission of the Shop Drawings for the steel deck. No shop drawings will be reviewed by the Contracting Officer prior to the submission and acceptance of this

certification letter. The certification letter shall include the following:

a. Signature and seal of the registered Professional Structural Engineer (registered in the State in which the work is being performed).
b. Statement that all steel deck shop drawings (including all connections, components, openings, spans and capacities) have been prepared in accordance with the Contract Document requirements and under the direction of the Professional Structural Engineer.
c. Statement that the Professional Structural Engineer's signature and seal shall appear on all steel deck shop drawings (including all connections, components, openings, spans and capacities).

1.3.5 Qualification Data

a. Provide evidence that the structural steel fabricator has a minimum of five (5) years of experience in designing, detailing and fabricating projects constructed in the USA.
b. Provide evidence that the structural steel erector has a minimum of five (5) years of experience in the installation of structural steel for similar projects constructed in the USA.

1.3.6 LEED Certification

a. The contractor shall submit invoices and documentation to the Contracting Officer from the steel decking and forms manufacturer, indicating that all steel decking and forms contain a minimum of 90 percent recycled material (75 percent post consumer steel) prior to the submission of shop drawings. No shop drawings will be reviewed by the Contracting Officer prior to the submission and acceptance of such documentation.
b. The contractor shall submit a letter and documentation stating that a minimum of 80 percent or higher of all steel decking and forms will be manufactured within 500 miles of the project site. No shop drawings will be reviewed by the Contracting Officer prior to the submission of and acceptance of this letter and documentation.

1.3.7 Regulatory Requirements

1.3.7.1 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.

1.3.7.1.1 Product Certificates

Stating that each type of steel deck meets UL design certification number for fire ratings, and compliance with Factory Mutual requirements.

1.3.7.2 Wind Storm Resistance

Provide roof construction assembly meeting the following minimum wind rating for uplift when tested in accordance with the uplift pressure test described in the FM DS 1-28R or as described in UL 580 and in general compliance with UFC 3-301-01.

1 - 60 for main roof field area

1 - 90 for roof perimeter area
1 - 120 for roof corner area

1.3.8 Fabrication Drawings

a. 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.

b. All revisions on resubmitted shop drawings shall be clouded. Non-clouded shop drawings will be rejected.

c. Professional Structural Engineer's signature and seal shall appear on all steel deck shop drawings.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver deck units to the site in a dry and undamaged condition. Store and handle steel deck in a manner to protect it from corrosion, deformation, and other types of damage. Do not use decking for storage or as working platform until units have been fastened into position. Exercise care not to damage material or overload decking during construction. The maximum uniform distributed storage load must not exceed the design live load. Stack decking on platforms or pallets and cover with weathertight ventilated covering. Elevate one end during storage to provide drainage. Maintain deck finish at all times to prevent formation of rust. Repair deck finish using touch-up paint. Replace damaged material.

1.5 TESTING AND INSPECTION

The Contractor shall hire a qualified Third Party Inspection Agency who will perform all field tests and inspections in connection with installation of steel decking and forms. Testing and Inspections shall be performed under the direction of a Licensed Professional Engineer, registered in the State in which the work is being performed. Testing agency will report inspection results promptly and in writing to Contractor and Contracting Officer.

The inspection shall consist of:

a. Visual checking of the installation and field welding or fastening of the steel deck and forms to the supporting structural steel framing including bearing plates, angles, and other miscellaneous supports and closures.
b. Visual checking of the installation and attachment of metal screeds, forms and closure plates

1.6 DESIGN REQUIREMENTS FOR ROOF DECKS

1.6.1 Properties of Sections

Properties of metal roof deck sections must comply with engineering design width as limited by the provisions of AISI D100.

1.6.2 Allowable Loads

Indicate total uniform dead and live load for detailing purposes.

PART 2 PRODUCTS

2.1 DECK UNITS

Submit manufacturer's design calculations, or applicable published literature for the structural properties of the proposed deck units.

Recycled content of steel products: provide products with an average recycled content of steel products so postconsumer recycled content plus one half of preconsumer recycled content not less than 25 percent.

2.1.1 Roof Deck

Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:

a. Galvanized and Shop-Primed Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.

1. Color: Gray top surface with white underside.

b. Roof Deck Types:

1. 1 1/2 inch galvanized steel roof deck, 20 gauge, Type B. Maximum span: 6 feet-6 inches center to center of support to meet FM Global guidelines.
2. Minimum Properties: $Ip = 0.20 in^4$; $Sp = 0.23\ in^3$; $Sn = 0.24\ in^3$

c. Span Condition: Double span or more.

d. Side Laps: Overlapped.

Conform to ASTM A792/A792M or ASTM A1008/A1008M for deck used in conjunction with insulation and built-up roofing.

2.1.2 Acoustical Roof Deck

a. Acoustical Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:

1. Galvanized and Shop-Primed Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.

(a) Color: Gray top surface with white underside.

2. Acoustic Roof Deck Types: 1-1/2 inch galvanized cellular acoustic steel roof deck with bottom plate, 20/20 gauge, Type BCAS Cellular Acoustic.
3. Span Condition: Double span or more.
4. Side Laps: Overlapped.

5. Acoustical Perforations: Cellular deck units with manufacturer's standard perforated flat-bottom plate welded to ribbed deck.
6. Sound-Absorbing Insulation: Manufacturer's standard premolded roll or strip of glass or mineral fiber.

(a) Factory install sound-absorbing insulation into cells of cellular deck.
(b) Installation of sound-absorbing insulation is specified in Division 07.

7. Acoustical Performance: NRC 0.70 tested according to ASTM C423

2.1.3 Composite Floor Deck

Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 30, with the minimum section properties indicated, and with the following:

a. Composite Floor Deck Types

1. 2 inch galvanized composite steel deck, 18 gauge.
Minimum properties: Ip = 0.517 in4; Sp = 0.480 in3; Sn = 0.483 in3.
2. 2 inch galvanized composite steel deck, 20 gauge.
Minimum properties: Ip = 0.390 in^4; Sp = 0.332 in^3; Sn = 0.345 in^3

b. Span Condition: Double span or more.

Conform to ASTM A653/A653M or ASTM A1008/A1008M for composite deck assembly.

2.1.4 Shop Priming

Shop prime accessories and underside of exposed deck at the factory after coating. Clean surfaces in accordance with the manufacturer's standard procedure followed by a spray, dip or roller coat of rust-inhibitive primer, oven cured.

2.1.5 Touch-Up Paint

Provide a high zinc-dust content paint for regalvanizing welds in galvanized steel conforming to ASTM A780/A780M.

Provide touch-up paint for shop-painted units of the same type used for the shop painting, and touch-up paint for zinc-coated units of an approved galvanizing repair paint with a high-zinc dust content. Touch-up welds with paint conforming to SSPC Paint 20 in accordance with ASTM A780/A780M. Maintain finish of deck units and accessories by using touch-up paint whenever necessary to prevent the formation of rust.

2.2 ACCESSORIES

Provide accessories of same material as deck, unless specified otherwise. Provide manufacturer's standard type accessories, as specified.

2.2.1 Adjusting Plates

Provide adjusting plates, or segments of deck units, of same thickness and

configuration as deck units in locations too narrow to accommodate full size units. Provide factory cut plates of predetermined size where possible.

2.2.2 End Closures

Fabricated of sheet metal by the deck manufacturer. Provide end closures minimum 0.0295 inch thick to close open ends at exposed edges of floors, parapets, end walls, eaves, and openings through deck.

2.2.3 Partition Closures

Provide closures for closing voids above interior walls and partitions that are perpendicular to the direction of the configurations. Provide rubber, plastic, or sheet steel closures above typical partitions. Provide minimum one inch thick soft composition rubber closures above walls and partitions contiguous to acoustical steel deck. Provide sheet steel closures above fire-resistant interior walls and partitions located on both sides of wall or partition. Provide glass fiber blanket insulation in the space between pairs of closures at acoustical partitions.

2.2.4 Flexible Closure Strips for Roof Decks

Provide strips made of vulcanized, closed-cell, synthetic rubber material specified and premolded to the configuration required to provide tight-fitting closures at open ends and sides of steel roof decking.

Conforming to ASTM D1056, Grade 2A1, with the following additional properties:

Brittleness temperature of minus 40 degrees F when tested in accordance with ASTM D746.

Flammability resistance with a flame spread rating of less than 25 when tested in accordance with ASTM E84.

Resistance to ozone must be "no cracks" after exposure of a sample kept under a surface tensile strain of 25 percent to an ozone concentration of 100 parts per million of air by volume in air for 100 hours at 104 degrees F and tested in accordance with ASTM D1149.

Provide a elastomeric type adhesive as recommended by the manufacturer of the flexible closure strips.

2.2.5 Closure Plates for Composite Deck

Steel sheet, minimum yield strength of 33,000 psi and minimum 16 gauge, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth.

Support and retain concrete at each floor level. Provide edge closures at all edges of the slab of sufficient strength and stiffness to support the wet concrete. Provide metal closures for all openings in composite steel deck 1/4 inch and over.

2.2.6 Sheet Metal Collar

Where deck is cut for passage of pipes, ducts, columns, etc., and deck is to remain exposed, provide a neatly cut sheet metal collar to cover edges

of deck. Do not cut deck until after installation of supplemental supports.

2.2.7 Cover Plates

Sheet metal to close panel edge and end conditions, and where panels change direction or butt. Polyethylene-coated, self-adhesive, 2 inch wide joint tape may be provided in lieu of cover plates on flat-surfaced decking butt joints.

Fabricate cover plates for abutting floor deck units from the specified structural-quality steel sheets not less than nominal 18 gagethick before galvanizing. Provide 6 inch wide cover plates and form to match the contour of the floor deck units.

2.2.8 Roof Sump Pans

Sump pans must be provided for roof drains and must be minimum 0.075 inch thick steel, recessed type. Shape sump pans to meet roof slope by the supplier or by a sheet metal specialist. Provide bearing flanges of sump pans to overlap steel deck a minimum of 3 inch. Shape, size, and reinforce the opening in bottom of the sump pan to receive roof drain.

2.2.9 Column Closures

Sheet metal, minimum 0.0358 inch thick or metal rib lath.

2.2.10 Access Hole Covers

Sheet metal, minimum 0.0474 inch thick.

2.2.11 Hanger

Provide clips or loops for 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.

e. Do not support utilities, ducts or light fixtures from roof deck.

2.2.12 Shear Connectors

Provide shear connectors in accordance with AWS D1.1/D1.1M headed stud Type B. Submit stud manufacturer's certification that the studs delivered conform to the material requirements. Submit stud manufacturer's test reports for the last completed in-plant quality control mechanical tests.

2.2.13 Cant Strips for Roof Decks

Fabricate cant strips from the specified commercial-quality steel sheets not less than nominal 0.0358 inch thick before galvanizing. Bend strips to

form a 45-degree cant not less than 5 inch wide, with top and bottom flanges a minimum 3 inch wide. Length of strips 10 feet.

2.2.14 Ridge and Valley Plates for Roof Decks

Fabricate plates from the specified structural-quality steel sheets, not less than nominal 0.0358 inch thick before galvanizing. Provide plates of minimum 4-1/2 inch wide and bent to provide tight fitting closures at ridges and valleys. Provide a minimum length of ridge and valley plates of 10 feet.

2.2.15 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.

2.2.16 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.

2.2.17 Sound Absorbing Material

Provide glass fiber in roll or premolded form for acoustical noncellular steel roof deck and glass fiber rigid strip for acoustical cellular steel deck in accordance with the manufacturer's standards. Provide a sample of acoustical material to be used.

2.2.18 Mechanical Fasteners

Corrosion-resistant, low velocity powder actuated or pneumatically driven fasteners; or self-drilling, self-threading screws for anchoring the deck to structural supports and adjoining units that are designed to meet the loads indicated. Provide positive locking-type fasteners listed by the Steel Deck Institute and ICC-ES, as approved by the Contracting Officer. All fasteners shall be driven flush and at 90 degrees to the metal deck support substrate.

2.2.19 Side Lap Fasteners

Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

2.2.20 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 C, ANSI/SDI NC, ANSI/SDI RD, SDI DDMO3 and approved shop drawings. Place units on structural supports with a minimum bearing of 2 inches. Properly adjust, level, and align 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. 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 light fixtures, ducts, utilities, or other loads by steel deck unless indicated. Distribute loads by appropriate means to prevent damage. Prepare shoring in position before concrete placement begins in composite deck. Mesh decking panels accurately and place in accordance with UL 209. Neatly fit acoustical material into the rib voids of acoustic roof deck. Take total responsibility to verify that the deck will support wet concrete loads and construction loads on the decking during and after installation. Provide, at no additional cost, any and all shoring required during concrete pouring and for other purposes consistent with concrete construction methods employed.

3.2.1 Attachment

a. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated as follows:

(1) Weld diameter: 3/4 inch nominal.
(2) Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches apart in the field of roof and 6 inches apart in roof corners and perimeter, based on roof-area definitions in FMG Loss Prevention Data Sheet 1-28.

b. Side-Lap Fastening: Fasten side laps of panels between supports with self-drilling, No. 10 diameter or larger, carbon-steel screws, at intervals not exceeding 12 inches.

c. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions. Fasteners shall have equivalent or greater working capacity than 5/8 inch diameter puddle welds for floor decks and 3/4 inch diameter for roof decks.

d. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 2 inches on steel members or 3 inches on masonry, with end joints as follows:

(1) End Joints: Lapped 2 inches minimum.

e. Ceilings, light fixtures, ducts or other utilities shall not be supported by roof deck.

f. Refer to Typical Details on Contract Documents for additional attachment requirements.

Floor-Deck Installation

a. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

(1) Weld Diameter: 5/8 inch, nominal
(2) Weld Spacing: Weld edge ribs of panels at each support. Space additional welds a maximum of 12 inches apart.

b. Side-Lap Fastening: Fasten side laps of panels between supports with self-drilling, No. 10 diameter or larger, carbon-steel screws, at intervals not exceeding 12 inches.

c. Perimeter Edge Fastening: Fasten perimeter edges of panels as follows:

(1) Weld or fasten the edge rib of decking or forms which are spanning parallel to spandrel beams and beams around stair, mechanical, and elevator shafts at 9 inch centers.
(2) Weld or fasten each rib of decking which are supported by spandrel beams and beams around stair, mechanical, escalator and elevator.

d. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions. Fasteners shall have equivalent or greater working capacity than 5/8 inch diameter puddle welds for floor decks and 3/4 inch diameter for roof decks.

e. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 2 inches on steel members or 3 inches on masonry, with end joints as follows:

(1) End Joints: Butted.

f. Pipes over 3 inches in diameter, mechanical units, or any point load in excess of 100 pounds shall not be supported by floor deck, regardless of concrete thickness above deck. Ductwork, ceiling and lights may be supported off floor deck provided the attachment is designed and supplied by the respective contractor.

g. Refer to Typical Details on Contract Documents for additional attachment requirements.

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 the connections of the deck to supports. Do not use welding washers at sidelaps. Holes and similar defects will not be acceptable. Attach all partial or segments of deck units to structural supports in accordance with Section 2.5 of SDI DDMO3. Attach shear connectors as shown and welded as per AWS D1.1/D1.1M through the steel deck to the steel member.

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 or painted finish with the manufacturer's standard touch-up paint.

3.2.1.2 Mechanical Fastening

Anchor deck to structural supports and adjoining units with mechanical fasteners. Drive the powder-actuated fasteners with a low-velocity piston tool by an operator authorized by the manufacturer of the powder-actuated tool. Drive pneumatically fasteners with a low-velocity fastening tool and comply with the manufacturer's recommendations. Drive screws to properly clamp desk to supporting steel.

3.2.2 Openings

Cut or drill all holes and openings required and be coordinated with the drawings, specifications, and other trades. Reinforce holes and openings 6 to 12 inch across with 2 inch x 2 inch x 1/4 inch steel angles at least 12 inches wider and longer than the opening and be fastened to the steel deck at each end and at a maximum of 6 inches on center. Reinforce holes and openings larger than 12 inches in accordance with details provided on structural drawings. Openings must not interfere with seismic members such as chords and drag struts.

3.2.3 Deck Damage

SDI MOC2, for repair of deck damage.

3.2.4 Touch-Up Paint

3.2.4.1 Roof Deck

After roof decking installation, wire brush, clean, and touchup paint the scarred areas on top and bottom surfaces of metal roof decking. The scarred areas include welds, weld scars, bruises, and rust spots. Touchup galvanized surfaces with galvanizing repair paint. Touchup painted surfaces with repair paint of painted surfaces.

3.2.4.2 Floor Deck

For floor decking installation, wire brush, clean, and touchup paint the scarred areas on the top and bottom surfaces of the metal floor decking and on the surface of supporting steel members. Include welds, weld scars, bruises, and rust spots for scarred areas. Touched up the galvanized surfaces with galvanizing repair paint. Touch up the painted surfaces with paint for the repair of painted surfaces.

3.2.5 Accessory Installation

3.2.5.1 Adjusting Plates

Provide in locations too narrow to accommodate full-size deck units and install as shown on shop drawings.

3.2.5.2 End Closures

Provide end closure to close open ends of cells at columns, walls, and openings in deck.

3.2.5.3 Closures Above Partitions

Provide for closing voids between cells over partitions that are perpendicular to direction of cells. Provide a one-piece closure strip for partitions 4 inch nominal or less in thickness and two-piece closure strips for wider partitions. Provide sheet metal closures above fire-rated partitions at both sides of partition with space between filled with fiberglass insulation. Provide flexible rubber closures above acoustic-rated partitions at both sides of partition with space between filled with blanket insulation.

3.2.5.4 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.

3.2.5.5 Column Closures

Provide for spaces between floor decking and columns which penetrate the deck. Field cut closure plate to fit column in the field and tack weld to decking and columns.

3.2.5.6 Access Hole Covers

Provide access whole covers to seal holes cut in decking to facilitate welding of the deck to structural supports.

3.2.5.7 Hangers

Provide as indicated to support suspended ceilings. Space devices as indicated or so as to provide one device per 6.25 square feet.

3.2.6 Sound Absorbing Material

Install sound absorbing glass fiber roll or premolded form, neatly in voids between perforated webs of acoustical noncellular steel deck and glass fiber rigid strip, in cells of acoustical cellular steel deck. Keep sound absorbing material dry before, during and after installation.

3.2.7 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.

3.2.8 Preparation of Fire-Proofed Surfaces

Provide deck surfaces, both composite and noncomposite, which are to receive sprayed-on fireproofing, galvanized and free of all grease, mill oil, paraffin, dirt, salt, and other contaminants which impair adhesion of the fireproofing. Complete any required cleaning prior to steel deck installation using a cleaning method that is compatible with the sprayed-on fireproofing.

3.3 ROOF SUMP PANS

Place sump pans over openings in roof decking and fusion welded to top surface of roof decking. Do not exceed spacing of welds of 12 inch with not less than one weld at each corner. Field cut opening in the bottom of each roof sump pan to receive the roof drain as part of the work of this section.

3.4 CANT STRIPS FOR ROOF DECKS

Provide strips to be fusion welded to surface of roof decking, secured to wood nailers by galvanized screws or to steel framing by galvanized self-tapping screws or welds. Do not exceed spacing of welds and fasteners of 12 inch. Lap end joints a minimum 3 inch and secure with galvanized sheet metal screws spaced a maximum 4 inch on center.

3.5 RIDGE AND VALLEY PLATES FOR ROOF DECKS

Provide plates to be fusion welded to top surface of roof decking. Lap end joints a minimum 3 inch. For valley plates, provide endlaps to be in the direction of water flow.

3.6 CLOSURE STRIPS FOR ROOF DECKS

Provide closure strips at open, uncovered ends and edges of the roof decking and in voids between roof decking and top of walls and partitions where indicated. Install closure strips in position in a manner to provide a weathertight installation.

3.7 ROOF INSULATION SUPPORT FOR ROOF DECKS

Provide metal closure strips for support of roof insulation where rib openings in top surface of metal roof decking occur adjacent to edges and openings. Weld metal closure strips in position.

3.8 CLEANING AND PROTECTION FOR ROOF DECKS

Upon completion of the deck, sweep surfaces clean and prepare for installation of the roofing.

3.9 FIELD QUALITY CONTROL

3.9.1 Headed Stud Inspection

In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.

b. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

3.9.2 Deck Weld Inspection

Visual inspect welds in accordance with AWS D1.3/D1.3M.

3.9.3 Decks Not Receiving Concrete

Inspect the decking top surface for distortion after installation. For roof decks not receiving concrete, verify distortion by placing a straight edge across three adjacent top flanges. The maximum allowable gap between the straight edge and the top flanges is 1/16 inch; when gap is more than 1/16 inch, provide corrective measures or replacement. Reinspect decking after performing corrective measures or replacement.

-- End of Section --

SECTION 05 40 00

COLD-FORMED METAL FRAMING
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.

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI S100	(2012) North American Specification for the Design of Cold-Formed Steel Structural Members
AISI S200	(2007) North American Standard for Cold-Formed Steel Framing - General Provision
AISI S201	(2007) North American Standard for Cold-Formed Steel Framing - Product Data
AISI S202	(2011) Code of Standard Practice for Cold-formed Steel Structural Framing
AISI S211	(2007) North American Standard for Cold-Formed Steel Framing - Wall Stud Design
AISI S212	(2007) North American Standard for Cold-Formed Steel Framing - Header Design
AISI S213	(2007; Suppl 1 2009) North American Standard for Cold-Formed Steel Framing - Lateral Design
AISI SG02-KIT	(2001; Supp 1 2004) North American Specification for the Design of Cold-Formed Steel Structural Members
AISI SG03-3	(2002; Suppl 2001-2004; R 2008) Cold-Formed Steel Design Manual Set

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2010; Errata 2011) Structural Welding Code - Steel
AWS D1.3/D1.3M	(2008; Errata 2008) Structural Welding Code - Sheet Steel

ASTM INTERNATIONAL (ASTM)

ASTM A1003/A1003M	(2013) Standard Specification for Steel

	Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members
ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A653/A653M	(2013) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM C1007	(2011a) Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories
ASTM C1513	(2013) Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections
ASTM C955	(2011c) Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases
ASTM E119	(2014) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E329	(2014a) Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
ASTM F1941	(2010) Standard Specification for Electrodeposited Coatings on Threaded Fasteners (Unified Inch Screw Threads (UN/UNR))
ASTM F1941M	(2007) Standard Specification for Electrodeposited Coatings on Threaded Fasteners (Metric)

1.2 SYSTEM DESCRIPTION

1.2.1 Performance Requirements

Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

a. Design Loads: As indicated on Contract Drawings.
b. Deflection Limits: Design framing systems to withstand design loads

without deflections greater than the following:

1. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height for brick/stone veneer, 1/360 of the wall height for all other facade materials.
2. Ceiling Joist Framing: Vertical deflection of 1/360 of the span.

c. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
d. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

1. Upward and downward movement of L/300 for floors and L/200 for roofs unless noted otherwise on contract drawings.

e. Cold-Formed Steel Framing, General: Design according to AISI S200 "Standard for Cold-Formed Steel Framing-General Provisions".

1. Headers: Design according to AISI - Header-04 - Standard for Cold-Formed Steel Framing - Header Design
2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

Delegated Design: Design cold-formed metal-framing, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated. Conform to local and state codes.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Framing Components; G

a. Cross sections, plans, and/or elevations showing component types and locations for each framing application; including shop coatings and material thicknesses for each framing component.

b. Connection details showing fastener type, quantity, location, and other information to assure proper installation.

c. Drawings depicting panel configuration, dimensions, components, locations, and construction sequence if the Contractor elects to install prefabricated/prefinished frames.

SD-03 Product Data

Steel studs,joists, tracks, bracing, bridging and accessories

SD-05 Design Data

Design calculations for Cold Formed Metal Framing (CFMF); G

SD-07 Certificates

Cold-formed metal framing

Fabricator and Erector Qualifications; G

Initial Certification Letter From Contractor's Delegated-Design Professional Engineer; G

Welds

Certified copies of welder qualifications test records showing qualification in accordance with AWS D1.3/D1.3M.

SD-11 Closeout Submittals

Final Certification Letter From Contractor's Delegated-Design Professional Engineer; G

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to job site and store in adequately ventilated, dry locations. Storage area shall permit easy access for inspection and handling. If necessary to store materials outside, stack off the ground, support on a level platform, and protect from the weather as approved. Handle materials to prevent damage. Finish of the framing members shall be maintained at all times, using an approved high zinc dust content, galvanizing repair paint whenever necessary to prevent the formation of rust. Replace damaged items with new, as directed by the Contracting Officer. Steel framing and related accessories shall be stored and handled in accordance with the AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing".

1.5 LOAD-BEARING COLD-FORMED METAL FRAMING

Include top and bottom tracks, bracing, fastenings, and other accessories necessary for complete installation. Framing members shall have the structural properties indicated. Where physical structural properties are not indicated, they shall be as necessary to withstand all imposed loads. Design framing in accordance with AISI SG03-3. Non-load-bearing metal framing, furring, and ceiling suspension systems are specified in Section 09 22 00 SUPPORTS FOR PLASTER AND GYPSUM BOARD. Metal suspension systems for acoustical ceilings are specified in Section 09 51 00 ACOUSTICAL CEILINGS.

1.6 MAXIMUM DEFLECTION

a. Exterior Studs:

Deflection Criteria	Exterior Finish
L/240 or L/360	Synthetic Plaster, Metal Panels

Deflection Criteria	Exterior Finish
L/360	Cement Plaster, Wood Veneer
L/600	Brick Veneer, Stone Panels

Wall deflections shall be computed on the basis that studs withstand all lateral forces independent of any composite action from sheathing materials. Studs abutting windows or louvers shall also be designed not to exceed 1/4 inch maximum deflection.

b. Floor Joists:

L/360 - Live load only
L/240 - Total load

c. Roof Rafters:

L/240 - Live load only

1.7 QUALITY ASSURANCE

a. Design Calculations for Cold Formed Metal Framing (CFMF): Design CFMF 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.

b. Initial Certification Letter from Contractor's Delegated-Design 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. Initial Certification Letter shall be submitted for information only. The Certification Letter shall include the following:

1. Signature and seal of the registered Professional Engineer (registerd in the state or district in which the project is located).
2. Statement that the Professional Engineer is fully experienced in the design of CFMF.
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 CFMF have been performed in accordance with the Professional Engineer's design.

c. Final Certification Letter from Contractor's Delegated-Design Professional Engineer: After construction of the CFMF is complete, submit a signed and sealed Certification Letter from the responsible design professional stating that the fabrication and installation of the CFMF have been performed in accordance with the Professional Engineer's design. Final Certification Letter shall be submitted for record only.

d. Fabricator and Erector Qualifications

1. The fabricator shall submit a letter confirming that he has a minimum of 5 years experience in the fabrication of metal stud curtain wall systems and shall have successfully fabricated a minimum of 5 projects similar to this project.
2. The erector shall submit a letter confirming that he has a minimum of 5 years of experience in the erection of metal stud curtain wall systems and shall have erected a minimum of 5 projects similar to this project.

d. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E329 for testing indicated.

e. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

f. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel".

2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel".

g. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E119 by, and displaying a classification label from, a testing and inspecting agency acceptable to authorities having jurisdiction.

h. AISI Specifications and Standards: Comply with:

1. AISI S100, "North American Specification for the Design of Cold-Formed Steel Structural Members".

2. AISI S200, "North American Standard for Cold-Formed Steel Framing - General Provision".

3. AISI S201, "North American Standard for Cold-Formed Steel Framing - Product Data".

4. AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing".

5. AISI S211, "North American Standard for Cold-Formed Steel Framing - Wall Stud Design".

6. AISI S212, "North American Standard for Cold-Formed Steel Framing - Header Design".

7. AISI S213, "North American Standard for Cold-Formed Steel Framing - Lateral Design".

1.7.1 Cold-Formed Metal Framing For Exterior Cladding Support and Where Designated as "CFMF" on Contract Drawings

Include top and bottom tracks, bracing, fastenings, and other accessories necessary for complete installation. Framing members shall have the minimum structural properties indicated on structural drawings. Design CFMF as necessary to withstand all imposed gravity, lateral, and blast loads. Design framing in accordance with AISI SG03-3. Metal framing for interior partitions, furring, and ceiling suspension systems are specified in Section 09 22 00 SUPPORTS FOR PLASTER AND GYPSUM BOARD. Metal suspension systems for acoustical ceilings are specified in Section 09 51 00 ACOUSTICAL CEILINGS.

1.7.2 Drawing Requirements

Submit framing components to show sizes, thicknesses, layout, material designations, methods of installation, and accessories.

a. Cross sections, plans, and/or elevations showing component types and locations for each framing application; including shop coatings and material thicknesses for each framing component.

b. Connection details showing fastener type, quantity, location, and other information to assure proper installation.

c. Drawings depicting panel configuration, dimensions, components, locations, and construction sequence if the Contractor elects to install prefabricated/prefinished frames.

d. All revisions on resubmitted shop drawings shall be clouded. Non-clouded shop drawings will be rejected.

PART 2 PRODUCTS

2.1 STEEL STUDS, JOISTS, TRACKS, BRACING, BRIDGING AND ACCESSORIES

Framing components shall comply with ASTM C955 and the following.

a. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

b. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.

2. Coating: G90 (Z275).

c. Steel Sheet for Vertical Deflection Clips: ASTM A1003/A1003M, ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.

2. Coating: G90 (Z275).

d. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated on contract drawings.

2. Flange Width: As indicated on contract drawings.

e. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.

2. Flange Width: 1-1/4 inches.

2.1.1 Sizes, Gages, Section Modulus, and Other Structural Properties

Size and gage as indicated. Steel stud lateral deflection shall be limited to L/600 for exterior wall brick veneer construction.

2.2 MARKINGS

Studs and track shall have product markings stamped on the web of the section. The markings shall be repeated throughout the length of the member at a maximum spacing of 4 feet on center and shall be legible and easily read. The product marking shall include the following:

a. An ICC number.

b. Manufacturer's identification.

c. Minimum delivered uncoated steel thickness.

d. Protective coating designator.

e. Minimum yield strength.

2.3 CONNECTIONS

Screws for steel-to-steel connections shall be self-drilling, tapping screws in compliance with ASTM C1513 of the type, size and location as shown on the drawings. Electroplated screws shall have a minimum 5 micron zinc coating in accordance with ASTM F1941. Screws, bolts, and anchors shall be hot-dipped galvanized in accordance with ASTM A123/A123M or

ASTM A153/A153M as appropriate. Screws bolts, and anchors shall be hot dipped galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M as appropriate.

2.4 PLASTIC GROMMETS

Supply plastic grommets, recommended by stud manufacturer, to protect electrical wires. Prevent metal to metal contact for plumbing pipes.

PART 3 EXECUTION

3.1 FASTENING

Fasten framing members together by welding or by using self-drilling or self-tapping screws. Electrodes and screw connections shall be as required and indicated in the design calculations.

3.1.1 Welds

All welding shall be performed in accordance with AWS D1.3/D1.3M, as modified by AISI SG02-KIT. All welders, welding operations, and welding procedures shall be qualified according to AWS D1.3/D1.3M. All welds shall be cleaned and coated with rust inhibitive galvanizing paint. Do not field weld materials lighter than 18 gage.

3.1.2 Screws

Screws shall be of the self-drilling self-tapping type, size, and location as required by calculation. Screw penetration through joined materials shall not be less than three exposed threads. Minimum spacings and edge distances for screws shall be as specified in AISI SG02-KIT. Screws covered by sheathing materials shall have low profile heads.

3.1.3 Anchors

Anchors shall be of the type, size, and location as required by calculation.

3.1.4 Powder-Actuated Fasteners

Powder-actuated fasteners shall be of the type, size, and location as required by calculation.

3.2 INSTALLATION

Install cold-formed framing in accordance with ASTM C1007 and AISI S200.

Install cold-formed steel framing according to AISI S202 and to manufacturer's written instructions unless more stringent requirements are indicated.

3.2.1 Tracks

Provide accurately aligned runners at top and bottom of partitions. Anchor tracks as indicated in design calculations. Butt weld joints in tracks or splice with stud inserts. Fasteners shall be at least 3 inches from the edge of concrete slabs.

3.2.2 Studs

Cut studs square and set with firm bearing against webs of top and bottom tracks. Position studs vertically in tracks and space as indicated in design. Do not splice studs. Provide at least two studs at jambs of doors and other openings 2 feet wide or larger. Provide jack studs over openings, as necessary, to maintain indicated stud spacing. Provide tripled studs at corners, positioned to receive interior and exterior finishes. Fasten studs to top and bottom tracks by welding or screwing both flanges to the tracks. Framed wall openings shall include headers and supporting components as shown on the drawings. Headers shall be installed in all openings that are larger than the stud spacing in a wall. In curtain wall construction, provide for vertical movement where studs connect to the structural frame. Provide horizontal bracing in accordance with the design calculations and AISI SG03-3, consisting of, as a minimum, runner channel cut to fit between and welded to the studs or hot- or cold-rolled steel channels inserted through cutouts in web of each stud and secured to studs with welded clip angles. Bracing shall be not less than the following:

LOAD	HEIGHT	BRACING
Wind load only	Up to 10 feet	One row at mid-height
	Over 10 feet	Rows 5'-0" o.c. maximum
Axial load	Up to 10 feet	Two rows at 1/3 points
	Over 10 feet	Rows 3'-4" o.c. maximum

3.2.3 Joists and Trusses

Locate each joist or truss directly above a stud. Provide doubled joists under parallel partitions wherever partition length exceeds 1/2 of joist span. Joists shall have at least 2.50 inches of bearing on steel, 4 inches on masonry, and shall be reinforced over bearings where required to prevent web crippling. Splice joists over bearings only. Lap and weld splices as indicated. Provide manufacturer's standard bridging which shall not be less than the following:

CLEAR SPAN	BRIDGING
Up to 14 feet	One row near center
14 to 20 feet	Two rows at 1/3 points
20 to 26 feet	Three rows at 1/4 points
26 to 32 feet	Four rows at 1/5 points

Temporary bracing shall be provided and remain in place until work is permanently stabilized.

3.2.4 Erection Tolerances

a. Framing members which will be covered by finishes such as wallboard, plaster, or ceramic tile set in a mortar setting bed, shall be within the following limits:

   1. Layout of walls and partitions: 1/4 inch from intended position;

   2. Plates and runners: 1/4 inch in 8 feet from a straight line;

   3. Studs: 1/4 inch in 8 feet out of plumb, not cumulative; and

   4. Face of framing members: 1/4 inch in 8 feet from a true plane.

b. Framing members which will be covered by ceramic tile set in dry-set mortar, latex-portland cement mortar, or organic adhesive shall be within the following limits:

   1. Layout of walls and partitions: 1/4 inch from intended position;

   2. Plates and runners: 1/8 inch in 8 feet from a straight line;

   3. Studs: 1/8 inch in 8 feet out of plumb, not cumulative; and

   4. Face of framing members: 1/8 inch in 8 feet from a true plane.

3.3 FIELD QUALITY CONTROL

Testing and inspection for Contractor Quality Control (CQC).

a. Testing: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
b. Field and shop welds will be subject to testing and inspecting.
c. Testing agency will report test results promptly and in writing to Contractor and Architect.
d. Remove and replace work where test results indicate that it does not comply with specified requirements.
e. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.4 REPAIRS AND PROTECTION

a. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
b. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

-- End of Section --

SECTION 05 50 13

MISCELLANEOUS METAL FABRICATIONS
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.

ALUMINUM ASSOCIATION (AA)

AA DAF45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 303	(2010) Code of Standard Practice for Steel Buildings and Bridges

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.3	(2013) Operations - Safety Requirements for Powder Actuated Fastening Systems

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2010; Errata 2011) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME B18.2.1	(2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(2010) Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
ASME B18.21.1	(2009) Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (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) Machine Screws, Tapping Screws, and Machine Drive Screws (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A153/A153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A307	(2014) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A47/A47M	(1999; R 2014) Standard Specification for Ferritic Malleable Iron Castings
ASTM A48/A48M	(2003; R 2012) Standard Specification for Gray Iron Castings
ASTM A500/A500M	(2013) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A653/A653M	(2013) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A780/A780M	(2009) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A786/A786M	(2005; R 2009) Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates
ASTM A924/A924M	(2014) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B108/B108M	(2012; E 2012) Standard Specification for Aluminum-Alloy Permanent Mold Castings
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
ASTM B26/B26M	(2012) Standard Specification for Aluminum-Alloy Sand Castings
ASTM C1513	(2013) 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

MASTER PAINTERS INSTITUTE (MPI)

MPI 79	(Oct 2009) Alkyd Anti-Corrosive Metal Primer

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 211	(2013) Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 3	(1982; E 2004) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning

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. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Access doors and panels, installation drawings; G

Cover plates and frames, installation drawings; G

Expansion joint covers, installation drawings; G

Embedded angles and plates, installation drawings; G

Roof hatch; G

Submit fabrication drawings showing layout(s), connections to structural system, and anchoring details as specified in AISC 303.

Submit templates, erection and installation drawings indicating thickness, type, grade, class of metal, and dimensions. Show construction details, reinforcement, anchorage, and installation with relation to the building construction.

SD-03 Product Data

Access doors and panels; G

Steel framing and supports for operable partitions; G

Steel framing and support for overhead doors, shutters, and grilles;

G

Steel framing and supports for countertops; G

Steel framing and support for mechanical and electrical equipmentG;

Steel framing and supports for applications where framing and supports are not specified in other Sections; G

Elevator machine beams, hoist beams; G

Support angles for elevator door sills; G

Shelf angles; G

Loose bearing and leveling plates; G

Miscellaneous steel trim including steel angle corner guards, steel edgings, support angle for elevator doorsill and loading-dock angles; G

Metal laddersG

Metal ships' laddersG

Metal bollardsG

Metal downspout coversG

Loose steel lintelsG

Anchor bolts, steel pipe sleeves, slotted-channel inserts and wedge-type inserts indicated to be cast into concrete or built into unit masonryG

Steel weld plates and angles for casting into concrete for applications where they are not specified in other SectionsG

Expansion joint covers; G

Corner guards; G

Roof hatch; G

SD-04 Samples

Expansion joint covers

Control-joint covers

Provide full size samples , taken from manufacturer's stock, and be complete as required for installation in the structure. Samples may be installed in the work, provided each sample is clearly identified and its location recorded.

SD-05 Design Data

Design Calculations; G

SD-07 Certificates

Initial Engineer Certification LetterG

Final Engineer Certification LetterG

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 QUALITY ASSURANCE

1.5.1 Design Data Required

A. Design Calculations: Design miscellaneous metal fabrications 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. Design calculation 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. Calculation Data submission must be concurrent with the submission of corresponding fabrication drawings. Fabrication drawings submitted without corresponding Calculations Design Data will be returned as "Not Reviewed", Calculations shall be submitted for information only.

1.6.2 Certificates Required

A. Initial Engineer Certification Letter: Prior to the submission of shop drawings, product data, 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. Initial 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 miscellaneous metal elements.
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 miscellaneous metal element has been performed in accordance with the Professional Engineer's design.

B. Final Engineer Certification Letter: After construction of the miscellaneous metal element is complete, submit a signed and sealed certification letter from the responsible design professional stating that the fabrication and installation of the miscellaneous metal element 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 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.

2.1.5 Gratings

a. Gray cast iron ASTM A48/A48M, Class 40.

2.1.6 Floor Plates, Patterned

Floor plate ASTM A786/A786M. Steel plate shall not be less than 14 gage.

2.1.7 Anchor Bolts

ASTM A307. Where exposed, shall be of the same material, color, and finish as the metal to which applied.

2.1.7.1 Expansion Anchors, Sleeve Anchors, Adhesive Anchors

As required by calculation.

2.1.7.2 Lag Screws and Bolts

ASME B18.2.1, type and grade best suited for the purpose.

2.1.7.3 Toggle Bolts

ASME B18.2.1.

2.1.7.4 Bolts, Nuts, Studs and Rivets

ASME B18.2.2 or ASTM A307.

2.1.7.5 Powder Actuated Fasteners

Follow safety provisions of ASSE/SAFE A10.3.

2.1.7.6 Screws

ASME B18.2.1, ASME B18.6.2, ASME B18.6.3 and ASTM C1513.

2.1.7.7 Washers

Provide plain washers to conform to ASME B18.21.1. Provide beveled washers for American Standard beams and channels, square or rectangular, tapered in thickness, and smooth. Provide lock washers to conform to ASME B18.21.1.

2.1.8 Aluminum Alloy Products

Conform to ASTM B209 for sheet plate, ASTM B221 for extrusions and ASTM B26/B26M or ASTM B108/B108M for castings, as applicable. Provide aluminum extrusions at least 1/8 inch thick and aluminum plate or sheet at least 0.050 inch thick.

2.2 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, grating fasteners, 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. Steel to be embedded in concrete shall be

free of dirt and grease. Do not paint or galvanize bearing surfaces, including contact surfaces within slip critical joints, but coat with rust preventative applied in the shop.

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.

2.2.6 Aluminum Surfaces

2.2.6.1 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.

2.2.6.2 Aluminum Finishes

Unexposed sheet, plate and extrusions may have mill finish as fabricated. Sandblast castings' finish, medium, AA DAF45. Unless otherwise specified, provide all other aluminum items with a 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 AA DAF45. Provide a polished satin finish on items to be anodized.

2.3 ACCESS DOORS AND PANELS

Provide flush type access doors and panels unless otherwise indicated. Fabricate frames for access doors of steel not lighter than 14 gage with welded joints and anchorage for securing into construction. Provide access doors with a minimum of 14 by 20 inches and of not lighter than 14 gage steel, with stiffened edges and welded attachments. Provide access doors hinged to frame and with a flush-face, turn-screw-operated latch. Provide exposed metal surfaces with a shop applied prime coat.

2.4 CONTROL-JOINT COVERS

Provide control-joint covers to be located on wall surfaces of concrete, masonry and tile work. Provide protective coating on the surface in contact with concrete, masonry or tile.

2.5 CORNER GUARDS AND SHIELDS

For jambs and sills of openings and edges of platforms provide steel shapes and plates anchored in masonry or concrete with welded steel straps or end-weld stud anchors. Form corner guards for use with glazed or ceramic tile finish on walls with 0.0625 inch thick corrosion-resisting steel with polished or satin finish, extend 5 feet above the top of cove base or to the top of the wainscot, whichever is less, and securely anchor to the supporting wall. Corner guards on exterior shall be galvanized.

2.6 COVER PLATES AND FRAMES

Fabricate cover plates of 1/4 inch thick rolled steel weighing not more than 100 pounds per plate with a selected raised pattern nonslip top surface. Plate shall be galvanized. Reinforce to sustain a live load of 100 pounds per square foot. Frames shall be structural steel shapes and plates, 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. 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.

2.7 EXPANSION JOINT COVERS

Provide expansion joint covers constructed of extruded aluminum with anodized satin aluminum finish for walls and ceilings and with standard mill finish for floor covers and exterior covers. Furnish plates, backup angles, expansion filler strip and anchors as indicated. Provide a 2-hour fire rating expansion joint system where indicated.

2.8 GUARD POSTS (BOLLARDS/PIPE GUARDS)

Provide 6 inch galvanized standard weight steel pipe as specified in ASTM A53/A53M. Anchor posts in concrete as indicated and fill solidly with concrete with minimum compressive strength of 2500 psi.

2.9 MISCELLANEOUS PLATES AND SHAPES

Provide for items that do not form a part of the structural steel framework, such as lintels, sill angles, support framing for ceiling-mounted toilet partitions, 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 welds. Construct to have at least 8 inches bearing on masonry at each end.

Provide angles and plates, ASTM A36/A36M, for embedment as indicated. Galvanize embedded items exposed to the elements according to ASTM A123/A123M.

2.10 DOWNSPOUT BOOTS

Provide cast iron downspout boots with receiving bells sized to fit downspouts.

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. Exposed fastenings shall be compatible materials, shall generally match 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 shall be cause for rejection. Conceal fastenings where practicable. Thickness of metal

and details of assembly and supports shall provide strength and stiffness. Form joints exposed to the weather shall be formed to exclude water. Items listed below require additional procedures.

3.2 WORKMANSHIP

Provide miscellaneous metalwork that is well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Provide continuous welding along the entire area of contact except where tack welding is permitted. Do not tack weld exposed connections of work in place and ground smooth. Provide a smooth finish on exposed surfaces of work in place and unless otherwise approved, flush exposed riveting. Mill joints where tight fits are required. Corner joints shall be coped or mitered, well formed, and in true alignment. Accurately set work to established lines and elevations and securely fastened in place. 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 miscellaneous metal items securely in place. Include for anchorage not otherwise specified or indicated slotted inserts, expansion shields, and powder-driven fasteners, when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts 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 BUILT-IN WORK

Form for anchorage metal work built-in with concrete or masonry, or provide with suitable anchoring devices as indicated or as required. Furnish 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.

3.6 FINISHES

3.6.1 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.

3.6.2 Field Preparation

Remove rust preventive coating just prior to field erection, using a remover approved by the rust preventive manufacturer. Surfaces, when assembled, shall be free of rust, grease, dirt and other foreign matter.

3.6.3 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.

3.7 ACCESS PANELS

Install a removable access panel not less than 12 by 12 inches directly below each valve, flow indicator, damper, or air splitter that is located above the ceiling, other than an acoustical ceiling, and that would otherwise not be accessible.

3.8 CONTROL-JOINT COVERS

Provide covers over control-joints and fasten on one side only with fasteners spaced to give positive contact with wall surfaces on both sides of joint throughout the entire length of cover.

3.9 COVER PLATES AND FRAMES

Install the tops of cover plates and frames flush with floor.

3.10 ROOF HATCH (SCUTTLES)

Provide zinc-coated steel sheets not less than 14 gage, with 3 inch beaded flange, welded and ground at corner. Provide a minimum clear opening of 30 by 36 inches. Construction and accessories as follows:

a. Insulate cover and curb with one inch thick rigid fiberboard insulation covered and protected by zinc-coated steel liner not less than 26 gage with 12 inches high curb, formed with 3 inch mounting flange with holes provided for securing to the roof deck. Equip the curb with an integral metal cap flashing of the same gage and metal as the curb, full welded and ground at corners for weather tightness.

b. Provide hatch completely assembled with pintle hinges, compression spring operators enclosed in telescopic tubes, positive snap latch with turn handles on inside and outside, and neoprene draft seal. Provide fasteners for padlocking on the inside. Equip the cover with an automatic hold-open arm complete with grip handle to permit one-hand release. Cover action shall be smooth through its entire range with an operating pressure of approximately 30 pounds.

3.11 INSTALLATION OF CHIMNEYS, VENTS, AND SMOKESTACKS

Install chimneys and vents in accordance with NFPA 211. Provide a cleanout opening with a tight-fitting, hinged, cast-iron door and frame at the base of each smokestack. Provide a top band on stacks for attachment of painter's rigging. Provide roof housing, rain cap, downdraft diverter, fire damper, and other accessories required for a complete installation. Join sections of prefabricated lined stacks with acid-resisting high-temperature cement and steel draw bands. Provide means to prevent accumulation of water in the smokestack.

3.12 INSTALLATION OF GUARD POSTS (BOLLARDS/PIPE GUARDS)

Set pipe guards vertically in concrete piers. Construct piers of, and the hollow cores of the pipe filled with, concrete having a compressive strength of 3000 psi.

3.13 INSTALLATION OF DOWNSPOUT BOOTS

Secure downspouts to building through integral lips with appropriate fasteners.

-- End of Section --

SECTION 05 51 00

METAL STAIRS
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.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 314	(1990; R 2008) Standard Specification for Steel Anchor Bolts

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 360	(2010) Specification for Structural Steel Buildings

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7	(2010; Errata 2011; Supp 1 2013) Minimum Design Loads for Buildings and Other Structures

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2010; Errata 2011) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME B18.2.1	(2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)
ASME B18.21.1	(2009) Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series)
ASME B18.6.1	(1981; R 2008) Wood Screws (Inch Series)
ASME B18.6.3	(2013) Machine Screws, Tapping Screws, and Machine Drive Screws (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM A1008/A1008M	(2015) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened
ASTM A1011/A1011M	(2014) Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and

	High-Strength Low-Alloy with Improved Formability and Ultra-High Strength
ASTM A108	(2013) Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A27/A27M	(2013) Standard Specification for Steel Castings, Carbon, for General Application
ASTM A283/A283M	(2013) Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A307	(2014) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A325	(2014) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A449	(2010) Standard Specification for Hex Cap Screws, Bolts, and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
ASTM A47/A47M	(1999; R 2014) Standard Specification for Ferritic Malleable Iron Castings
ASTM A500/A500M	(2013) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A512	(2006) Standard Specification for Cold-Drawn Buttweld Carbon Steel Mechanical Tubing
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A568/A568M	(2013a) Standard Specifications for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for
ASTM A653/A653M	(2013) Standard Specification for Steel

	Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A924/A924M	(2014) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM C514	(2004; E 2009; R 2009) 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	(2010) Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2015; ERTA 2015) Life Safety Code

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 25	(1997; E 2004) Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II

1.2 PERFORMANCE REQUIREMENTS

Structural Performance of Stairs: Provide metal stairs capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

a. Uniform Load 100 lbf/sq. ft.
b. Concentrated Load: 300 lbf applied on an area of 4 sq. in.
c. Uniform and concentrated loads need not be assumed to act concurrently.
d. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
e. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch.

Seismic Performance: Provide metal stairs capable of withstanding the effects of earthquake motions determined according to ASCE 7 and information provided on the Structural drawings.

The design shall be in accordance with the aesthetic design intent of the project, possibly requiring structural profiles different from the minimum structural requirements. The Architect shall have final authority in reference to these aesthetic matters.

a. All proposed deviations from the specification and drawings must be so noted on the submittal drawings.
b. Approval of the submittals does not constitute approval of changes to the design intent without proper notification of same.

Delegated Design: Manufacturer's responsibilities include using a qualified professional engineer to prepare comprehensive structural

calculations for metal stair members and connections, using performance requirements and design criteria indicated.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Iron and Steel Hardware; G

Steel Shapes, Plates, Bars and Strips; G

Metal Stair System; G

SD-03 Product Data

Structural Steel Plates, Shapes, and Bars; G

Structural Steel Tubing; G

Cold-Drawn Steel Tubing; G

Malleable Iron Castings; G

Concrete Inserts; G

Masonry Anchorage Devices; G

Protective Coating; G

Steel Pan Stairs; G

SD-05 Design Data

Design Calculations; G, FIO

SD-07 Certificates

Welding Procedures; G

Welder Qualification; G

Initial Certification Letter from Contractor's Delegated-Design Professional Engineer; G, FIO

SD-08 Manufacturer's Instructions

Structural Steel Plates, Shapes, and Bars; G

Structural Steel Tubing; G

Cold-Drawn Steel Tubing; G

Malleable Iron Castings; G

Protective Coating; G

Masonry Anchorage Devices; G

SD-11 Close Out Submittals

Final Certification Letter from Contractor's Delegated-Design Professional Engineer; G

1.4 QUALITY ASSURANCE

1.4.1 Design Calculations

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.

1.4.2 Initial Certification Letter from Contractor's Delegated-Design 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. Initial 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 Stairs.
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 Stairs have been performed in accordance with the Professional Engineer's design.

1.4.3 Final Certification Letter from Contractor's Delegated-Design Professional Engineer

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.

1.4.4 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 test 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 an immediate retest of two test welds and 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 made.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

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.

Pre-assemble 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, prior to cleaning, treating, and application of surface finishes, including zinc coatings.

2.2 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.

2.3 STRUCTURAL STEEL TUBING

Structural steel tubing, hot-formed, welded or seamless, conforming to ASTM A500/A500M, Grade B, unless otherwise noted.

2.4 COLD-FINISHED STEEL BARS

Cold-finished steel bars conforming to ASTM A108, grade as selected by the fabricator.

2.5 HOT-ROLLED CARBON STEEL SHEETS AND STRIPS

Hot-rolled carbon sheets and strips conforming to ASTM A568/A568M and ASTM A1011/A1011M, pickled and oiled.

2.6 COLD-ROLLED CARBON STEEL SHEETS

Cold-rolled carbon steel sheets conforming to ASTM A1008/A1008M.

2.7 GALVANIZED CARBON STEEL SHEETS

Galvanized carbon steel sheets conforming to ASTM A653/A653M, with galvanizing conforming to ASTM A653/A653M and ASTM A924/A924M.

2.8 COLD-DRAWN STEEL TUBING

Cold drawn steel tubing conforming to ASTM A512, sunk drawn, butt-welded, cold-finished, and stress-relieved.

2.9 MALLEABLE IRON CASTINGS

Malleable iron castings conforming to ASTM A47/A47M, grade as selected.

2.10 STEEL PIPE

Steel pipe conforming to ASTM A53/A53M, type as selected, Grade B; primed finish, unless galvanizing is required; standard weight (Schedule 40).

2.11 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, 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 galvanized1/8-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.

2.12 FASTENERS

Galvanized zinc-coated fasteners in accordance with ASTM A153/A153M and 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.

Standard/regular hexagon-head bolts and nuts be conforming to ASTM A307, Grade A.

Square-head lag bolts conforming to ASME B18.2.1.

Machine screws cadmium-plated steel conforming to ASME B18.6.3.

Wood screws, flat-head carbon steel conforming to ASME B18.6.1.

Plain washers, round, general-assembly-grade, carbon steel conforming to ASME B18.21.1.

Lockwashers helical spring, carbon steel conforming to.

2.13 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.

Toggle bolts of the tumble-wing type, conforming to ASTM A325, ASTM A449 and ASTM C636/C636M, type, class, and style as required.

2.14 GENERAL FABRICATION

Prepare and submit metal stair system shop drawings with detailed plans and elevations at not less than 1 inch to 1 foot with details of sections and connections at not less than 3 inches to 1 foot. Also detail placement drawings, diagrams, templates for installation of anchorage, including but not limited to, concrete inserts, anchor bolts, and miscellaneous metal items having integral anchorage devices.

Use materials of size and thicknesses indicated or, if not indicated, of required size and thickness to produce adequate strength and durability in finished product for intended use. Work materials to dimensions indicated on approved detail drawings, using proven details of fabrication and support. Use 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. 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 smooth exposed welds 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 flathead (countersunk) screws or bolts.

Provide and coordinate anchorage of the type indicated with the supporting structure. Fabricate anchoring devices, space as indicated and 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 as fabricated from cold-finished or cold-rolled stock.

2.15 PROTECTIVE COATING

Shop prime steelwork with red oxide primer in accordance with SSPC Paint 25

Hot dip galvanize steelwork as indicated in accordance with ASTM A123/A123M. Touch up abraded surfaces and cut ends of galvanized members with zinc-dust, zinc-oxide primer, or an approved galvanizing repair compound.

2.16 STEEL PAN STAIRS

2.16.1 General

Use welding for joining pieces together. Fabricate units so that bolts and other fastenings do not appear on finish surfaces. Make joints true and tight, and connections between parts lightproof tight. Grind smooth continuous welds 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.

2.16.2 Stair Framing

Fabricate stringers of structural steel channels, or plates, or a combination thereof as indicated. Provide closures for exposed ends of stringers.

Construct platforms of structural steel channel headers and miscellaneous framing members as indicated. Bolt headers to stringers and newels and framing members to stringers and headers.

2.16.3 Riser, Subtread, And Subplatform Metal Pans

Form metal pans of 0.1084-inch (12-gage) thick structural steel sheets, conforming to ASTM A1011/A1011M, Grade 36. Shape pans to configuration indicated.

Construct riser and subtread metal pans with steel angle supporting brackets, of size indicated, welded to stringers. Secure metal pans to brackets with rivets or welds. Secure subplatform metal pans to platform frames with welds.

2.16.4 Steel Stairs

Provide steel stairs complete with stringers, metal-pan concrete-filled treads, landings, columns, handrails, and necessary bolts and other fastenings. Shop paint steel stairs and accessories.

2.16.4.1 Design Loads

Refer to "Performance Requirements". Conform to AISC 360 with the design and fabrication of steel stairs, other than a commercial product. Design fire stairs to conform to NFPA 101.

2.16.4.2 Materials

Provide steel stairs of welded construction except that bolts may be used where welding is not practicable. Screw or screw-type connections are not permitted.

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 from mill scale, flake rust and rust pitting prior to shop finishing. Weld permanent connections. Finish welds flush and smooth on surfaces that will be exposed after installation.

PART 3 EXECUTION

3.1 STEEL STAIRS

Provide iron and steel hardware including anchor bolts, grating fasteners, washers, and all parts or devices necessary for proper installation. Provide lock washers under nuts.

3.2 FIELD WELDING

Execute procedures of manual shielded metal arc welding, appearance and quality of welds made, and methods used in correcting welding work in compliance with AWS D1.1/D1.1M.

3.3 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
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.

ALUMINUM ASSOCIATION (AA)

AA DAF45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

Too many characters	Laboratory Ventilation Package

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2010; Errata 2011) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A47/A47M	(1999; R 2014) Standard Specification for Ferritic Malleable Iron Castings
ASTM A500/A500M	(2013) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A653/A653M	(2013) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A780/A780M	(2009) Standard Practice for Repair of

	Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A924/A924M	(2014) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B108/B108M	(2012; E 2012) Standard Specification for Aluminum-Alloy Permanent Mold Castings
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
ASTM B26/B26M	(2012) Standard Specification for Aluminum-Alloy Sand Castings
ASTM D1187/D1187M	(1997; E 2011; R 2011) Asphalt-Base Emulsions for Use as Protective Coatings for Metal

MASTER PAINTERS INSTITUTE (MPI)

MPI 79	(Oct 2009) Alkyd Anti-Corrosive Metal Primer

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 3	(1982; E 2004) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning

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

29 CFR 1910.27	Fixed Ladders

1.2 PERFORMANCE CRITERIA

a. Structural Performance of Ladders: Provide ladders capable of withstanding the effects of loads and stresses within limits and under conditions specified in ANSI ASC A14.3/ANSI/ASSE A1254.1.

b. Structural Performance of Alternating Tread Devices: Alternating tread devices shall withstand the effects of loads and stresses within limits and under conditions specified in ICC's International Building Code (IBC).

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Ladders, installation drawings; G

Ship's ladder (with or without guards), installation drawings; G

SD-03 Product Data

Ladders; G

Ship's ladder (with or without guards); G

SD-05 Design Data

Design Calculations; G, FIO

Initial Certification Letter from Contractor's Delegated-Design Professional Engineer; G, FIO

SD-11 Closeout Submittals

Final Certification Letter from Contractor's Delegated-Design Professional Engineer; G, FIO

1.4 QUALITY ASSURANCE

1.4.1 Design Calculations

Design Metal Ladders 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.

1.4.2 Initial Certification Letter from Contractor's Delegated-Design 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. Initial 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 Ladders.
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 Ladders have been performed in accordance with the Professional Engineer's design.

1.4.3 Final Certification Letter from Contractor's Delegated-Design Professional Engineer

After construction of the Metal Ladders is complete, submit a signed and sealed Certification Letter from the responsible design professional stating that the fabrication and installation of the Metal Ladders have been performed in accordance with the Professional Engineer's design. Final Certification Letter shall be submitted for record only.

1.5 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.

1.6 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.

2.1.5 Aluminum Alloy Products

Conform to ASTM B209 for sheet plate, ASTM B221 for extrusions and ASTM B26/B26M or ASTM B108/B108M for castings, as applicable. Provide aluminum extrusions at least 1/8 inch thick and aluminum plate or sheet at least 0.050 inch thick.

2.2 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.

2.2.6 Aluminum Surfaces

2.2.6.1 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.

2.2.6.2 Aluminum Finishes

Unexposed plate and extrusions may have mill finish as fabricated. Sandblast castings' finish, medium, AA DAF45. Unless otherwise specified,

provide all other aluminum items with standard mill finish. Provide a coating thickness not less than that specified for protective and decorative type finishes for items used in interior locations or architectural Class I type finish for items used in exterior locations in AA DAF45.

2.3 LADDERS

Fabricate vertical ladders conforming to Section 7 of 29 CFR 1910.27. Use 2 1/2 by 3/8 inch steel flats for stringers and 3/4 inch diameter steel rods for rungs. Rungs to be not less than 16 inches wide, spaced one foot apart, plug welded or shouldered and headed into stringers. Install ladders so that the distance from the rungs to the finished wall surface will not be less than 7 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.

2.3.1 Ship's Ladder

Fabricate stringers and framing of steel plate or shapes. Bolt, rivet or weld connections and anchor to supporting construction. Provide treads with non-slip surface as specified for safety treads. Aluminum ladders may be provided, subject to approval of treads, materials, and shop drawings. Requirements shown or specified for steel apply. Provide anchor items of zinc-coated steel. Design assembly, including tread connections and methods of attachment, to support a live load of 300 pounds per tread. Provide railings as specified for metal handrails.

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 finished roof.

-- End of Section --

SECTION 05 52 00

METAL RAILINGS
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.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 314	(1990; R 2008) Standard Specification for Steel Anchor Bolts

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2010; Errata 2011) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME B18.2.1	(2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)
ASME B18.21.1	(2009) Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series)
ASME B18.6.1	(1981; R 2008) Wood Screws (Inch Series)
ASME B18.6.3	(2013) Machine Screws, Tapping Screws, and Machine Drive Screws (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM A108	(2013) Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A27/A27M	(2013) Standard Specification for Steel Castings, Carbon, for General Application
ASTM A283/A283M	(2013) Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A307	(2014) Standard Specification for Carbon

	Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A325	(2014) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A449	(2010) Standard Specification for Hex Cap Screws, Bolts, and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
ASTM A47/A47M	(1999; R 2014) Standard Specification for Ferritic Malleable Iron Castings
ASTM A500/A500M	(2013) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A512	(2006) Standard Specification for Cold-Drawn Buttweld Carbon Steel Mechanical Tubing
ASTM A513/A513M	(2014) Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A575	(1996; E 2013; R 2013) Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades
ASTM C514	(2004; E 2009; R 2009) 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	(2010) Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM AMP 521	(2001) Pipe Railing Manual

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 25	(1997; E 2004) Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II

1.2 ADMINISTRATIVE REQUIREMENTS

1.2.1 Pre-Installation 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. 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. Anchorage and fastening systems

1.3 PERFORMANCE REQUIREMENTS

Structural Performance of Railings: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

a. Handrails:

    1. Uniform load of 50 lbf/ ft. applied in any direction.
    2. Concentrated load of 200 lbf applied in any direction.
    3. Uniform and concentrated loads need not be assumed to act concurrently.

b. Top Rails of Guards:

    1. Uniform load of 50 lbf/ ft. applied in any direction.
    2. Concentrated load of 200 lbf applied in any direction.
    3. Uniform and concentrated loads need not be assumed to act concurrently.

c. Infill of Guards:

1. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft..
2. Uniform load of 25 lbf/sq. ft. applied horizontally.
3. Infill load and other loads need not be assumed to act concurrently.

Seismic Performance: Provide metal railings capable of withstanding the effects of earthquake motions determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures" and information provided on the Structural drawings.

The design shall be in accordance with the aesthetic design intent of the project, possibly requiring structural profiles different from the minimum structural requirements. The Architect shall have final authority in reference to these aesthetic matters.

a. All proposed deviations from the specification and drawings must be so noted on the submittal drawings.
b. Approval of the submittals does not constitute approval of changes to the design intent without proper notification of same.

Delegated Design: Manufacturer's responsibilities include using a qualified professional engineer to prepare comprehensive structural calculations for railing members and connections, using performance requirements and design criteria indicated.

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-02 Shop Drawings - are to be signed and sealed by the qualified professional engineer designing the railings.

Fabrication Drawings; G

Iron and Steel Hardware; G

Steel Shapes, Plates, Bars and Strips; G

SD-03 Product Data

Structural Steel Plates, Shapes, and Bars; G

Structural Steel Tubing; G

Cold-Finished Steel Bars; G

Hot-Rolled Carbon Steel Bars; G

Cold-Drawn Steel Tubing; G

Concrete Inserts; G

Masonry Anchorage Devices; G

Protective Coating; G

Steel Railings and Handrails; G

Anchorage and Fastening Systems; G

SD-05 Design Data

Design Calculations; G, FIO

SD-07 Certificates

Welding Procedures; G

Welder Qualification; G

Initial Certification Letter from Contractor's Delegated-Design Professional Engineer; G, FIO

SD-08 Manufacturer's Instructions

Installation Instructions; G

SD-11 Closeout Submittals

Final Certification Letter from Contractor's Delegated-Design Professional Engineer; G, FIO

1.5 QUALITY ASSURANCE

1.5.1 Design Calculations

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.

1.5.2 Initial Certification Letter from Contractor's Delegated-Design 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. Initial 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 Stairs.
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 Stairs have been performed in accordance with the Professional Engineer's design.

1.5.3 Final Certification Letter from Contractor's Delegated-Design Professional Engineer

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.

1.5.4 Welding Procedures

Section 05 05 23 WELDING, STRUCTURAL applies to work specified in this section.

Submit 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.

1.5.5 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 be performed on test pieces in positions and with clearances equivalent to those actually encountered. If a test weld fails to meet requirements, make an immediate retest of two test welds and ensure 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.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

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 referenced in this section. Include in the drawings wood components which are part of the railing construction.

Pre-assemble 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, prior to cleaning, treating, and application of surface finishes, including zinc coatings.

For fabrication of wood components in the railing construction, see Section 06 20 00 FINISH CARPENTRY.

2.2 GENERAL FABRICATION

Provide railings and handrails 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 required size and thickness to produce adequate strength and durability in finished product for intended use. Work materials to dimensions indicated on approved detail drawings, using proven details of fabrication and support. Use 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 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 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 flathead (countersunk) 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.

2.3 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.

2.4 STRUCTURAL STEEL TUBING

Provide structural steel tubing, hot-formed, welded or seamless, conforming to ASTM A500/A500M, Grade B, unless otherwise noted.

2.5 HOT-ROLLED CARBON STEEL BARS

Provide bars and bar-size shapes conforming to ASTM A575, grade as selected by the fabricator.

2.6 COLD-FINISHED STEEL BARS

Provide cold-finished steel bars conforming to ASTM A108, grade as selected by the fabricator.

2.7 COLD-DRAWN STEEL TUBING

Provide tubing conforming to ASTM A512, sunk drawn, butt-welded, cold-finished, and stress-relieved.

2.8 STEEL PIPE

Provide pipe conforming to ASTM A53/A53M, type as selected, Grade B; primed finish, unless galvanizing is required; standard weight (Schedule 40).

2.9 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 galvanized 1/8-inchthick pressed steel plate conforming to ASTM A283/A283M, made of box-type welded construction with slot designed to receive 3/4-inch diameter square-head bolt with knockout cover; and hot-dip galvanized in accordance with ASTM A123/A123M.

2.10 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 anchors 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 A325, ASTM A449 and ASTM C636/C636M, type, class, and style as required.

2.11 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.

2.12 PROTECTIVE COATING

Shop prime steelwork with red oxide primer in accordance with SSPC Paint 25.

Shop prime steelwork as indicated in accordance with Section 09 90 00 PAINTS AND COATINGS except surfaces of steel to be encased in concrete, surfaces to be welded, contact surfaces to be high-strength bolt connected, and surfaces of crane rails.

Provide hot dipped galvanized steelwork as indicated in accordance with ASTM A123/A123M. Touch up abraded surfaces and cut ends of galvanized members with zinc-dust, zinc-oxide primer, or an approved galvanizing repair compound.

2.13 STEEL RAILINGS AND HANDRAILS

NAAMM AMP 521, provide the same size rail and post. Provide pipe collars of the same material and finish as the handrail and posts.

2.13.1 Steel Handrails

Provide steel handrails, including inserts in concrete or structural tubing conforming to ASTM A500/A500M, Grade A or B of equivalent strength or ASTM A513/A513M, Type 5 (mandrel drawn). Provide steel railings of 1 1/2 inches nominal size, hot-dip galvanized and shop painted.

a. Fabrication: Joint posts, rail, and corners by one of the following methods:

(1) 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.

(2) Railings may be bent at corners in lieu of jointing, provided bends are made in suitable jigs and the pipe is not crushed.

b. Provide removable sections as indicated.

Provide kickplates between railing posts where indicated, and consist 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.

Provide black steel pipe for interior railings.

Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

The railing design shall be in accordance with the aesthetic design intent of the project, possibly requiring structural profiles different from the minimum structural requirements. Contact the Contracting Officer if such revisions are required.

Delegated Design: The manufacturer's responsibilities include using a qualified professional engineer to prepare comprehensive structural calculations for metal railing members and connections, using performance requirements and design criteria indicated.

PART 3 EXECUTION

3.1 INSTALLATION INSTRUCTIONS

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. Cold finished steel bars

d. Hot-Rolled carbon steel bars

e. Cold-Drawn steel tubing

f. Protective coating

g. Masonry anchorage devices

h. Steel railings and handrails

i. 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 referenced in this section.

3.2 PREPARATION

Adjust stair railings and handrails prior to securing in place to ensure proper matching at butting joints and correct alignment throughout their length. Where posts are indicated, space posts not more than 5 feet on center. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:

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 post and sleeve with molten lead, sulfur, or a quick-setting hydraulic cement. Cover anchorage joint with a round steel flange welded to the post.

Weld posts to steel stringers as indicated or where posts are not indicated, weld railing system directly to steel stair members as indicated.

Anchor rail ends into concrete and masonry with steel round flanges welded to rail ends and anchored into the wall construction with lead expansion shields and bolts.

Anchor rail ends to steel with steel brackets welded to rail and to the steel stair members or railing post as indicated.

Secure handrails to walls by means of wall brackets and return handrail to wall surface at ends. Provide brackets of malleable iron castings, with not less than 2-1/4-inch clearance from the finish wall surface to the wall side face 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:

For concrete and solid masonry anchorage, use bolt anchor expansion shields and lag bolts.

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.

3.3 STEEL HANDRAIL

Install in pipe sleeves embedded in concrete and filled with non-shrink grout or quick setting anchoring cement with anchorage covered with

standard pipe collar pinned to post masonry with expansion shields and bolts or toggle bolts, by means of posts and other railing members welded to stringers or structural steel frame work. Secure rail ends as indicated.

3.4 FIELD WELDING

Ensure 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. Grind welds smooth.

3.5 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.

-- End of Section --

SECTION 06 10 00

ROUGH CARPENTRY
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.

AMERICAN FOREST AND PAPER ASSOCIATION (AF&PA)

AF&PA T10	(2001) Wood Frame Construction Manual for One- and Two-Family Dwellings
AF&PA T101	(2005) National Design Specification (NDS) for Wood Construction

AMERICAN INSTITUTE OF TIMBER CONSTRUCTION (AITC)

AITC 111	(2005) Recommended Practice for Protection of Structural Glued Laminated Timber During Transit, Storage and Erection

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)

ALSC PS 20	(2010) American Softwood Lumber Standard

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA BOOK	(2012) AWPA Book of Standards
AWPA M2	(2011) Standard for Inspection of Treated Wood Products
AWPA M6	(2007) Brands Used on Forest Products
AWPA P18	(2010) Nonpressure Preservatives
AWPA P49	(2010) Standard for Fire Retardant FR-1
AWPA P5	(2010) Standard for Waterborne Preservatives
AWPA T1	(2012) Use Category System: Processing and Treatment Standard
AWPA U1	(2012) Use Category System: User Specification for Treated Wood

THE ENGINEERED WOOD ASSOCIATION (APA)

APA E445	(2002) Performance Standards and Qualification Policy for Structural-Use Panels (APA PRP-108)

APA EWS R540	(2007) Builder Tips Proper Storage and Handling of Glulam Beams
APA F405	(1999) Performance Rated Panels
APA L870	(2010) Voluntary Product Standard, PS 1-09, Structural Plywood
APA S350	(2011) Performance Standard for Wood-Based Structural-Use Panels

ASME INTERNATIONAL (ASME)

ASME B18.2.1	(2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(2010) Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
ASME B18.5.2.1M	(2006; R 2011) Metric Round Head Short Square Neck Bolts
ASME B18.5.2.2M	(1982; R 2010) Metric Round Head Square Neck Bolts
ASME B18.6.1	(1981; R 2008) Wood Screws (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM A153/A153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A307	(2014) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM D2898	(2010) Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing
ASTM D6007	(2002; R 2008) Standard Test Method for Determining Formaldehyde Concentration in Air from Wood Products Using a Small Scale Chamber
ASTM D6330	(1998; R 2008) Standard Practice for Determination of Volatile Organic Compounds (Excluding Formaldehyde) Emissions from Wood-Based Panels Using Small Environmental Chambers Under Defined Test Conditions
ASTM E1333	(2010) Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber

ASTM F1667	(2011a; E 2012) Driven Fasteners: Nails, Spikes, and Staples
ASTM F547	(2006; R 2012) Nails for Use with Wood and Wood-Base Materials

FM GLOBAL (FM)

FM 4435	(2004) Roof Perimeter Flashing

FOREST STEWARDSHIP COUNCIL (FSC)

FSC STD 01 001	(2000) Principles and Criteria for Forest Stewardship

GREEN SEAL (GS)

GS-36	(2000) Commercial Adhesives

NATIONAL HARDWOOD LUMBER ASSOCIATION (NHLA)

NHLA Rules	(2007) Rules for the Measurement & Inspection of Hardwood & Cypress

NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)

NELMA Grading Rules	(2006) 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	(1989; R 2005) Adhesive and Sealant Applications

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	(2002) Standard Grading Rules for Southern Pine Lumber

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-1923	(Rev A; Notice 2) Shield, Expansion (Lag, Machine and Externally Threaded Wedge Bolt Anchors)
CID A-A-1924	(Rev A; Notice 2) Shield, Expansion (Self Drilling Tubular Expansion Shell Bolt Anchors

CID A-A-1925	(Rev A; Notice 2) Shield Expansion (Nail Anchors)

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC	(2009) Leadership in Energy and Environmental Design(tm) New Construction Rating System

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

WCLIB 17	(2000) Standard Grading Rules

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

WWPA G-5	(1998) 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 Contractor Quality Control approval. The following shall be submitted 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

Local/Regional Materials; (LEED NC)

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.

Engineered wood products; (LEED NC)

Submit documentation verifying that no urea-formaldehyde resins were used.

Adhesives; (LEED NC)

Submit manufacturer's product data, indicating VOC content.

SD-06 Test Reports

Preservative-treated lumber and plywood

SD-07 Certificates

Forest Stewardship Council (FSC) Certification; (LEED NC)

Certificates of grade

Manufacturer's certificates (approved by an American Lumber Standards approved agency) attesting that lumber and material not normally grade marked meet the specified requirements. Certificate of Inspection for grade marked material by an American Lumber Standards Committee (ALSC) recognized inspection agency prior to shipment.

Preservative treatment

SD-10 Operation and Maintenance Data

Take-back program

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/or reuse.

SD-11 Closeout Submittals

Local/Regional Materials; (LEED NC)

LEED documentation relative to local/regional materials credit in accordance with LEED Reference Guide. Include in LEED Documentation Notebook.

Adhesives; (LEED NC)

LEED documentation relative to low emitting materials credit in accordance with LEED Reference Guide. Include in LEED Documentation Notebook.

Engineered Wood Products; (LEED NC)
Structural-Use and Oriented Strand Board (OSB) Panels; (LEED NC)

LEED documentation relative to low emitting materials credit in accordance with LEED Reference Guide. Include in LEED Documentation Notebook.

Certified Wood; (LEED NC)

LEED documentation relative to certified wood credit in accordance with LEED Reference Guide. Include in LEED Documentation Notebook.

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. Laminated timber shall be handled and stored in accordance with AITC 111 or APA EWS R540. 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 shall be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. Surfaces that are to be exposed to view shall 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 shall 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 shall not bear grademarks or other types of identifying marks.

1.4.3 Preservative-Treated Lumber and Plywood

The Contractor shall be responsible for the quality of treated wood products. Each treated piece shall be inspected in accordance with AWPA M2 and permanently marked or branded, by the producer, in accordance with AWPA M6. The Contractor shall provide Contracting Officer's Representative (COR) with the inspection report of an approved independent inspection agency that offered products comply with applicable AWPA Standards. The appropriate Quality Mark on each piece will be accepted, in lieu of inspection reports, as evidence of compliance with applicable AWPA treatment standards.

1.4.4 Fire-Retardant Treated Lumber

Mark each piece in accordance with AWPA M6, except pieces that are to be natural or transparent finished. In addition, exterior fire-retardant lumber shall 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.

1.5 SIZES AND SURFACING

ALSC PS 20 for dressed sizes of yard and structural lumber. Lumber shall be surfaced four sides. Size references, unless otherwise specified, are nominal sizes, and actual sizes shall 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 shall be as follows at the time of delivery to the job site:

a. Framing lumber and board, 19 percent maximum

b. Timbers 5 inches and thicker, 25 percent maximum

c. Materials other than lumber; moisture content shall 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 shall conform to the requirements of AWPA BOOK Use Category System Standards U1 and T1. Pressure-treated wood products shall 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 shall not exceed the limits of the U.S. EPA's Toxic Characteristic Leaching Procedure (TCLP), and shall 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.

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 shall be air or kiln dried after treatment. Specific treatments shall 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. The following items shall 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.

    1. Wood furring and nailers that are set into or in contact with concrete or masonry.

    2. Nailers, edge strips, crickets, curbs, and cants for roof decks.

1.7.1 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 shall be pressure treated with fire retardants conforming to AWPA P49. Fire retardant treatment of wood products shall

conform to the requirements of AWPA U1, Commodity Specification H and AWPA T1, Section H. Treatment and performance inspection shall be by an independent and qualified testing agency that establishes performance ratings. Each piece or bundle of treated material shall bear identification of the testing agency to indicate performance in accordance with such rating. Treated materials to be exposed to rain wetting shall 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, shall receive exterior fire-retardant treatment. Fire-retardant-treated wood products shall be free of halogens, sulfates, ammonium phosphate, and formaldehyde. Items to be treated include the following:

a. Blocking used in non-combustible walls.

1.9 QUALITY ASSURANCE

1.9.1 Drawing Requirements

For fabricated structural members, trusses, qlu-lam members, indicate materials, details of construction, methods of fastening, and erection details. Include reference to design criteria used and manufacturers design calculations. Submit drawings for all proposed modifications of structural members. Do not proceed with modifications until the submittal has been approved.

1.9.2 Certificates of Grade

Submit certificates attesting that products meet the grade requirements specified in lieu of grade markings where appearance is important and grade marks will deface material.

1.9.3 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 products at interior spaces, provide temporary ventilation.

1.11 SUSTAINABLE DESIGN REQUIREMENTS

1.11.1 Local/Regional Materials

Use materials or products extracted, harvested, or recovered, as well as manufactured, within a 500 mile radius from the project site, if available from a minimum of three sources. See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total local material requirements. Wood and materials may be locally available.

1.11.2 Certified Wood

Wood products shall be FSC-certified as specified herein. See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total certified wood requirements.

1.11.3 Forest Stewardship Council (FSC) Certification

Use FSC-certified wood where specified. Provide letter of certification signed by lumber supplier. Indicate compliance with FSC STD 01 001 and identify certifying organization. Submit FSC certification numbers; identify each certified product on a line-item basis. Submit copies of invoices bearing the FSC certification numbers.

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. Lumber shall be FSC-certified.

2.1.2 Engineered Wood Products

Products shall be FSC-certified and shall contain no added urea-formaldehyde if exposed to interior spaces. Determine formaldehyde concentrations in air from engineered wood products under test conditions of temperature and relative humidity in accordance with ASTM D6007 or ASTM E1333. Products shall not be used if formaldehyde concentration is found to be greater than 0. Determine Volatile Organic Compounds (VOCs), excluding formaldehyde, emitted from manufactured wood-based panels in accordance with ASTM D6330. Products shall not be used if VOC emissions exceed those allowable.

2.1.3 Natural Decay- and Insect-Resistant Wood

Naturally durable wood shall be FSC-certified or salvaged. An occasional piece with corner sapwood shall be permitted if 90 percent or more of the width of each side on which the sapwood occurs is heartwood.

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 shall be one of the species listed in the table below. Minimum grade of species shall be as listed.

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,	All Species: Standard
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	No. 2 Boards
SCMA Spec standard specifications	Cypress	No. 2 Common	No. 2 Common

Table of Grades for Framing and Board Lumber			
Grading Rules	Species	Framing	Board Lumber
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,	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,	Construction Heart
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 Subflooring

2.3.1.1 Plywood

C-D Grade, Exposure 1 durability classification, Span rating of 24/16 or greater. FSC-certified.

2.3.2 Other Uses

2.3.2.1 Plywood

Plywood for for blocking and backing panels. Plywood shall be FSC-certified.

2.4 OTHER MATERIALS

2.4.1 Miscellaneous Wood Members

2.4.1.1 Blocking

Blocking shall be standard or number 2 grade.

2.4.1.2 Rough Bucks and Frames

Rough bucks and frames shall be straight standard or number 2 grade.

2.4.2 Adhesives

Comply with applicable regulations regarding toxic and hazardous materials, GS-36, SCAQMD Rule 1168, and as specified. Use water-based adhesives with maximum VOC content of 15 grams/liter for all interior applications. Interior adhesives, sealants, primers and sealants used as filler must meet the requirements of LEED low emitting materials credit.

2.5 ROUGH HARDWARE

Unless otherwise indicated or specified, rough hardware shall be of the type and size necessary for the project requirements. Sizes, types, and spacing of fastenings of manufactured building materials shall be as recommended by the product manufacturer unless otherwise indicated or specified. Fasteners shall be fabricated from 100 percent re-melted steel. See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total recycled content requirements. Fasteners may contain post-consumer or post-industrial recycled content. Rough hardware exposed to the weather or embedded in or in contact with preservative treated wood, exterior masonry, or concrete walls or slabs shall 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 shall be copper alloy or hot-dipped galvanized fasteners as recommended by the treated wood manufacturer.

2.5.1 Bolts, Nuts, Studs, and Rivets

ASME B18.2.1, ASME B18.5.2.1M, ASME B18.5.2.2M and ASME B18.2.2.

2.5.2 Anchor Bolts

ASTM A307, size as indicated, complete with nuts and washers.

2.5.3 Expansion Shields

CID A-A-1923, CID A-A-1924, and CID A-A-1925. Except as shown otherwise, maximum size of devices shall be 3/8 inch.

2.5.4 Lag Screws and Lag Bolts

ASME B18.2.1.

2.5.5 Wood Screws

ASME B18.6.1.

2.5.6 Nails

ASTM F547, size and type best suited for purpose. For sheathing and subflooring, length of nails shall be sufficient to extend 1 inch into supports. In general, 8-penny or larger nails shall be used for nailing through 1 inch thick lumber and for toe nailing 2 inch thick lumber; 16-penny or larger nails shall be used for nailing through 2 inch thick lumber. Nails used with treated lumber and sheathing shall be hot-dipped galvanized in accordance with ASTM A153/A153M. Nailing shall be in accordance with the recommended nailing schedule contained in AF&PA T10. Where detailed nailing requirements are not specified, nail size and spacing shall be sufficient to develop an adequate strength for the connection. The connection's strength shall be verified against the nail

capacity tables in AF&PA T101. Reasonable judgment backed by experience shall ensure that the designed connection will not cause the wood to split. If a load situation exceeds a reasonable limit for nails, a specialized connector shall be used.

2.5.7 Wire Nails

ASTM F1667.

PART 3 EXECUTION

3.1 INSTALLATION

Conform to AF&PA T10 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. Frame members for the passage of pipes, conduits, and ducts.

3.1.1 Anchors in Concrete

Except where indicated otherwise, embed anchor bolts not less than 8 inches in poured concrete walls and provide each with a nut and a 2 inch diameter washer at bottom end. A bent end may be substituted for the nut and washer; bend shall be not less than 90 degrees. Powder-actuated fasteners spaced 3 feet o.c. may be provided in lieu of bolts for single thickness plates on concrete.

3.1.2 Anchors in Masonry

Except where indicated otherwise, embed anchor bolts not less than 15 inches in masonry unit walls and provide each with a nut and a 2 inch diameter washer at bottom end. Fully grout bolts with mortar.

3.2 MISCELLANEOUS

3.2.1 Wood Roof Nailers, Edge Strips, Crickets, Curbs, and Cants

Provide sizes and configurations indicated or specified and anchored securely to continuous construction.

3.2.1.1 Roof Edge Strips and Nailers

Provide at perimeter of roof, around openings through roof, and where roofs abut walls, curbs, and other vertical surfaces. Except where indicated otherwise, nailers shall be 6 inches wide and the same thickness as the insulation. Anchor nailers securely to underlying construction. Anchor perimeter nailers in accordance with FM 4435. Strips shall be grooved as indicated for edge venting; install at walls, curbs, and other vertical surfaces with a 1/4 to 1/2 inch air space.

3.2.1.2 Crickets, Cants, and Curbs

Provide wood cant strips, curbs for scuttles and wood nailers bolted to tops of concrete or masonry curbs and at expansion joints, as indicated, specified, or necessary and of lumber or 3/4 inch thick exterior plywood.

3.2.2 Rough Wood Bucks

Size as indicated 2 inch nominal thickness. Set wood bucks true and plumb. Anchor bucks to concrete or masonry with steel straps extending into the wall 8 inches minimum. Place anchors near the top and bottom of the buck and space uniformly at 2 foot maximum intervals.

3.2.3 Wood Blocking

Provide proper sizes and shapes at proper locations for the installation and attachment of wood and other finish materials, fixtures, equipment, and items indicated or specified.

3.2.4 Wood Grounds

Provide for fastening wood trim, finish materials, and other items to plastered walls and ceilings. Install grounds in proper alignment and true with an 8 foot straightedge.

3.2.5 Wood Furring

Provide where shown and as necessary for facing materials specified. Except as shown otherwise, furring strips shall 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 shall be plumb, rigid, and level and shall be shimmed as necessary to provide a true, even plane with surfaces suitable to receive the finish required. Form furring for offsets and breaks in walls or ceilings on 1 by 4 wood strips spaced 16 inches o.c.

3.2.6 Temporary Closures

Provide with hinged doors and padlocks and install during construction at exterior doorways and other ground level openings that are not otherwise closed. Cover windows and other unprotected openings with polyethylene or other approved material, stretched on wood frames. Provide dustproof barrier partitions to isolate areas as directed.

3.2.7 Wood Sleepers

Run wood sleepers in lengths as long as practicable and stagger end joints in adjacent rows. Sleepers for gymnasium floors are specified in Section entitled "Gymnasium-Type Hardwood Strip Flooring Systems."

3.3 ERECTION TOLERANCES

a. Framing members which will be covered by finishes such as wallboard, plaster, or ceramic tile set in a mortar setting bed, shall be within the following limits:

   (1) Face of framing members: 1/4 inch in 8 feet from a true plane.

b. Framing members which will be covered by ceramic tile set in dry-set mortar, latex-portland cement mortar, or organic adhesive shall be within the following limits:

   (1) Face of framing members: 1/8 in 8 feet from a true plane.

3.4 WASTE MANAGEMENT

In accordance with the Waste Management Plan and as specified. Separate and reuse scrap sheet materials larger than 2 square feet, framing members larger than 16 inches, and multiple offcuts of any size larger than 12 inches. Clearly separate damaged wood and other scrap lumber for acceptable alternative uses on site, including bracing, blocking, cripples, ties, and shims.

Separate composite wood from other wood types and recycle or reuse. Coordinate with manufacturer for take-back program and submit manufacturer's policy statement on program. Fold up metal banding, flatten, and recycle.

Separate treated, stained, painted, and contaminated wood and place in designated area for hazardous materials. Dispose of according to local regulations. Do not leave any wood, shavings, sawdust, or other wood waste buried in fill or on the ground, unless for planned future use. Prevent sawdust and wood shavings from entering the storm drainage system. Compost sawdust. Do not burn scrap lumber that has been pressure treated, or lumber that is less than one year old.

-- End of Section --

SECTION 06 20 00

FINISH CARPENTRY
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.

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)

ALSC PS 20	(2010) American Softwood Lumber Standard

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A208.2	(2009) Medium Density Fiberboard (MDF) for Interior Applications

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA C20	(2003) Structural Lumber Fire-Retardant Treatment by Pressure Processes
AWPA C27	(2002) Plywood - Fire-Retardant Treatment by Pressure Processes

THE ENGINEERED WOOD ASSOCIATION (APA)

APA L870	(2010) Voluntary Product Standard, PS 1-09, Structural Plywood

ARCHITECTURAL WOODWORK INSTITUTE (AWI)

AWI AWS	(2009) Architectural Woodwork Standards

ASME INTERNATIONAL (ASME)

ASME B18.2.1	(2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(2010) Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
ASME B18.6.1	(1981; R 2008) Wood Screws (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM F547	(2006; R 2012) Nails for Use with Wood and Wood-Base Materials

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.9	(2010) Cabinet Hardware

HARDWOOD PLYWOOD AND VENEER ASSOCIATION (HPVA)

HPVA HP-1	(2009) American National Standard for Hardwood and Decorative Plywood

NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)

NELMA Grading Rules	(2006) Standard Grading Rules for Northeastern Lumber

THE ENGINEERED WOOD ASSOCIATION (APA)

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

WWPA G-5	(1998) Western Lumber Grading Rules

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

WDMA I.S.4	(2013) Preservative Treatment for Millwork

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. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G

SD-03 Product Data

Wood Items; G

Manufacturer's printed data indicating the usage of engineered or recycled wood products, and environmentally safe fire-retardant treatments.

Submit sample of wood veneer with stain. Sample to be no less than 6 inches x 6 inches for Review

SD-07 Certificates

Certificates of grade

Certificates of compliance

1.3 DETAIL DRAWINGS

The Contractor shall submit detail drawings showing fabricated items and special mill and woodwork items. Drawings shall indicate materials and details of construction, methods of fastening, erection, and installation.

1.4 CERTIFICATES

Provide certificates of grade from the grading agency on graded but unmarked lumber or plywood attesting that materials meet the grade

requirements specified herein.

Provide certificates of compliance unless materials bear certification markings or statements.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver lumber, plywood, trim, and millwork to job site 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. Do not store products in building until wet trade materials are dry.

1.6 QUALITY ASSURANCE

1.6.1 Lumber

Identify each piece or each bundle of lumber, millwork, and trim by the grade mark of a recognized association or independent inspection agency that is certified by the Board of Review, American Lumber Standards Committee, to grade the species.

1.6.2 Plywood

Each sheet of plywood shall bear the mark of a recognized association or independent inspection agency that maintains continuing control over quality of the plywood. Mark shall identify plywood by species group or span rating, and shall show exposure durability classification, grade, and compliance with APA L870.

1.6.3 Medium Density Fiberboard

Materials shall bear a marking or statement identifying the producer and the applicable standard.

1.6.4 Nonpressure-Treated Woodwork and Millwork

Mark, stamp, or label, indicating compliance with WDMA I.S.4.

1.6.5 Fire-Retardant Treated Lumber

Each piece to bear Underwriters Laboratories label or the label of another nationally recognized independent testing laboratory.

PART 2 PRODUCTS

2.1 WOOD

2.1.1 Sizes and Patterns of Wood Products

Yard and board lumber sizes shall conform to ALSC PS 20. Provide shaped lumber and millwork in the patterns indicated and standard patterns of the association covering the species. Size references, unless otherwise specified, are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the applicable standard.

2.1.2 Trim, Finish, and Frames

Provide species and grades listed for materials to be stained, natural, or transparent finished. Provide species indicated for materials to be transparent finished. Run trim, except window stools and aprons with hollow backs.

Provide hardwood trim and caps of species: Red Oak, finish and appearance to match flush acoustical wood wall panels. Hardwood trim is to be AWI AWS Grade I.

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. per Special Western Red Cedar Rules.
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

2.1.3 Flush Wood Paneling (Wood-Veneer Wall Surfacing)

a. Grade: Premium.

b. Wood Species and Cut: See Finish Schedule.

c. Matching of Adjacent Veneer Leaves: Slip match.

d. Vertical Panel-Matching Method: Continuous end match; veneer leaves of upper panels are continuations of veneer leaves of lower panels.

e. Panel Core Construction: Medium-density fiberboard.

   1. Thickness: As indicated.

f. Exposed Panel Edges: Wood-veneer matching faces.

g. Panel Reveals: As indicated.

h. Assemble panels by gluing and concealed fastening.

i. Wood Paneling Materials

   1. Materials, General: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.

2. Wood Moisture Content: 5 to 10 percent.
3. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.

   a. Recycled Content of Medium-Density Fiberboard and Particleboard: Refer to Division 01 Section "Sustainable Design Requirements" for LEED requirements applicable to the work of this section.
   b. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.
   c. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.

4. Adhesives: Use adhesives that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.1.4 Utility Shelving

Utility shelving shall be a suitable species equal to or exceeding 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.

2.1.5 Softwood Plywood

APA L870, thicknesses as indicated.

a. Plywood for Shelving: Interior type, A-B Grade, any species group.

b. Plywood for Countertops: Exterior type, A-C Grade.

2.1.6 Hardwood Plywood

HPVA HP-1, Premium (A) Grade, hardwood veneer core construction, face veneers of Red Oak, of thickness indicated.

2.1.7 Medium Density Fiberboard (MDF)

MDF is to comply with ANSI A208.2 Grade 130, made with binder containing no urea/formaldehyde.

2.1.8 Marine Plywood

Marine plywood is to comply with AWI Standard for Premium (A) Grade.

2.1.9 Wood Seats

Clear red oak hardwood, thickness, sizes and details as indicated.

2.2 COUNTER TOPS

2.2.1 Solid Surface

For solid surface counter tops refer to section 06 61 16, SOLID POLYMER (SOLID SURFACING) FABRICATIONS.

2.3 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 job site, and when installed, shall be as follows:

a. 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.

b. Moisture content of other materials shall be in accordance with the applicable standards.

2.4 FIRE-RETARDANT TREATMENT

2.4.1 Wood Products

Fire-retardant treated lumber shall be pressure treated in accordance with AWPA C20. Fire-retardant treated plywood shall be pressure treated in accordance with AWPA C27. Material use shall be defined in AWPA C20 and AWPA C27 for Interior Type. Treatment and performance inspection shall be by a qualified independent testing agency that establishes performance ratings. Each piece or bundle of treated material shall bear identification of the testing agency to indicate performance with such rating.

Treat the following items:

Wood benches.

2.5 HARDWARE

Provide sizes, types, and spacings of manufactured building materials recommended by the product manufacturer except as otherwise indicated or specified.

2.5.1 Wood Screws

ASME B18.6.1.

2.5.2 Bolts, Nuts, Lag Screws, and Studs

ASME B18.2.1 and ASME B18.2.2.

2.5.3 Nails

Nails shall be the size and type best suited for the purpose and shall conform to ASTM F547. Nails shall be hot-dip galvanized or aluminum when used on exterior work. For siding, length of nails shall be sufficient to extend 1-1/2 inches into supports, including wood sheathing over framing. Screws for use where nailing is impractical shall be size best suited for purpose.

2.5.4 Adjustable Shelf Standards and Brackets

ANSI/BHMA A156.9, Type B04102, with shelf brackets Type B04112.

2.5.5 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 bracket for rods more than 48 inches long.

2.6 FABRICATION

2.6.1 Quality Standards (QS)

The terms "Premium," "Custom," and "Economy" refer to the quality grades defined in AWI AWS. Items not specified to be of a specific grade shall be Custom grade. The AWI QS is superseded by all contract document requirements indicated or stated herein.

2.6.2 Finish

Provide a natural factory finish on wood surfaces after fabrication. Finish shall be fabricator's standard natural finish, except that it shall be equivalent to one coat of sealer and one coat of spar varnish on all surfaces and a second coat of spar varnish on surfaces exposed to view. Sand lightly and wipe clean between coats. Finish color, appearance and sheen is to match that of red oak acoustical wall panels.

2.6.3 Benches and Trim

To be premium grade. Fabricate as indicated. Fasten to framing with suitable wood screws or bolts. Exposed surfaces are to be smooth with eased exposed edges.

2.6.4 Millwork With Transparent Finish (CTF)

2.6.4.1 AWI Quality Grade (CTF)

Premium grade.

2.6.4.2 Construction (CTF)

Details shall be as indicated.

2.6.4.3 Exposed Parts

Red oak specie, cut to match red oak acoustical panels specified for use on this project.

2.6.4.4 Semi-Exposed Parts

As specified in the AWI AWS for the grade selected.

2.6.5 Casework With High Pressure Laminate Finish (CHPL)

As specified in Section 06 41 16.00 LAMINATE CLAD ARCHITECTURAL CASEWORK.

PART 3 EXECUTION

3.1 FINISH WORK

Provide sizes, materials, and designs as indicated and as specified. Apply

primer to finish work before installing. Where practicable, shop assemble and finish items of built-up millwork. Joints shall be tight and constructed in a manner to conceal shrinkage. Miter trim and moldings at exterior angles and cope at interior angles and at returns. Material shall show no warp after installation. Install millwork and trim in maximum practical lengths. Fasten finish work with concealed fasteners where practicable. Set face fasteners for putty stopping or wood plugs depending on fastener's size.

3.1.1 Interior Finish Work

After installation, sand exposed surfaces smooth and apply finish where shop finishing is impractical.

3.1.2 Window Stools

Window stools are to be fabricated from solid polymer (solid surfacing) materials. See Section 06 61 16 SOLID POLYMER (SOLID SURFACING) FABRICATIONS for requirements.

3.1.3 Finish Stair Rail Work

Fit, nail, screw, bolt, and glue stair work together with metal railing to form a strong rigid structure without squeaks or vibrations. Anchor rail securely to metal railing framing. Return railing profile at ends and secure joints with bolts and nuts. Secure railing to metal railing with concealed anchors.

3.2 SHELVING

1 inch nominal thick wood shelf material or 3/4 or 23/32 inch thick plywood shelf material with solid hardwood edges supported substantially with end and intermediate supports and arranged to prevent buckling and sagging. Hook strips shall be 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 o.c.

3.2.1 Storage Closets

Provide storage rooms with shelves of size and arrangement as indicated 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.

3.2.2 Cleaning-Gear Closets

Provide shelves of size and arrangement indicated.

3.3 MISCELLANEOUS

3.3.1 Benches

Construct as indicated. Install level, plumb, and tight against adjacent construction. Fasten to walls with screws or toggle bolts and to floors with expansion bolts.

Support seats as indicated. Secure seats to supports with screws or bolts

as required; countersink heads of screws and bolts and fill holes with hardwood filler or hardwood plugs depending on fastener size, finished flush with tops of seats.

-- End of Section --

SECTION 06 41 16.00 20

LAMINATE CLAD ARCHITECTURAL CASEWORK
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

ARCHITECTURAL WOODWORK INSTITUTE (AWI)

AWI AWS	(2009) Architectural Woodwork Standards

ASTM INTERNATIONAL (ASTM)

ASTM F547	(2006; R 2012) Nails for Use with Wood and Wood-Base Materials

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.9	(2010) Cabinet Hardware

COMPOSITE PANEL ASSOCIATION (CPA)

CPA A208.2	(2009) Medium Density Fiberboard (MDF) for Interior Applications

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA LD 3	(2005) Standard for High-Pressure Decorative Laminates

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	Scientific Certification Systems (SCS)Indoor Advantage

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC	(2009) Leadership in Energy and Environmental Design(tm) New Construction Rating System

UL ENVIRONMENT (ULE)

ULE Greenguard	UL Greenguard Certification Program

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

WDMA I.S.1A (2011) Architectural Wood Flush Doors

1.2 SYSTEM DESCRIPTION

Work in this section includes laminate clad custom casework cabinets vanities as shown on the drawings and as described in this specification. This Section includes high-pressure laminate surfacing and cabinet hardware. 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 REQUIREMENTS

Materials in this technical specification may contribute towards contract compliance with sustainability requirements.

1.3.1 LEED REQUIREMENTS

See Section 01 33 29 LEED DOCUMENTATION for project LEED NC local/regional materials, low-emitting materials, recycled content, and certified wood requirements.

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-02 Shop Drawings

Shop Drawings
Installation

SD-03 Product Data

Wood Materials
Finish Schedule
Certification

SD-04 Samples

Plastic Laminates
Cabinet Hardware

SD-07 Certificates

Quality Assurance
Laminate Clad Casework

SD-11 Closeout Submittals

LEED Documentation

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 AWI AWS, 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 AWI AWS requirements, in general, and the specific AWI AWS 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, 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 on the drawings. 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

Product shall be third party certified in accordance with ULE Greenguard Gold, SCS Scientific Certification Systems Indoor Advantage Gold or equal. Certification shall be performed annually and shall be current.

1.6 DELIVERY, STORAGE, AND HANDLING

Casework may be delivered knockdown or fully assembled. Deliver all units to the site in undamaged condition, stored off the ground in fully enclosed areas, and protected from damage. 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.

2.1.2 Panel Products

2.1.2.1 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 POLYMER (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 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.

2.3.4 Backing Sheet (BK) Grade

Undecorated backing sheet grade laminate is formulated specifically to be used on the backside of plastic laminated panel substrates to enhance dimensional stability of the substrate. Backing sheet thickness 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 surfaces.

2.5 EDGE BANDING

Edge banding for casework doors and drawer fronts shall be PVC vinyl and shall be 0.020 inch thick. Material width shall be as indicated on the drawings. Color and pattern shall match exposed door and drawer front laminate pattern and color.

2.6 CABINET HARDWARE

Submit one sample of each cabinet hardware item specified to include hinges, pulls, drawer glides. All hardware shall conform to ANSI/BHMA A156.9, unless otherwise noted, and shall consist of the following components, all colors to be selected from manufacturer's standard colors:

a. Door Hinges: Concealed, self-closing type, BHMA No. B01602/B01603.

b. Cabinet Pulls: Nominal 4" by 1-1/2" projection anodized aluminum edge pulls with minimum 7/8 inch lip.

c. Drawer Slide: Side mounted type, BHMA No. B0511 with full extension and a minimum 100 pound load capacity. Slides shall include an integral stop to avoid accidental drawer removal.

d. Adjustable Shelf Support System:

(1) Recessed (mortised) metal standards, BHMA No. BO4071, finish: Stainless steel. Support clips for the standards shall be closed type, BHMA No. B04081, finish: Stainless steel.

2.7 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.

2.8 ADHESIVES, CAULKS, AND SEALANTS

2.8.1 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.

2.8.1.1 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 WDMA I.S.1A.

2.8.1.2 Laminate Adhesive

Adhesive used to join high-pressure decorative laminate to wood shall be adhesive consistent with AWI and laminate manufacturer's recommendations. PVC edgebanding shall be adhered using a polymer-based hot melt glue.

2.8.2 Caulk

Caulk used to fill voids and joints between laminated components and between laminated components and adjacent surfaces shall be clear, 100 percent silicone.

2.8.3 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.

2.9 ACCESSORIES

2.9.1 Grommets

Grommets shall be plastic 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 AWI AWS, 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:

a. Body Members (Ends, Divisions, Bottoms, and Tops): 3/4 inch medium density fiberboard (MDF) panel product.

b. Face Frames and Rails: 3/4 inch hardwood lumber.

c. Shelving: 3/4 inch medium density fiberboard (MDF) panel product.

d. Cabinet Backs: 1/4 inch medium density fiberboard (MDF) panel product.

e. Drawer Sides, Backs, and Subfronts: 1/2 inch hardwood lumber.

f. Drawer Bottoms: 1/4 inch medium density fiberboard (MDF) panel product.

g. Door and Drawer Fronts: 3/4-inch medium density fiberboard (MDF) panel

product.

2.10.1.2 Joinery Method for Case Body Members

a. Tops, Exposed Ends, and Bottoms.

(1) Stop dado, glued under pressure, and either nailed, stapled or screwed (fasteners will not be visible on exposed parts).

b. Exposed End Corner and Face Frame Attachment.

(1) For mitered joint: lock miter or spline or biscuit, glued under pressure (no visible fasteners).

c. 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:

(1) 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.

d. Cabinet Backs (Floor Standing Cabinets).

(1) Side bound, captured in grooves; glued and fastened to top and bottom.

e. 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. 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 fiberboard (MDF. All door and drawer front edges shall be surfaced with high pressure plastic laminate PVC edgebanding, color and pattern to match exterior face laminate.

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:

a. Drawer Sides and Backs For Laminate Finish: 1/2 inch thick 7-ply hardwood veneer core substrate.

b. Drawer Bottom: 1/4 inch thick veneer core panel product for transparent or plastic laminate finish.

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. All shelving top and bottom surfaces shall be finished with HPDL plastic laminate thermoset decorative overlay (melamine). .

2.10.5.2 Shelf Support System

The shelf support system shall be:

a. Pin Hole Method. Holes shall be drilled on the interior surface of the cabinet side walls. Holes shall be evenly spaced in two vertical columns The holes in each column shall be spaced 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. Holes shall be drilled to provide a level, stable surface when the shelf is resting on the shelf pins. Hole diameter shall be coordinated 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:

a. Base/Wall Cabinet Case Body.

(1) Exterior (exposed) surfaces to include exposed and semi-exposed face frame surfaces: HPDL Grade VGS.

(2) Interior (semi-exposed) surfaces to include interior back wall, bottom, and side walls: HPDL Grade CLS, for open units; Thermoset Decorative Overlay (melamine).

b. Adjustable Shelving.

(1) Top and bottom surfaces: HPDL Grade HGS, for open shelving; Thermoset Decorative Overlay (melamine), for closed shelving.

(2) All edges: PVC edgebanding.

c. Fixed Shelving.

(1) Top and bottom surfaces: HPDL Grade HGS, for open shelving; Thermoset Decorative Overlay (melamine), for closed shelving.

(2) Exposed edges: PVC edgebanding.

d. Door, Drawer Fronts, Access Panels.

(1) Exterior (exposed) and interior (semi-exposed) faces: HPDL Grade VGS.

(2) Edges: PVC edgebanding.

e. Drawer Assembly.

All interior and exterior surfaces: Thermoset Decorative Overlay (melamine).

f. Tolerances: Flushness, flatness, and joint tolerances of laminated surfaces shall meet the AWI AWS 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 AWI AWS 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 AWI AWS 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 . 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 . 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 AWI AWS 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.

-- End of Section --

SECTION 06 61 16

SOLID POLYMER (SOLID SURFACING) FABRICATIONS
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 D2583	(2013a) Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
ASTM D5116	(2010) Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products
ASTM D570	(1998; E 2010; R 2010) Standard Test Method for Water Absorption of Plastics
ASTM D638	(2010) Standard Test Method for Tensile Properties of Plastics
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM G21	(2013) Determining Resistance of Synthetic Polymeric Materials to Fungi

INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS (IAPMO)

IAPMO Z124.3	(2005) Plastic Lavatories
IAPMO Z124.6	(2007) Plastic Sinks

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

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	Scientific Certification Systems (SCS)Indoor Advantage

TILE COUNCIL OF NORTH AMERICA (TCNA)

TCA Hdbk	(2010) Handbook for Ceramic Tile Installation

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC	(2009) Leadership in Energy and Environmental Design(tm) New Construction Rating System

UL ENVIRONMENT (ULE)

ULE Greenguard	UL Greenguard Certification Program

1.2 SYSTEM DESCRIPTION

a. Work under this section includes vanities, countertops and window stools, and other items utilizing solid polymer (solid surfacing) fabrication as shown 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 polymer fabricated components and assemblies will require strong, correctly located structural support provided by other trades. To provide a stable, sound, secure installation, close coordination is required between the solid polymer 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, countertops, shelving, and all other solid polymer fabrications to the degree and extent recommended by the solid polymer manufacturer.

c. Appropriate staging areas for solid polymer fabrications. Allow variation in component size and location of openings of plus or minus 1/8 inch.

1.3 SUSTAINABILITY REQUIREMENTS

Materials in this technical specification may contribute towards contract compliance with sustainability requirements.

1.3.1 LEED REQUIREMENTS

See Section 01 33 29 LEED DOCUMENTATION for project LEED NC local/ regional materials and recycled content requirements.

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-02 Shop Drawings

Detail Drawings; G
Installation; G

SD-03 Product Data

Solid polymer material
Qualifications
Fabrications
Certification
VOC Content

SD-04 Samples

Material; G
Counter and Vanity Tops; G

SD-06 Test Reports

Solid polymer material

SD-07 Certificates

Fabrications
Qualifications

SD-10 Operation and Maintenance Data

Clean-up

SD-11 Closeout Submittals

LEED Documentation

1.5 QUALITY ASSURANCE

1.5.1 Qualifications

To ensure warranty coverage, solid polymer fabricators shall be certified to fabricate by the solid polymer material manufacturer being utilized. Mark all fabrications with the fabricator's certification label affixed in an inconspicuous location. Fabricators shall have a minimum of 5 years of experience working with solid polymer materials. Submit solid polymer manufacturer's certification attesting to fabricator qualification approval.

1.5.2 Mock-ups

Submit Detail 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 window stool and countertop where multiple units are required. The mock-up shall include all solid polymer components required to provide a completed unit. The mock-up shall utilize finishes in patterns and colors indicated on the drawings. 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.

1.5.3 Sustainable Design Certification

Product shall be third party certified in accordance with ULE Greenguard Gold, SCS Scientific Certification Systems Indoor Advantage Gold or equal.

VOC content and emissions shall be determined by ASTM D5116. Certification shall be performed annually and shall be current.

1.6 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. Materials shall be stored indoors and adequate precautions taken to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation, for duration of project.

1.7 WARRANTY

Provide manufacturer's warranty of ten years against defects in materials, excluding damages caused by physical or chemical abuse or excessive heat. Warranty shall provide for material and labor for replacement or repair of defective material for a period of ten years after component installation.

PART 2 PRODUCTS

2.1 MATERIAL

Provide solid polymer material that is a homogeneous filled solid polymer; not coated, laminated or of a composite construction; meeting IAPMO Z124.3 and IAPMO Z124.6 requirements. Material shall have minimum physical and performance properties specified. Superficial damage to a depth of 0.01 inch shall be repairable by sanding or polishing. Material thickness shall be as indicated on the drawings. In no case shall material be less than 1/4 inch in thickness. Submit a minimum 4 by 4 inch sample of each color and pattern for approval. Samples shall indicate full range of color and pattern variation. Approved samples shall be retained as a standard for this work. Submit test report results from an independent testing laboratory attesting that the submitted solid polymer material meets or exceeds each of the specified performance requirements.

2.1.1 Cast, 100 Percent Acrylic Polymer Solid Surfacing Material

Cast, 100 percent acrylic solid polymer material shall be composed of acrylic polymer, mineral fillers, and pigments and shall meet 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 D 696
Boiling Water Surface Resistance	No Change	ANSI/NEMA LD 3-3.05
High Temperature Resistance	No Change	ANSI/NEMA LD 3-3.06

PROPERTY	REQUIREMENT (min. or max.)	TEST PROCEDURE
Impact Resistance (Ball drop)		ANSI/NEMA LD 3-303
1/4 inch sheet	36 inches, 1/2 lb ball, no failure	
1/2 inch sheet	140 inches, 1/2 lb ball, no failure	
3/4 inch sheet	200 inches, 1/2 lb ball, no failure	
Mold & Mildew Growth	No growth	ASTM G21
Bacteria Growth	No growth	ASTM G21
Liquid Absorption (Weight in 24 hrs.)	0.1 percent max.	ASTM D570
Flammability		ASTM E84
Flame Spread	25 max.	
Smoke Developed	30 max.	
Sanitation	"Food Contact" approval	NSF/ANSI 51

2.1.2 Material Patterns and Colors

Patterns and colors for all solid polymer components and fabrications shall be those indicated on the project finish schedule. Pattern and color shall occur, and shall be consistent in appearance, throughout the entire depth (thickness) of the solid polymer material.

2.1.3 Surface Finish

Exposed finished surfaces and edges shall receive a uniform appearance. Exposed surface finish shall be as indicated on the drawings.

2.2 ACCESSORY PRODUCTS

Accessory products, as specified below, shall be manufactured by the solid polymer manufacturer or shall be products approved by the solid polymer manufacturer for use with the solid polymer materials being specified.

2.2.1 Seam Adhesive

Seam adhesive shall be a two-part adhesive kit to create permanent, inconspicuous, non-porous, hard seams and joints by chemical bond between solid polymer materials and components to create a monolithic appearance of the fabrication. Adhesive shall be approved by the solid polymer manufacturer. Adhesive shall be color-matched to the surfaces being bonded

where solid-colored, solid polymer materials are being bonded together. The seam adhesive shall be clear or color matched where particulate patterned, solid polymer materials are being bonded together.

2.2.2 Panel Adhesive

Panel adhesive shall be neoprene based panel adhesive meeting TCA Hdbk, Underwriter's Laboratories (UL) listed. Use this adhesive to bond solid polymer components to adjacent and underlying substrates.

2.2.3 Silicone Sealant

Sealant shall be a mildew-resistant, FDA and OSHA Nationally Recognized Testing Laboratory (NRTL) listed silicone sealant or caulk in a clear formulation. The silicone sealant shall be approved for use by the solid polymer manufacturer. Use sealant to seal all expansion joints between solid polymer components and all joints between solid polymer components and other adjacent surfaces such as walls, floors, ceiling, and plumbing fixtures.

2.2.4 Mounting Hardware

Provide mounting hardware, including sink/bowl clips, inserts and fasteners for attachment of undermount sinks and lavatories.

2.3 FABRICATIONS

Components shall be factory or shop fabricated 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 shall 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 polymer, joint adhesive, sealants, and heat reflective tape. Both the manufacturer of materials and the fabricator shall 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 polymer components using manufacturer's approved seam adhesive. Joints shall be inconspicuous in appearance and without voids to create a monolithic appearance.

2.3.2 Edge Finishing

Rout and finish component edges to a smooth, uniform appearance and finish. Edge shapes and treatments, including any inserts, shall be as detailed on the drawings. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.

2.3.3 Counter and Vanity Top Splashes

Fabricate backsplashes and end splashes from 1/2 inch thick solid surfacing material to be 4 inches high. Backsplashes and end splashes

shall be provided at locations indicated on the drawings. Backsplashes shall be shop fabricated and be loose, to be field attached.

2.3.3.1 End Splashes

End splashes shall be provided loose for installation at the jobsite after horizontal surfaces to which they are to be attached have been installed.

2.3.4 Window Stools

Fabricate window stools from 1/2 inch thick solid surfacing, solid polymer material. Dimensions, edge shape, and other details shall be as indicated on the drawings. All corners must be rounded where applicable.

2.3.5 Counter and Vanity Tops

Fabricate all solid surfacing, solid polymer counter top and vanity top components from 1/2 inch thick material. Edge details, dimensions, locations, and quantities shall be as indicated on the Drawings. Counter tops shall be complete with 4 inch high loose back and endsplashes where indicated on the drawings. Attach 2 inch wide reinforcing strip of polymer 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. The sample shall include the edge profile and backsplash as detailed on the project drawings. Solid polymer material shall be of a pattern and color as indicated on the drawings. Sample shall include at least one seam. Approved sample shall be retained as standard for this work. All corners must be rounded where applicable.

2.3.5.1 Counter Top With Sink

a. Stainless Steel or Vitreous China Sink. Countertops with sinks shall include cutouts to template as furnished by the sink manufacturer. Manufacturer's standard sink mounting hardware for stainless steel vitreous china, self-rimming installation shall be provided. Seam between sink and counter top shall be sealed with silicone sealant. Sink, faucet, and plumbing requirements shall be in accordance with Section 22 00 00 PLUMBING,GENERAL PURPOSE.

2.3.5.2 Vanity Tops With Bowls

a. Countertops with vitreous china bowls shall include cutouts to template as furnished by the sink manufacturer. Manufacturer's standard sink mounting hardware for vitreous china self-rimming installation shall be provided. Seam between sink and counter top shall be sealed with silicone sealant. Sink, faucet, and plumbing requirements shall be in accordance with Section 22 00 00 PLUMBING,GENERAL PURPOSE.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Components

Install all components and fabricated units plumb, level, and rigid. Make field joints between solid polymer components using solid polymer 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 polymer

manufacturer's recommended clear silicone sealant and mounting hardware. Solid polymer sinks and bowls shall be installed using a color-matched seam adhesive. Plumbing connections to sinks and lavatories shall be made in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.

3.1.1.1 Loose Counter Top Splashes

Mount loose splashes in the locations noted on the drawings. Loose splashes shall be adhered to the counter top with a color matched silicone sealant when the solid polymer components are solid colors. Use a clear silicone sealant to provide adhesion of particulate patterned solid polymer splashes to counter tops. All corners must be rounded where applicable.

3.1.2 Silicone Sealant

Use a clear, silicone sealant or caulk to seal all expansion joints between solid polymer components and all joints between solid polymer components and other adjacent surfaces such as walls, floors, ceiling, and plumbing fixtures. Sealant bead shall be smooth and uniform in appearance and shall be the minimum size necessary to bridge any gaps between the solid surfacing material and the adjacent surface. Bead shall be continuous 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 shall be cleaned after installation and covered to protect against damage during completion of the remaining project items. Components damaged after installation by other trades will be repaired or replaced at the General Contractor's cost. Component supplier will provide a repair/replace cost estimate to the General Contractor who shall approve estimate before repairs are made. Submit a minimum of six copies of maintenance data indicating manufacturer's care, repair and cleaning instructions. Maintenance video shall be provided,if available. Maintenance kit for matte finishes shall be submitted.

-- End of Section --

SECTION 07 08 27.00 10

BUILDING AIR BARRIER SYSTEM TESTING FOR COMMISSIONING
02/13

PART 1 GENERAL

1.1 SUMMARY

The air barrier shall be contiguous and connected across the six surfaces of the enclosed air barrier envelope indicated. Perform building thermography and air barrier leakage tests to demonstrate that the air barrier materials are properly installed and joined; that windows, doors, dampers, and ducts are sufficiently air tight; and that the overall air barrier envelope is sealed. The quality of the construction of the air barrier systems, including the joining and sealing of the air barrier materials and accessories must be sufficient to limit leakage under pressure to the maximum leakage functional requirements outlined in this specification.

Passing an air barrier leakage test and thermography test to demonstrate that the building envelope is properly sealed and insulated will result in system acceptance. Report the results of the thermograph and leakage tests. The testing and reporting shall be performed in accordance with the procedures outlined in this specification.

1.2 REFERENCES

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

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ASNT CP-105	(2011) ASNT Standard Topical Outlines for Qualification of Nondestructive Testing Personnel - Item No. 2821
ASNT SNT-TC-1A	(2011; Text Correction 2013) Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing

ASTM INTERNATIONAL (ASTM)

ASTM C1060	(2011a) Standard Practice for Thermographic Inspection of Insulation Installations in Envelope Cavities of Frame Buildings
ASTM D4541	(2009; E 2010) Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM E1105	(2000; R 2008) 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 E1186	(2003; R 2009) Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems
ASTM E1827	(2011) Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door
ASTM E779	(2010) Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
ASTM E783	(2002; R 2010) Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 6781	(1983) Thermal Insulation - Qualitative Detection of Thermal Irregularities in Building Envelopes - Infrared Method

1.3 DEFINITIONS

The following terms as they apply to this section:

1.3.1 Air Barrier 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 and service elements that are installed in the environmental separator.

1.3.4 Air Barrier Material

A building material that is designed and constructed to provide the primary resistance to airflow through an air barrier assembly.

1.3.5 Air Barrier System

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. This includes the roof, wall, and floor assemblies, and the wall and roof components, and may include interior walls or partitions. There may be more than one air barrier system in a single building.

1.3.6 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 (in.w.g or Pa) across the assembly. (examples: CFM/sq.ft. @ 0.30 in.w.g, or CFM/sq.ft. @ 75 Pa)

1.3.7 Air Permeance

The rate of airflow (CFM) through a unit area (sq.ft.) of a material driven by unit static pressure difference (in.w.g. or Pa) across the material.

1.3.8 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.

1.3.9 Test Zone

The portion of or volume within a building enclosed by an air barrier system which is to be tested for air leakage. The test zones are indicated.

1.4 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 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, 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 Contractor Quality Control approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-07 Certificates

Air Barrier Inspector; G

Two copies 30 days after Notice to Proceed.

Thermography Test Firm

Two copies 60 days prior to thermography testing.

Thermography Test Technician

Two copies 60 days prior to thermography testing.

Air Barrier Leakage Test Firm; G

Two copies 60 days prior to leakage testing.

Air Barrier Leakage Test Technician; G

Two copies 60 days prior to leakage testing.

SD-06 Test Reports

Thermography Test Procedures; G

Two copies 30 day prior to thermographic testing / examination.

Building Air Barrier Leakage Test Procedures; G

Two copies OF detailed test procedures indicating the test apparatus, the test methods and procedures, and the analysis methods to be employed for the Building Air Barrier Leakage Test 30 prior to leakage testing.

Design Review Report; G

Two copies not later than 14 days after approval of the Air Barrier Inspector Qualifications.

Thermographic Test Report; G

Two copies of interim reports 10 days after completion.
Four copies of the final report 14 days after completion.

Air Barrier Leakage Test Report; G

Two copies of interim reports 10 days after completion.
Four copies of the final report 14 days after completion.

1.6 AIR BARRIER SYSTEM SURFACE AREA AND FUNCTIONAL REQUIREMENTS

The building air barrier systems shall meet the following leakage functional requirements. The allowable leakage rate and the maximum leakage are at a pressure of 0.30 in.w.g.

a. Test Zone 1 Air Barrier System

(1) Surface Area: 100 square feet
(2) Allowable leakage rate: 0.25 CFM/sq.ft
(3) Maximum leakage: 25 total CFM

b. Test Zone 2 Air Barrier System

(1) Surface Area: 100 square feet
(2) Allowable leakage rate: 0.25 CFM/sq.ft
(3) Maximum leakage: 25 total CFM

c. Test Zone 3 Air Barrier System

(1) Surface Area: 100 square feet
(2) Allowable leakage rate: 0.25 CFM/sq.ft
(3) Maximum leakage: 25 total CFM

1.7 QUALITY CONTROL

1.7.1 Qualifications

1.7.1.1 Air Barrier Inspector

Two years experience in the installation of air barrier materials and assemblies including the experience in joining and sealing various components, and sealing of penetrations of air barriers. Experience coordinating and instructing personnel involved in the installation, joining, and sealing of air barrier materials and components. The Air Barrier Inspector shall have training and certification as an Air Barrier Installer from the Air Barrier Association of America (ABAA).

1.7.1.2 Thermography Test Firm

Minimum 2 years experience in thermographic testing and analysis, with a minimum of 3 successful projects of similar type and scope in the previous 3 years, using the specified testing standard, and employing qualified test technicians under the supervision of a Level III Certified Infrared Thermographer.

1.7.1.3 Thermography Test Technician

Possess Level II Training and Certification from a firm whose training and certification program complies with the recommended practice established by ASNT SNT-TC-1A and ASNT CP-105. Possess a certificate indicating successful completion of a course and examination specifically related to building envelope thermography. Document demonstration of 2 years experience in infrared thermography testing including interpreting and reporting findings in accordance with the requirements of ASTM C1060.

1.7.1.4 Air Barrier Leakage Test Firm

Minimum 2 years experience in air tightness testing and analysis, with a minimum of 3 successful projects of similar type and scope in the previous 3 years, using the specified testing standard, and employing qualified test technicians.

1.7.1.5 Air Barrier Leakage Test Technician

Two years experience in air tightness testing using the specified testing standard and equipment.

1.7.2 Design Review

The Air Barrier Inspector shall 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. The Air Barrier Inspector shall provide a Design Review Report individually listing each deficiency and the corresponding proposed corrective action necessary for proper air barrier system.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 QUALITY CONTROL

3.1.1 Documentation and Reporting

Document the entire installation process on daily job site reports. These reports include information on the Installer, substrates, substrate preparation, products used, ambient and substrate temperature, the location of the air barrier installation, the results of the quality control procedures, and testing results.

3.1.2 Construction Mock-Up

a. Prepare a construction mock-up to demonstrate proper installation of the air barrier. The mock-up shall include air barrier connections between floor and wall, wall and window, wall and roof. The mock-up shall include the sealing method between membrane joints at transitions from one material or component to another, at pipe or conduit penetrations of the wall and roof, and at duct penetration of the wall and roof. Work will not begin until the mock-up is satisfactory to the Contracting Officer.

b. The mock-up shall be approximately 8 feet long by 8 feet high. The mock-up shall be representative of primary exterior wall assemblies and glazing components including backup wall and typical penetrations as acceptable to the Contracting Officer.

c. Mock-Up Tests for Air and Water Infiltration: Test the mock-up for air and water infiltration in accordance with ASTM E1186 or ASTM E783 and ASTM E1105. Use smoke tracer to locate sources of air leakage. If deficiencies are found, reconstruct the mock-up and retest until satisfactory results are obtained. Deficiencies include air leakage beyond the values specified, uncontrolled water leakage, and insecure materials. Perform the air leakage tests and water penetration test of the mock-up prior to installation of cladding and trim but after installation of all fasteners for cladding and trim and after installation of other penetrating elements.

d. Mock-Up Tests for Adhesion: Test the mock-up of materials for adhesion in accordance with manufacturer's recommendations. Perform the test after the curing period recommended by the manufacturer. Record the mode of failure and the area which failed in accordance with ASTM D4541. When the air barrier material manufacturer has established a minimum adhesion level for the product on the particular substrate, the inspection report shall indicate whether this requirement has been met. Where the manufacturer has not declared a minimum adhesion value for their product/substrate combination, then the inspector shall simply record the value.

3.1.3 Quality Control Testing

Conduct the following qualitative and quantitative tests and inspections in the presence of the Contracting Officer during installation of the air barrier system.

a. Qualitative Testing and Inspection As Applicable:

(1) Provide a Daily Report of Observations with a copy to the

Contracting Officer.

(2) Ensure 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.

(3) Ensure structural support of the air barrier system to withstand design air pressures.

(4) Ensure 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.

(5) Ensure site conditions for application temperature, and dryness of substrates are within guidelines.

(6) Ensure substrate surfaces are properly primed.

(7) Ensure laps in materials are at least a 2-inch minimum, shingled in the correct direction or mastic applied on exposed edges with no fishmouths.

(8) Ensure that mastic is applied on cut edges.

(9) Ensure that a roller has been used to enhance adhesion.

(10) Measure application thickness of liquid applied materials to manufacturer's specifications for the specific substrate.

(11) Ensure that the correct materials are installed for compatibility.

(12) Ensure proper transitions for change in direction and structural support at gaps.

(13) Ensure proper connection between assemblies (membrane and sealants) for cleaning, preparation and priming of surfaces, structural support, integrity and continuity of seal.

b. Quantitative Tests:

(1) Provide written test reports of all tests performed with a copy to the Contracting Officer.

(2) Determine the bond strength of coatings to substrate in accordance with ASTM D4541.

3.2 THERMOGRAPHY TEST

Upon completion of construction, and completion of quality control measures for the air barrier system and the thermal envelope, infrared thermography tests shall be conducted.

3.2.1 Field Conditions

Perform testing under conditions stipulated in test standards, in instrument manufacturer's instructions, and in this Section. Perform

testing on dry building surfaces after sunset and prior to sunrise under the following environmental conditions:

a. Wind speed: Not greater than 15 mph.

b. Outside Air Temperature: Either a minimum of 18 degrees F above building interior temperature or a minimum of 18 degrees F below building interior temperature, for a minimum of 4 hours prior to test, and not varying more than 30 percent during the test.

c. Indoor Air Temperature: At constant temperature varying not more than 4 degrees F.

d. Direct Solar Exposure of Surfaces: No direct solar radiation on inspected surfaces during and for minimum 4 hours prior to inspection for frame construction, 8 hours for masonry veneer construction, at acceptable outside air temperature.

3.2.2 Thermography Test Procedures

The building envelope shall be tested using Infrared Thermography technology. The thermography testing shall be completed in accordance with the requirements of ASTM C1060 and ISO 6781. Perform a complete thermographic inspection consisting of full exterior and interior inspection of the complete thermal envelope and air barrier system. Note areas of the envelope that the inspection cannot cover due to limited or no access. The Contracting Officer shall be given the opportunity to witness the testing. Conduct testing just before the Building Air Barrier Leakage Test. Also, conduct testing during the Building Air Barrier Leakage Test so that air leaks are detected. If the building air barrier leakage test is failed, Thermographic testing shall be repeated just before and during subsequent air barrier leakage tests until the leakage test is successful. Address the cause and required corrective action for all anomalous thermal images resulting from the examination.Submit detailed test procedures indicating the test apparatus, the test methods and procedures, and the analysis methods to be employed for the Thermography Test.

3.2.3 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 any areas of compromise in the building envelope, and note all actions required and taken to correct those areas. Final thermography test report shall demonstrate that the problem areas have been corrected. Submit the complete test and analysis.

3.3 AIR BARRIER LEAKAGE TEST

Upon completion of construction, and quality control measures for the air barrier system, building air barrier leakage tests shall be conducted.

3.3.1 Building Air Barrier Leakage Test Procedures

Perform the air leakage test in accordance with ASTM E779 with the following additions and exceptions:

a. The test consists of measuring the flow rates required to establish a minimum of 12 positive and 12 negative building pressures. The lowest test pressure shall be 0.10 in.w.g or 25 Pa; the highest test pressure

shall be 0.30 in.w.g or 75 Pa; and there must be at least 0.10 in.w.g or 25 Pa difference between the lowest and highest test pressures.

b. Measure the test pressure in a representative location such that pressures in the extremities of the enclosure can be shown to not exceed 10 percent of the measured test pressure. At least 12 bias pressure readings must be taken across the envelope and averaged over at least 20 seconds each before and after the flow rate measurements. None of the bias pressure readings must exceed 30 percent of the minimum test pressure when testing in both directions.

c. Where it can be shown that it is impossible to test in both directions, then the building may be tested in the positive direction only, provided the bias pressure does not exceed 10 percent of the minimum test pressure.

d. The mean value of the air leakage flow rate calculated from measured data at 0.3 in.w.g shall not exceed the air barrier functional requirements specified and the upper confidence limit as defined by ASTM E779. Reference measurements at standard conditions of 14.696 psi and 68 degrees F.

e. Conduct the test with ventilation fans and exhaust fans turned off and the outdoor air intake dampers and exhaust dampers closed. Provide a responsible HVAC technician with the authority to place the HVAC system in the correct mode for the pressure test. The test technician shall have unhindered access to mechanical rooms, air handlers, exhaust fans, and outdoor air and exhaust dampers.

f. Ensure that all windows in the test enclosure are kept closed. Prohibit entry and exit through doors in the test enclosure during the test. Discard data collected while the pressures and flows are affected by a door opening and closing. The openings of roll-up or roll-back type overhead doors shall be masked with plastic and sealed. Internal doors within the air barrier test enclosure shall be open; this includes access doors to attics enclosed by the air barrier system.

g. Perform a diagnostic evaluation in accordance with ASTM E1186, whether the building achieves the air barrier system functional requirement or not. Use the diagnostic evaluation to assist in identifying and eliminating air leakage so the system meets the functional requirement upon retesting. Also, express the testing results in terms of the Equivalent Leakage Area (EqLA) at 0.30 in.w.g or 75 Pa. The EqLA is the equivalent area of a flat plate orifice that leaks the same amount as the building envelope at 0.30 in.w.g or 75 Pa.

3.3.2 Fan Pressurization Test

Conduct the fan pressurization test to determine final compliance with the air barrier system functional requirement when all components of the air barrier system have been installed and inspected, and have passed any intermediate testing procedures. The test may be conducted before finishes that are not part of the air barrier system have been installed. For example, if suspended ceiling tile, interior gypsum board, or cladding systems are not part of the air barrier system, the test may be conducted before they are installed.

3.3.3 Air Barrier Leakage Test Report

Submit a certified written report of each inspection, test, or similar service. Written reports of each inspection and test or similar service shall include all the Report items described in ASTM E1827. Additionally, the report shall also include the following information:

a. Date of Issue
b. Project title and number
c. Name, address, and telephone number of testing agency
d. Dates and locations of samples and tests or inspections
e. Names of individuals making the inspection or test
f. Designation of the Work and test method
g. Identification of product and Specification Section
h. Complete inspection or test data
i. Test results and an interpretation of test results for each test zone
j. Name and signature of laboratory inspector
k. Recommendations on retesting
l. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements

3.4 AIR BARRIER FUNCTIONAL REQUIREMENTS FAILURE

If the final air barrier test indicates that the leakage of the constructed air barrier system exceeds the maximum leakage specified, coordinate with the Designer of Record, the subcontractors, and the Government to immediately determine the cause of the failure, develop a method to change or repair the air barrier system. Then, develop and schedule a re-test of the air barrier system. Repeat until the air barrier system test is passed.

3.5 REPAIR AND PROTECTION

Upon completion of inspection, testing, or sample taking and similar services, repair damaged construction and restore substrates and finishes, protect construction exposed by or for quality control service activities, and protect repaired construction.

-- End of Section --

SECTION 07 11 16

AIR AND VAPOR BARRIER
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.

ASTM INTERNATIONAL (ASTM)

ASTM D412	(2006a; R 2013) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D4541	(2009; E 2010) Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM D5147/D5147M	(2014) Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material
ASTM D882	(2012) Tensile Properties of Thin Plastic Sheeting
ASTM C920	(2014a) Standard Specification for Elastomeric Joint Sealants
ASTM D1004	(2009) Initial Tear Resistance of Plastic Film and Sheeting
ASTM E1186	(2003; R 2009) Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems
ASTM E154	(2008a) Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
ASTM E283	(2004; R 2012) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E2357	(2005) Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
ASTM E783	(2002; R 2010) Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
ASTM E96/E96M	(2014) Standard Test Methods for Water Vapor Transmission of Materials

CANADIAN GENERAL STANDARDS BOARD (CGSB)

CGSB 37-GP-56M	Membrane, Modified, Bituminous, Prefabricated, and Reinforced.
CGSB 37.58M86	Membrane, Elastomeric, Cold-Applied Liquid, for Non-Exposed Use in Roofing and Water Proofing
CGSB 71-GP-24M	Adhesive, Flexible, for Bonding Cellular Polystyrene Insulation

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

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS TT-S-00230C	SEALING COMPOUND: ELASTOMERIC TYPE, SINGLE COMPONENT(FOR CALKING, SEALING, AND GLAZING IN BUILDINGS AND OTHER STRUCTURES)

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. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G

SD-03 Product Data

AIR AND VAPOR BARRIER

Manufacturer's catalog data shall be submitted specifically indicating which items are in this contract.

Prior to commencing the Work, submit manufacturers product data, samples and complete set of standard details for the air barrier membrane system showing a continuous plane of air tightness throughout the building envelope. Include manufacturer's written instructions for evaluating, preparing and treating substrate; technical data (including required wet and dry film thickness); and tested physical and performance properties of products.

SD-06 Test Reports

AIR AND VAPOR BARRIER

Prior to commencing the Work, submit documentation from an approved independent testing laboratory certifying that the air

leakage rates of the air barrier membranes, including primary membrane and transition sheets, exceed the requirements of the Massachusetts Energy Code and in accordance with ASTM E 2178.

Test report submittals shall include test results on porous substrate and include sustained wind load and gust load air leakage results.

Include documentation of volatile organic compounds (VOC) content for both product and accessories.

SD-07 Certificates

AIR AND VAPOR BARRIER

Prior to commencing the Work, submit copies of manufacturers current ISO certification. Membrane, primers, sealants, and adhesives shall be included.

Certify that the air and vapor barriers and accessory materials are compatible with project materials that connect to or that come into contact with the barrier.

Certify that the product has passed ASTM E2357 assembly testing.

Certify that the air barrier, as designed in the assemblies indicated on the Drawings, has been tested to meet the requirements of NFPA 285 and has passed.

1.3 DETAIL DRAWINGS

Provide detail drawings for air and vapor-barrier assemblies.

Show locations and extent of air and vapor-barrier. Include details for substrate joints and cracks, counter-flashing strips, penetrations, inside and outside corners, terminations and tie-ins with adjoining construction.

Include details of interfaces with other materials that form part of air and vapor barrier.

1.4 QUALIFICATIONS FOR AIR AND VAPOR BARRIER INSTALLATION WORK

Air and vapor barrier membrane shall be installed by mechanics experienced and specializing in this type of work. Supervisory personnel assigned to this project shall have a minimum of 5 years of experience in air and vapor barrier membrane. Personnel working pursuant to this section may, at the Contracting Officer's option, be required to demonstrate technical competence by performing sample work and/or by displaying their state qualifications/certificates at no additional cost to the Government.

Prior to commencing the Work, submit references clearly indicating that the membrane manufacturer has successfully completed projects on an annual basis of similar scope and nature for a minimum of fifteen years. Submit references for a minimum of ten projects.

Include list of ABAA-certified installers and supervisors employed by the Installer, who will work on this Project.

1.5 SAMPLING AND TESTING

Air and vapor barrier membrane shall be sampled and tested in accordance with ASTM E96/E96M.

1.6 DELIVERY, HANDLING, AND STORAGE

Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and product.

Store role materials on end in original packaging.

Store air and vapor barrier membranes, adhesives and primers at temperatures of 40 degrees F. and above to facilitate handling.

Keep solvent away from open flame or excessive heat.

Protect rolls from direct sunlight until ready for use.

1.7 WEATHER RESTRICTIONS

Perform work only when conditions are acceptable to the manufacturer of the materials being installed.

Ensure all preparation work is complete prior to installing air/vapor barrier membrane.

1.8 QUALITY ASSURANCE

Installer: Submit in writing a document stating that the applicator of the primary air and vapor barrier membranes specified in this section is recognized by the manufacturer as suitable for the execution of the Work.

Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on the Project.

The work of this Section is required to comply with the requirements of NFPA 285 and be constructed with products approved as part of an NFPA 285 tested wall assembly.

The materials and systems included in this Section shall be installed by ABAA certified contractors in full compliance with the ABAA Quality Assurance Program which shall be administered by ABAA selected 3rd party facilitators.

Perform Work in accordance with the manufacturer's written instructions of the air barrier membrane and this specification.

Maintain one copy of manufacturer's written instructions on site.

At the beginning of the Work and at all times during the execution of the Work, allow access to Work site by the air barrier membrane manufacturers' representative.

Components used in this section shall be sourced from one manufacturer, including sheet membrane, air barrier sealants, primers, mastics, and adhesives.

Pre-Installation Conference: Convene prior to commencing work of this section.

Mock-Up

Where directed, construct typical exterior wall panel incorporation substrate, window frame, attachment of insulation, and showing air and vapor barrier membrane application details.

Allow 24 hours for inspection of mock-up before proceeding with air and vapor barrier work. Mock-up may remain as part of the work.

If Contracting Officer determines that mockups do not comply with the requirements, reconstruct mockups until mockups are approved. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Contracting Officer specifically approves such deviations in writing.

1.9 PRECONSTRUCTION TESTING

Preconstruction Testing Service: Contractor shall engage a qualified testing agency to perform preconstruction testing on field mockups.

Mockup Testing: Air and vapor-barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.

1.9.1 Qualitative Air-Leakage Testing

Mockups will be tested for evidence of air leakage according to ASTM E1186, chamber pressurization or depressurization with smoke tracers or chamber depressurization with detection liquids.

1.9.2 Quantitative Air-Leakage Testing

Mockups will be tested for air leakage according to ASTM E783.

1.9.3 Adhesion Testing

Mockups will be tested for minimum air and vapor-barrier adhesion of 30 lbf/sq. in. according to ASTM D4541.

Notify Contracting Officer seven days in advance of the dates and times when mockups will be tested.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide a continuous air and vapor barrier system where indicated. Obtain primary air and vapor-barrier materials and air and vapor-barrier accessories from a single source from a single manufacturer.

2.2 AIR AND VAPOR BARRIER

Provide a liquid emulsion air and vapor barrier membrane for construction surfaces such as masonry, concrete or gypsum board. Basis of design is Air-Bloc 32 by Henry Company.

A. Primary Membrane

1. Liquid air/vapor barrier (Thick System Type): Air-Bloc 32 as manufactured by Henry. A one component elastomeric bitumen, trowel or spray applied to a wet film thickness of 120 mils and having the following characteristics:
a. Air permeability: 0.00012 CFM/ft2 @ 1.6 lbs/ft2 to ASTM E283 and resist suction pressure of 62.8 lbs/ft2 maintained for 5 seconds with no increase in air leakage rate when tested at 1.6 lbs/ft2 ;
b. Water vapor permeance: 0.08 perms to ASTM E96/E96M;
c. VOC Content: No appreciable VOC (less then 100g/L)
d. Elastic Recovery: 75 percent to CGSB 37.58M86

B. Transition membrane (Self-Adhering)

1. Blueskin SA as manufactured by Henry. An SBS modified bitumen, self-adhering sheet membrane complete with a cross-laminated polyethylene film, and having the following physical properties:
a. Thickness: 0.0394 inches (40 mils) .
b. Air leakage: <0.0001 CFM/ft² @ 1.6 lbs/ft2 to ASTM E283;
c. Vapor permeance: 0.05 perms to ASTM E96/E96M;
d. Low temperature flexibility: -22 F to CGSB 37-GP-56M;
e. Elongation: 200 percent to ASTM D412 modified

C. Through-wall flashing membrane and dampproof course (Self-Adhering)

1. Blueskin TWF as manufactured by Henry. An SBS modified bitumen, self-adhering sheet membrane complete with a cross-laminated polyethylene film, having the following physical properties:
a. Thickness: 0.0394 inches (40 mils).
b. Film Thickness: 9.0 mils
c. Puncture Resistance: 40lbf to ASTM E154;
d. Tensile Strength (film): 5000 psi ASTM D882
e. Tear Resistance 13lbs. MD to ASTM D1004;
d. Low temperature flexibility: -22 F to CGSB 37-GP-56M

D. Transition Membrane

Transition membrane (Self-Adhering): A microporous film laminate, backed with a specially applied adhesive which allows water vapor to permeate through while acting as a barrier to air and bulk water. Membrane shall have the following physical properties:

1. Air leakage: <0.0001 CFM/ft² @1.6 lbs/ft2 to ASTM E283
2. Vapor permeance: 0.05 perms to ASTM E96/E96M
3. Membrane Thickness: 0.0394 inches (40 mils)
4. Low temperature flexibility: -22 degrees F to CGSB 37-GP-56M
5. Elongation: 200 percent to ASTM D412 modified

E. PRIMER

Primer for self-adhering membranes at temperatures above 25 degrees F shall be Aquatac Primer manufactured by Henry; a polymer emulsion based adhesive, quick setting. Primer shall have the following physical properties:

1. Color: Aqua
2. Weight: 8.7 lbs/gal

3. Solids by weight: 53 percent
4. Water based, no solvent odors
5. Drying time (initial set): 30 minutes at 50 percent RH and 70 degrees F

F. Through-wall flashing membrane (Self-Adhering)

Shall be Blueskin TWF manufactured by Henry; an SBS modified bitumen, self-adhering sheet membrane complete with a cross-laminated polyethylene film. Membrane shall have the following physical properties:

1. Membrane Thickness: 0.0394 inches (40 mils)
2. Film Thickness: 4.0 mils
3. Flow (ASTM D5147/D5147M): Pass @ 212 degrees F
4. Puncture Resistance: 134 lbf to ASTM E154
5. Tensile Strength (film): 5723 psi ASTM D882
6. Tear Resistance: 13lbs. MD to ASTM D1004
7. Low temperature flexibility: -22 degrees F to CGSB 37-GP-56M

G. Adhesive

Liquid air seal mastic and insulation adhesive: Trowel applied, rubber based adhesive type, having the following characteristics:

Compatibility: With air/vapor barrier membrane, substrate and insulation
Air Leakage: 0.0026 CFM/sq. ft. at 2.1 lbs./sq. ft. to ASTM E283;
Water Vapor Permeance: 0.03 perms to ASTM E96/E96M
Long Term Flexibility: CGSB 71-GP-24M
Chemical Resistance: Alkalis and salt

2.3 PENETRATION & TERMINATION SEALANT

Termination Sealant shall be HE925 BES Sealant manufactured by Henry; a moisture cure, medium modulus polymer modified sealing compound having the following physical properties:

1. Compatible with sheet air barrier, roofing and waterproofing membranes and substrate,
2. Complies with FS TT-S-00230C, Type II, Class A
3. Complies with ASTM C920, Type S, Grade NS, Class 25
4. Elongation: 450 - 550 percent
5. Remains flexible with aging
6. Seals construction joints up to 1 inch wide

2.4 PERFORMANCE REQUIREMENTS

General: Air and vapor barrier shall be capable of performing as a continuous vapor-retarding air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air and vapor-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

Installed product and accessories shall be air-tight, durable and continuous.

Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E2357.

PART 3 EXECUTION

3.1 EXAMINATION

Verify that surfaces and conditions are ready to accept the Work of this section. Notify contractor in writing of any discrepancies. Commencement of the work or any parts thereof shall mean acceptance of the prepared substrate.

3.2 PREPARATION

All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants. Fill spalled areas in substrate to provide an even plane. Clean, prepare, treat and seal substrate according to manufacturer's written instructions.

3.3 INSTALLATION

3.3.1 Fluid Air and Vapor-Barrier Membrane Installation

General: Apply fluid air and vapor-barrier material to form a seal with strips and transition strips and to achieve a continuous air and vapor barrier according to air and vapor-barrier manufacturer's written instructions. Apply fluid air and vapor-barrier material within manufacturer's recommended application temperature ranges.

1. Apply primer to substrates at required rate and allow it to dry.
2. Limit priming to areas that will be covered by fluid air and vapor-barrier material on same day. Reprime areas exposed for more than 24 hours.
3. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

Vapor-Retarding Membrane Air Barriers: Apply a continuous unbroken air and vapor-barrier membrane to substrates according to the following thickness. Apply air and vapor-barrier membrane in full contact around protrusions such as masonry ties.

Product Application by Spray:

1. Dispense through spray equipment approved by Manufacturer.
2. Spray on walls working from bottom upward with overlapping passes. Keep spray streams perpendicular to wall.
3. Apply at manufacturer's suggested wet film thickness, but not less than 0.075 inch (75 mils) minimum wet thickness.
4. Apply full thickness in one application. If required thickness is not achieved in one coat, apply additional coat(s).
5. After curing, verify cured membrane has achieved the manufacturer's suggested dry film thickness, but not less than 0.045 inch (45 mils) dry film thickness.

Provide complete coverage without sagging, pinholes or voids. Apply greater thickness where necessary to provide continuous coating over rough surfaces and irregularities. Remove and repair sagged material per

manufacturer's written instructions.

Apply strip and transition strip a minimum of 1 inch onto cured air and vapor-barrier material or strip and transition strip over cured air and vapor-barrier material overlapping 3 inches onto each surface according to air and vapor-barrier manufacturer's written instructions.

Do not cover air and vapor barrier until it has been tested and inspected by Owner's testing agency.

Correct deficiencies in or remove air and vapor barrier that does not comply with requirements; repair substrates and reapply air and vapor-barrier components.

3.3.2 Assemblies Installed After Air and Vapor Barrier Membrane

Seal penetrations made through installed Product according to the requirements of this Section.

Fenestration installed after Product: Seal fenestration frame to Transition Membrane in rough opening with continuous Joint Sealant over backer rod or Polyurethane Foam.

Seal mounting flange of doors and windows along jambs and head with minimum 4 inch width Transition Membrane strip. Apply Transition Membrane according to Part 3 of this Section.

Board Insulation Installed After Product: Attach with aerosol insulation adhesive or with insulation adhesive by others which is acceptable with AIB manufacturer.

Roof air barrier: Join to Product according to Manufacturer's instructions and drawings.

3.3.3 ABBA Field Certification

ABAA Auditor In Place Inspections: Air and vapor-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air and vapor-barrier system has been achieved throughout the building envelope with no gaps or holes. Verification of required dft at selected locations on the building.
2. Continuous structural support of air and vapor-barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed, if applicable.
7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fish mouths.
8. Termination mastic has been applied on cut edges.
9. Strips and transition strips have been firmly adhered to substrate.
10. Compatible materials have been used.

11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (air and vapor-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

3.3.4 Primer for Transition and Through-wall Flashing Membrane (Self-Adhering Type Only)

Apply primer for self-adhering membranes at rate recommended by manufacturer.

Apply primer to all areas to receive transition sheet and/or through-wall flashing membrane, as indicated on drawings by roller or spray and allow minimum 30 minute open time. Primed surfaces not covered by Blueskin transition membrane or Blueskin TWF through-wall flashing membrane during the same working day must be reprimed.

3.3.5 Transition Sheet

Position Blueskin self-adhered transition membrane and remove protective film. Press firmly into place. Ensure minimum 2 inch overlap at all end and side laps.

Promptly roll all laps with a countertop roller to effect seal.

Ensure all preparatory work is complete prior to installing Air-Bloc 31.

3.3.6 Through-wall Flashing Membrane (Self-Adhering Type)

Align and position the leading edge of self-adhering through-wall flashing membrane with the front horizontal edge of the foundation walls or self-angles, partially remove protective film and roll membrane over surface and up vertically.

Press firmly into place. Ensure minimum 2 inch overlap at all end and side laps.

Promptly roll all laps and membrane to effect the seal.

Ensure through-wall flashing membrane extends fully to the exterior face of the exterior masonry veneer. Trim off excess as directed by the consultant.

Apply through-wall flashing membrane along the base of masonry veneer walls, over windows, doors and all other wall openings. Membrane shall form continuous flashing and shall extend up a minimum of 8 inches up the backup wall.

3.3.7 Transition Membrane

When transition membrane is installed, apply by spray, trowel or brush over entire surface as indicated, to a wet film thickness of 90 mils requiring an average application of 18.6 sq. ft./gal. Overlap membrane a minimum of 1 inch. Spray, trowel or brush around all projections ensuring a complete and continuous seal.

Ensure continuity of the air and vapor barrier membrane system throughout the project.

3.4 PROTECTION OF FINISHED WORK

Air-Bloc 31 and Blueskin is not designed for permanent exposure. Product designed to withstand job site exposure for up to six weeks (less in summer applications), however good practice calls for covering as soon as possible. Wherever possible, begin covering membrane on south exposures, followed by remainder of surface.

-- End of Section --

SECTION 07 13 53

ELASTOMERIC SHEET WATERPROOFING
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.

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 D1876	(2008) Standard Test Method for Peel Resistance of Adhesives (T-Peel Test)
ASTM D41/D41M	(2011) Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
ASTM D412	(2006a; R 2013) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D5385	(1993; R 2006) Hydrostatic Pressure Resistance of Waterproofing Membranes
ASTM D570	(1998; E 2010; R 2010) Standard Test Method for Water Absorption of Plastics
ASTM D903	(1998; R 2010) Peel or Stripping Strength of Adhesive Bonds
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 E96/E96M	(2014) Standard Test Methods for Water Vapor Transmission of Materials

1.2 SUBMITTALS

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

SD-03 Product Data

Elastomeric waterproofing sheet material; G

Protection board

Primers, adhesives, and mastics

SD-04 Samples

Materials

Submit material samples showing resolution of corner and field conditions, attachment to existing waterproof sheeting.

SD-06 Test Reports

Elastomeric waterproofing sheet material

Certify compliance with performance requirements specified herein.

Field Quality Control

Verification Of Conditions

Protective Covering

SD-08 Manufacturer's Instructions

Primers, adhesives, and mastics

Submit Manufacturer's material safety data sheets for primers, adhesives and mastics.

1.3 QUALITY ASSURANCE

1.3.1 Shop Drawing Requirements

Include description and physical properties; termination details; application details; recommendations regarding shelf life, application procedures; requirements for protective covering; and precautions for flammability and toxicity.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver and store materials out of the weather, in manufacturer's original packaging with brand name and product identification clearly marked. Do not permit uncertified materials in the work area.

1.5 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 and 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, of maintaining the surface and ambient temperatures above 40 degrees F.

PART 2 PRODUCTS

2.1 MATERIALS

Provide one of the types of elastomeric waterproofing sheet materialand related primers, adhesives, and mastics as specified herein. Ensure compatibility of waterproofing materials within a specific type, with each other, and with the materials on which they will be applied. Materials shall conform to the applicable performance requirements cited below when tested in accordance with the referenced ASTM publications.

2.2 COMPOSITE, SELF-ADHERING MEMBRANE SHEETING

Cold applied composite sheet consisting of rubberized asphalt and cross laminated, high density polyethylene film. Not less than 60 mils minimum thickness is required consisting of 56 mils of rubberized asphalt laminated to a 4 mil high density cross-laminated polyethylene sheet.

2.2.1 Composite, Self-Adhering Sheeting Performance Requirements

a. Tensile Strength, ASTM D412, Die C: 250 psi minimum;

b. Ultimate Elongation, ASTM D412, Die C: 300 percent minimum;

c. Water Vapor Transmission,ASTM E96/E96M 80 Degrees F Permeance, Procedure B: 0.05 perm maximum;

d. Pliability Degrees F, ASTM D146/D146M: (180 Degrees Bend Over One Inch Mandrel): No cracks at minus 25 degrees F;

e. Cycling Over Crack at minus 15 Degrees F: Membrane is applied and rolled across two primed concrete blocks with no separation between blocks. Crack opened and closed from zero to 1/4 inch. No effect at 100 cycles;

f. Puncture Resistance, ASTM E154/E154M: 50 lb. minimum;

g. Lap Adhesion at Minimum Application Temperature, ASTM D1876 Modified, 880 N/m (5 lbs/in.);

h. Peel Strength, ASTM D903: Modified 9 lbs/n;

i. Resistance to Hydrostatic Head, ASTM D5385: 231 ft of water

j. Water Absorption, ASTM D570; 0.1 percent maximum.

2.2.2 Primer

Asphalt composition, ASTM D41/D41M, or synthetic polymer in solvent as recommended by the membrane manufacturer.

2.2.3 Mastic

Polymer modified asphalt in suitable solvent of trowel-grade consistency and as recommended by the membrane manufacturer.

2.2.4 Metal Termination Bars

Provide aluminum bars, approximately 1 inch x 1/8 inch thick pre-drilled at

8 inch centers.

2.3 Protection Board

Provide protection board that is compatible with the waterproofing membrane. Use a minimum 13 mm 1/2 inch thick fir bituminous - impregnated board 1 inch for polystyrene 1/8 inch thick for vertical and 1/4 inch for horizontal premolded bituminous protection board as recommended by the manufacturer.

PART 3 EXECUTION

3.1 VERIFICATION OF CONDITIONS

Before starting the work, verify that surfaces to be waterproofed are in satisfactory condition. Notify the Contracting Officer of defects or conditions that will prevent a satisfactory application. Do not start application until defects and conditions have been corrected.

3.2 SURFACE PREPARATION

Ensure surfaces to be treated are clean, dry, smooth, and free from deleterious materials and projections. Thoroughly wet holes, joints, cracks, and voids in masonry and concrete with water and fill with Portland cement mortar, strike flush, and permit to dry. Cut off high spots or grind smooth. Finish top surfaces of projecting masonry or concrete ledges below grade, except footings, to a steep bevel with Portland cement mortar. Sweep surfaces to be covered before applying waterproofing to remove dust and foreign matter. Cure concrete by a method compatible with the waterproofing system.

3.3 APPLICATION

Follow manufacturer's printed installation instructions. Where indicated, mop continuous cant strips in place at vertical and horizontal corners before installing the waterproofing membrane. Do not use untreated wood or wood fiber cants. When using solvent welding liquid, avoid prolonged contact with skin and breathing of vapor. Provide adequate ventilation. Carry waterproofing of horizontal surfaces up abutting vertical surfaces as indicated and adhere solid to the substrate. Avoid wrinkles and buckles in applying membrane and joint reinforcement.

a. 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.

b. Protection: Protect membrane over horizontal surfaces from abnormal traffic during installation. Use only equipment with rubber tires. Provide walkway protection where heavy traffic from other trades is expected. Do not store material on membrane.

3.4 Composite, Self-Adhering Membrane

Lap sheets at edges and ends a minimum of 2-1/2 inches over the preceding sheet. All side laps shall be minimum 2-1/2 inchesand end laps shall be 5 inches. Laps shall be self adhesive, mastic as per manufacturer's recommendation. Roll or firmly press to adhere membrane to substrate. Cover corners and joints with two layers of reinforcement by first applying

a 12 inch width of membrane centered along the axis. Flash drains and projections with a second ply of membrane for a distance of 6 inches from the drain or projection. Finish exposed, terminated edges of membrane on horizontal or vertical surfaces with a trowelled bead of mastic. Apply mastic around edges of membrane, and drains and projections. Apply mastic at end of each work day.

3.5 FLASHING

Flash penetrations through membrane. Ensure that where reinforcing bars penetrate a waterproofing membrane, each of those penetrations be sealed with the appropriate sealant or mastic flashing component. Embed elastomeric membrane in a heavy coat of adhesive, except for self-adhering membrane. Continuous metal reglets shall be installed, horizontally on footing and vertically on intersecting and connecting walls, and as specified in Section 07 60 00 FLASHING AND SHEET METAL. Metal reglets shall receive exposed edges of membrane waterproofing. Secure membrane into reglets by lead wedges and fill with cement as recommended by manufacturer of waterproofing materials. Counterflash upper edge of membrane waterproofing and protective covering as specified in Section 07 60 00 FLASHING AND SHEET METAL.

3.6 FIELD QUALITY CONTROL

Notify the Contracting Officer one day 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. Carefully 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 Contracting Officer.

3.7 PROTECTIVE COVERING

After installation has been inspected and approved by the Contracting Officer, apply a protective covering to the membrane waterproofing prior to backfilling. Protect vertical membrane waterproofing with a 1/2 inch minimum thickness of asphalt plank; 1/2 inchminimum thickness of fiberboard; or 1/8 inch minimum thickness of compatible water-resistant bitumen type protection board with edges abutting adjacent edges and exposed surfaces covered by a taping system recommended by manufacturer of protection board. Cover horizontal membrane waterproofing with similar protection board and Portland cement mortar not less than 3/4 inch thick; place uniformly and allow to set before installing subsequent construction.

-- End of Section --

SECTION 07 17 00

BENTONITE WATERPROOFING
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.

ASTM INTERNATIONAL (ASTM)

ASTM D1557	(2012) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)
ASTM D217	(2010) Cone Penetration of Lubricating Grease

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. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-08 Manufacturer's Instructions

Application

Protection

Corrections

1.3 DELIVERY, STORAGE, AND HANDLING

Do not place bentonite waterproofing materials in flooded areas or during precipitation. Provide bentonite panels and containers with manufacturer's labels intact, identifying the materials. Keep materials dry prior to use with polyethylene or canvas covering for sides and top and chocks or skids underneath, of sufficient height to maintain separation from ground water. Protect materials from moisture. Remove materials which show evidence of damage, deterioration, or contamination.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Bulk and Panel

Provide high-swelling, sodium bentonite containing a minimum of 90 percent montmorillonite and a maximum of 10 percent unaltered volcanic ash or other native sediments.

2.1.2 Bentonite

Provide material meeting the following requirements:

2.1.2.1 Free Swell Rating

Two grams of granular bentonite sifted into deionized water shall swell to occupy a minimum volume of 16 cubic centimeters.

2.1.2.2 Active Ingredient

Hydrous silicate of alumina, composed of the following chemical percentages and their allowable deviations:

Silica	61.0 plus/minus 3.0
Alumina	19.5 plus/minus 1.5
Iron oxide	5.0 plus/minus 1.0
Magnesia	2.8 plus/minus 0.4
Soda and potash oxides	2.4 plus/minus 0.7
Calcium oxide	0.6 plus/minus 0.5
Molecular water	6.1 plus/minus 0.6
Minor	2.6 plus/minus 0.6

2.1.3 Bentonite Panels

Provide panels containing bentonite material sealed between two layers of absorbent material, with a minimum of one pound of evenly distributed bentonite per square foot. The bentonite panels shall be 48 inches square by a minimum of 3/16 inch thick, in dry state.

2.1.4 Bentonite Mineral-Base Jelly

Provide material meeting requirements of ASTM D217 for a worked penetration range of 215 to 275. Jelly shall contain 45 percent controlled, partially hydrated, high-swelling sodium bentonite by weight with minimum pH. of 8.8, no free water, and 25 percent or more residual swell.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Examine surfaces prior to treatment, eliminating irregularities and removing loose and foreign material. Remove form tie rods. Point cracks and honeycombs in concrete surfaces. Surfaces of finished patches shall be flush with adjacent concrete surfaces.

3.2 APPLICATION

Apply bentonite waterproofing under elevator pits and where indicated, in accordance with manufacturer's printed instructions. Securely fasten

panels over all construction joints and all expansion joints. Thoroughly pack all through-wall openings and penetrations with bentonite gel or granular bentonite, or both, prior to placement of bentonite panels.

3.3 PROTECTION

Provide protection to bentonite panels during backfilling and compaction as recommended by manufacturer of bentonite materials. If backfill is not immediately applied, protect panels against precipitation by covering temporarily with polyethylene. Replace damaged panels with new panels before and during backfilling and compaction. Compact backfill to at least 85 percent of ASTM D1557 maximum density.

3.4 CORRECTIONS

Repair leaks and defective areas in accordance with manufacturer's recommendations.

-- End of Section --

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 C1289	(2016) Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
ASTM C165	(2007; R 2012) Standard Test Method for Measuring Compressive Properties of Thermal Insulations
ASTM C203	(2005; R 2012) Breaking Load and Flexural Properties of Block-Type Thermal Insulation
ASTM C272/C272M	(2012) Standard Test Method for Water Absorption of Core Materials for Sandwich Constructions
ASTM C552	(2015) Standard Specification for Cellular Glass Thermal Insulation
ASTM C553	(2013) Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
ASTM C578	(2015b) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C591	(2015) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C612	(2014) Mineral Fiber Block and Board Thermal Insulation
ASTM C930	(2012) Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories
ASTM D1621	(2010) Compressive Properties of Rigid Cellular Plastics
ASTM D3833/D3833M	(1996; R 2011) Water Vapor Transmission of Pressure-Sensitive Tapes
ASTM D4397	(2010) Standard Specification for

	Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
ASTM E136	(2016) Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C
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 E84	(2015b) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E96/E96M	(2014) Standard Test Methods for Water Vapor Transmission of Materials

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2012) International Building Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 211	(2016) Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances
NFPA 31	(2016) Standard for the Installation of Oil-Burning Equipment
NFPA 54	(2015) National Fuel Gas Code
NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	Scientific Certification Systems (SCS)Indoor Advantage

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY (TAPPI)

TAPPI T803 OM	(2010) Puncture Test of Container Board

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

29 CFR 1910.134	Respiratory Protection

UL ENVIRONMENT (ULE)

ULE Greenguard	UL Greenguard Certification Program

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability

Notebook, in conformance 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

Block or Board Insulation; G

Vapor Retarder; G

Pressure Sensitive Tape; G

Protection Board or Coatings; G

Accessories including sealants; G

SD-07 Certificates

Block or Board Insulation; G

Vapor Retarder; G

Protection Board or Coating; G

Draft Special Warranties; G

Final Special Warranties; G

ULE Greenguard; G

SD-08 Manufacturer's Instructions

Block or Board Insulation

Adhesive

SD-11 Closeout Submittals

ULE Greenguard; S

Volatile Organic Compound (VOC) Content; S

Recycled Content; S

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

Provide products that are third party certified in accordance with ULE Greenguard Gold, SCS Scientific Certification Systems Indoor Advantage Gold or approved equal. (http://www.scsglobalservices.com/indoor-air-quality-certification)

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. 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. 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 PRODUCT SUSTAINABILITY CRITERIA

Where allowed by performance criteria:

2.1.1 Reduced Volatile Organic Compound (VOC) Content

Provide products with reduced VOC content and provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING paragraph REDUCE VOLATILE ORGANIC COMPOUNDS.

2.1.2 Recycled Content

Provide products with recycled content and provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING paragraph RECYCLED CONTENT.

2.2 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. Cellular Glass: ASTM C552

b. Extruded Preformed Cellular Polystyrene: ASTM C578 REV A

c. Mineral Fiber Block and Board: ASTM C612

d. Unfaced Preformed Rigid Polyurethane and Polyisocyanurate Board: ASTM C591

e. Faced Rigid Cellular Polyisocyanurate and Polyurethane Insulation: ASTM C1289 REV A

   (1) Type I Aluminum Foil on both major surfaces. Class 1 - Non-reinforced core foam. Class 2 - Glass fiber reinforced core.

   (2) Type II Fibrous felt or glass fiber mat membrane on both major surfaces of the core foam.

   (3) Type III Perlite insulation board on one major surface of the core foam and a fibrous felt or glass fiber mat membrane on the other major surface of the core foam.

   (4) Type IV Cellulosic fiber insulating board on the one major surface of the core foam and fibrous felt or glass fiber mat membrane on the other major surface of the core foam.

   (5) Type V Oriented strand board or water board on one major surface of the core foam and fibrous felt or glass fiber mat membrane or aluminum foil on the other major surface of the core foam.

   (6) Type VI Perlite insulation board on both major surfaces of the core foam.

2.2.1 Fire Protection Requirements

a. Flame spread index of 75 or less when tested in accordance with ASTM E84.

b. Smoke developed index of 450 or less when tested in accordance with ASTM E84.

c. Provide insulated assemblies in accordance ICC IBC Chapter Fire and Smoke Protection Features.

2.2.2 Other Material Properties

Provide thermal insulating materials with the following properties:

a. Rigid cellular plastics: Compressive Resistance at Yield: Not less than 10 pounds per square inch (psi) when measured according to ASTM D1621.

b. Mineral fiber board: Compressive strength: Minimum load required to produce a reduction in thickness of 10 percent pounds per square foot (lbf/sf): 25 when tested according to ASTM C165.

c. Block-type insulation: Block-type insulation: Flexural strength: Not less than 25 psi when measured according to ASTM C203 REV A.

d. Water Vapor Permeance: Not more than 1.1 Perms or less when measured according to ASTM E96/E96M, desiccant method, in the thickness required to provide the specified thermal resistance, including facings, if any.

e. Water Absorption: Not more than 2 percent by total immersion, by volume, when measured according to ASTM C272/C272M.

f. Water Adsorption: Not more than 1 percent by volume when measured in accordance with paragraph 14 of ASTM C553.

2.2.3 Premolded Concrete Masonry Insert

Provide in accordance with ASTM C578 REV A. Provide inserts in concrete masonry units that are installed at the masonry unit manufacturing plant. Provide insert with thickness of not less than 1 1/4 inches.

2.2.4 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

2.2.5 Prohibited Materials

Do not provide materials containing asbestos.

2.3 VAPOR RETARDER AND DAMPPROOFING

2.3.1 Vapor Retarder in Framed Walls and Roofs

a. 6 mil thick polyethylene sheeting conforming to ASTM D4397 and having a water vapor permeance of 1 Perm or less when tested in accordance with ASTM E96/E96M.

b. Membrane with the following properties:

(1) Water Vapor Permeance: ASTM E96/E96M: 1 Perm

(2) Maximum Flame Spread: ASTM E84: 25

(3) Combustion Characteristics: Passing ASTM E136

(4) Puncture Resistance: TAPPI T803 OM: 15

2.3.2 Dampproofing for Masonry Cavity Walls

Bituminous material is specified in Section 07 11 13 BITUMINOUS DAMPPROOFING. Parging material is specified in Section 04 20 00 MASONRY.

2.3.3 Vapor Retarder under Floor Slab

a. Water vapor permeance: 0.2 Perm or less when tested in accordance with ASTM E96/E96M.

b. Puncture resistance: Maximum load no less than 40 pounds when tested according to ASTM E154/E154M REV A.

2.4 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.

2.5 PROTECTION BOARD OR COATING

As recommended by insulation manufacturer.

2.6 ACCESSORIES

2.6.1 Adhesive

As recommended by insulation manufacturer.

2.6.2 Mechanical Fasteners

Corrosion resistant fasteners as recommended by the insulation manufacturer.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 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.

3.2 INSTALLATION

3.2.1 Installation and Handling

Provide insulation in accordance with the manufacturer's printed installation instructions. Keep material dry and free of extraneous materials.

3.2.2 Electrical Wiring

Do not install insulation in a manner that would enclose electrical wiring between two layers of insulation.

3.2.3 Cold Climate Requirement

Place insulation on the outside of pipes.

3.2.4 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.

3.2.5 Coordination

Verify final installed insulation thicknesses comply with thicknesses indicated, R-values specified herein, and with the approved insulation submittal(s).

3.3 INSTALLATION ON WALLS

3.3.1 Installation using Furring Strips

Install insulation on members as recommended by insulation manufacturer.

3.3.2 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.

3.3.3 Adhesive Attachment to Concrete and Masonry Walls

Apply adhesive to wall and completely cover wall with insulation.

a. Full back bed method or

b. Spot method: Provide at least six spots having diameter of approximately 4 inches, located at each corner and mid points of each of the longer sides of each board.

c. As recommended by the insulation manufacturer.

d. Use only full back method for pieces of 1 square foot or less.

e. Butt all edges of insulation and seal edges with tape.

3.3.4 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.

3.3.5 Protection Board or Coating

Install protection board or coating in accordance with manufacturer's printed instructions. Install protection over all exterior exposed insulation and to 1 foot below grade.

3.4 INSTALLATION ON UNDERSIDE OF CONCRETE FLOOR SLAB

3.4.1 Mechanically Fastened Systems

Size insulation to cover underside of slab. Apply adhesive to slab and set

fasteners in adhesive as recommended by manufacturer. After curing of adhesive, install insulation over fasteners and bend split prongs to provide a flush condition with the insulation. Butt all edges of insulation and seal with tape.

3.4.2 Adhesively Bonded Systems

Apply adhesive to underside of slab and completely cover wall with insulation.

a. Full back bed method or

b. Spot method: Provide at least six spots having a diameter of approximately 4 inches, located at each corner and mid-point of each of the longer sides.

c. As recommended by insulation manufacturer.

d. Use full back method for insulation pieces 1 square foot or less.

e. 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 on exterior of foundation walls, on grade beams, partially below grade and on edges of slabs-on-grade where shown on drawings. Fasten insulation with adhesive or mechanical fasteners.

3.5.3 Insulation Under Slab

Provide insulation horizontally under slab on grade for a distance of 2 feet from the edge of slab. Turn insulation up at slab edge, and extend full height of slab. Install insulation on top of vapor retarder and turn retarder up over the outside edge of insulation to top of slab.

3.5.4 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. Install protection over entire exposed exterior insulation board. Extend protection at least 1 foot below grade.

3.6 VAPOR RETARDER

Apply vapor retarder continuous across all surfaces. Overlap all joints at least 6 inches and seal with pressure sensitive tape. Seal at sills,

header, windows, doors and utility penetrations. Repair punctures or tears with pressure sensitive tape.

3.7 ACCESS PANELS AND DOORS

Attach insulation to all access panels greater than 1 square foot and all access doors in insulated floors and ceilings. Use insulation with same R-Value as that for the floor or ceiling in which each panel occurs.

-- End of Section --

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	(2012) Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
ASTM C930	(2012) Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories
ASTM D3575	(2014) Flexible Cellular Materials Made From Olefin Polymers
ASTM D3833/D3833M	(1996; R 2011) Water Vapor Transmission of Pressure-Sensitive Tapes
ASTM D4397	(2010) Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
ASTM E136	(2016) Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C
ASTM E84	(2015b) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E96/E96M	(2014) Standard Test Methods for Water Vapor Transmission of Materials

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 211	(2016) Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances
NFPA 31	(2016) Standard for the Installation of Oil-Burning Equipment
NFPA 54	(2015) National Fuel Gas Code
NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY (TAPPI)

TAPPI T803 OM (2010) Puncture Test of Container Board

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

29 CFR 1910.134 Respiratory Protection

UL ENVIRONMENT (ULE)

ULE Greenguard UL Greenguard Certification Program

1.2 SUBMITTALS

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

SD-03 Product Data

Blanket Insulation

Sill Sealer Insulation

Vapor Retarder

Pressure Sensitive Tape

Accessories

SD-08 Manufacturer's Instructions

Insulation

SD-11 Closeout Submittals

Recycled Content for Insulation Materials; S

Reduce Volatile Organic Compounds (VOC) for Insulation Materials; S

1.3 SUSTAINABLE DESIGN CERTIFICATION

Product must be third party certified in accordance with ULE Greenguard Gold.

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 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 Recycled Content for Insulation Materials

Provide insulation materials meeting the recycled content requirements as stated within this section and provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING paragraph RECYCLED CONTENT.

2.1.2 Reduce Volatile Organic Compounds (VOC) for Insulation Materials

Provide insulation materials meeting the reduced VOC requirements as stated within this section and provide documentation in accordance with Section 01 33 29 SUSTAINABILITY REPORTING paragraph REDUCE VOLATILE ORGANIC COMPOUNDS.

2.2 BLANKET INSULATION

ASTM C665, Type I, blankets without membrane coverings; Class B, membrane-faced surface with a flame propagation resistance; critical radiant flux of 0.11 Btu/ft2 or greater, except a flame spread rating of 25 or less and a smoke developed rating of 150 or less when tested in accordance with ASTM E84.

2.2.1 Thermal Resistance Value (R-VALUE)

The R-Value must be as indicated on drawings.

2.2.2 Recycled Materials

Provide Thermal Insulation containing recycled materials to the extent practicable, provided the material meets all other requirements of this section. The minimum required recycled materials content by weight are:

Fiberglass: 20 to 25 percent glass cullet

2.2.3 Prohibited Materials

Do not provide asbestos-containing materials.

2.2.4 Reduced Volatile Organic Compounds (VOC) for Insulation Materials

ULE Greenguard Gold

2.3 SILL SEALER INSULATION

Provide polyethylene foam sill sealer 7.5 inches in width with the following characteristics:.

Physical Properties	Test Method	Measurement
Nominal Thickness	ASTM D3575	3/16 inch
Compressive Strength	ASTM D3575	1.2 psi
- Vertical Direction	Suffix D	
Tensile Strength	ASTM D3575	32 psi
	Suffix T	

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 VAPOR RETARDER

a. 6 mil thick polyethylene sheeting conforming to ASTM D4397 and having a water vapor permeance of 1 perm or less when tested in accordance with ASTM E96/E96M.

b. Membrane with the following properties:

Water Vapor Permeance: ASTM E96/E96M: 1 perm
Maximum Flame Spread: ASTM E84: 25
Combustion Characteristics: Passing ASTM E136
Puncture Resistance: TAPPI T803 OM: 15

2.6 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.

2.7 ACCESSORIES

2.7.1 Adhesive

As recommended by the insulation manufacturer.

Adhesives must follow the manufacturer's requirements for low pollutant emitting materials in achieving ULE Greenguard certification for their insulation products.

2.7.2 Mechanical Fasteners

Corrosion resistant fasteners as recommended by the insulation manufacturer.

2.7.3 Wire Mesh

Corrosion resistant and as recommended by the insulation manufacturer.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Blocking at Attic Vents and Access Doors

Prior to installation of insulation, install permanent blocking to prevent insulation from slipping over, clogging, or restricting air flow through soffit vents at eaves. Install permanent blocking to maintain accessibility to equipment or controls that require maintenance or adjustment.

3.1.2 Blocking Around Heat Producing Devices

Install non-combustible blocking around heat producing devices to provide the following clearances:

a. Recessed lighting fixtures, including wiring compartments, ballasts, and other heat producing devices, unless these are certified by the manufacturer for installation surrounded by insulation: 3 inches from outside face of fixtures and devices or as required by NFPA 70 and, if insulation is to be placed above fixture or device, 24 inches above fixture.

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.

3.2 INSTALLATION

3.2.1 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.

3.2.1.1 Electrical wiring

Do not install insulation in a manner that would sandwich electrical wiring between two layers of insulation.

3.2.1.2 Continuity of Insulation

Install blanket insulation to butt tightly against adjoining blankets and to studs, rafters, joists, sill plates, headers and any obstructions. Where insulation required is thicker than depth of joist, provide full width blankets to cover across top of joists. Provide continuity and integrity of insulation at corners, wall to ceiling joints, roof, and floor. Avoid creating thermal bridges.

3.2.1.3 Installation at Bridging and Cross Bracing

Insulate at bridging and cross bracing by splitting blanket vertically at center and packing one half into each opening. Butt insulation at bridging and cross bracing; fill in bridged area with loose or scrap insulation.

3.2.1.4 Cold Climate Requirement

Place insulation to the outside of pipes.

3.2.1.5 Insulation Blanket with Affixed Vapor Retarder

Locate vapor retarder as indicated. Do not install blankets with affixed vapor retarders unless so specified. Unless the insulation manufacturer's instructions specifically recommend not to staple the flanges of the vapor retarder facing, staple flanges of vapor retarder at 6 inch intervals flush with face or set in the side of truss, joist, or stud. Avoid gaps and bulges in insulation and "fishmouth" in vapor retarders. Overlap both flanges when using face method. Seal joints and edges of vapor retarder with pressure sensitive tape. Stuff pieces of insulation into small cracks between trusses, joists, studs and other framing, such as at attic access doors, door and window heads, jambs, and sills, band joists, and headers. Cover these insulated cracks with vapor retarder material and tape all joints with pressure sensitive tape to provide air and vapor tightness.

3.2.1.6 Insulation without Affixed Vapor Retarder

Provide snug friction fit to hold insulation in place. Stuff pieces of insulation into cracks between trusses, joists, studs and other framing, such as at attic access doors, door and window heads, jambs, and sills, band joists, and headers.

3.2.1.7 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.

3.2.1.8 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.

3.2.1.9 Installation of Sill Sealer

Size sill sealer insulation and place insulation over top of masonry or concrete perimeter walls or concrete perimeter floor slab on grade. Fasten sill plate over insulation.

3.2.1.10 Special Requirements for Floors

Hold insulation in place with corrosion resistant wire mesh, wire fasteners, or wire lacing.

3.2.1.11 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.

3.2.2 Installation of Separate Vapor Retarder

Apply continuous vapor retarder as indicated. Overlap joints at least 6 inches and seal with pressure sensitive tape. Seal at sill, header, windows, doors and utility penetrations. Repair punctures or tears with pressure sensitive tape.

-- End of Section --

SECTION 07 22 00

ROOF AND DECK INSULATION
08/11

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 SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7	(2010; Errata 2011; Supp 1 2013) Minimum Design Loads for Buildings and Other Structures

ASTM INTERNATIONAL (ASTM)

ASTM C1177/C1177M	(2013) Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
ASTM C1289	(2014a) Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
ASTM C208	(2012) Cellulosic Fiber Insulating Board
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials

FM GLOBAL (FM)

FM 4470	(2010) 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/
FM P9513	(2002) Specialist Data Book Set for Roofing Contractors; contains 1-22 (2001), 1-28 (2002), 1-29 (2002), 1-28R/1-29R (1998), 1-30 (2000), 1-31 (2000), 1-32 (2000), 1-33 (2000), 1-34 (2001), 1-49 (2000), 1-52 (2000), 1-54 (2001)

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	Scientific Certification Systems (SCS)Indoor Advantage

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC	(2009) Leadership in Energy and Environmental Design(tm) New Construction Rating System

UL ENVIRONMENT (ULE)

ULE Greenguard	UL Greenguard Certification Program

UNDERWRITERS LABORATORIES (UL)

UL Bld Mat Dir	(2012) Building Materials 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. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Wood nailers

Tapered roof insulation system; G

Taper cants and crickets

Show location and spacing of wood nailers that are required for securing insulation. Show a complete description of the procedures for the installation of each phase of the system indicating the type of materials, thicknesses, identity codes, sequence of laying insulation, location of ridges and valleys, special methods for cutting and fitting of insulation, and special precautions. The drawings shall be based on field measurements.

SD-03 Product Data

Fasteners ; G

Adhesives ; G

Insulation; G

Certification

Include minimum thickness of insulation for steel and concrete decks and fastener pattern for insulation on steel decks.

Recycled materials; (LEED NC)

MR4; Submit documentation indicating percentage of post-industrial and post-consumer recycled content per unit of product. Indicate relative dollar value of recycled content products to total dollar value of products included in project.

Local/Regional Materials; (LEED NC)

MR5; 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.

SD-06 Test Reports

Flame spread and smoke developed ratings

Submit in accordance with ASTM E84.

SD-07 Certificates

Installer qualifications

SD-08 Manufacturer's Instructions

Nails and fasteners

Roof insulation, including field of roof and perimeter attachment requirements.

1.3 MANUFACTURER'S CERTIFICATE

Submit certificate from the insulation manufacturer attesting that the installer has the proper qualifications for installing tapered roof insulation systems.

Certificate attesting that the expanded perlite or polyisocyanurate insulation contains recovered material and showing estimated percent of recovered material. Certificates of compliance for felt materials.

1.4 QUALITY ASSURANCE

1.4.1 Insulation on Steel Decks

Roof insulation shall have a flame spread rating not greater than 75 and a smoke developed rating not greater than 150, exclusive of covering, when tested in accordance with ASTM E84. Insulation bearing the UL label and listed in the UL Bld Mat Dir as meeting the flame spread and smoke developed ratings will be accepted in lieu of copies of test reports. Compliance with flame spread and smoke developed ratings will not be required when insulation has been tested as part of a roof construction assembly of the type used for this project and the construction is listed as fire-classified in the UL Bld Mat Dir or listed as Class I roof deck construction in the FM APP GUIDE. Insulation tested as part of a roof construction assembly shall bear UL or FM labels attesting to the ratings specified herein.

1.4.2 Sustainable Design Certification

Product shall be third party certified in accordance with ULE Greenguard, SCS Scientific Certification Systems Indoor Advantage or equal. Certification shall be performed annually and shall be current.

1.4.3 Insulation for Cool Roofing

Provide thermal insulation above the roof deck with an R value of 25.

1.4.4 Local/Regional Materials

See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total local material requirements. Roof insulation and materials may be locally available.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Delivery

Deliver materials to 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; and

Deliver materials in sufficient quantity to allow continuity of the work.

1.5.2 Storage and Handling

Store and handle materials in a manner to protect from damage, exposure to open flame or other ignition sources, and from wetting, condensation or moisture absorption. Store in an enclosed building or trailer that provides a dry, adequately ventilated environment. Replace damaged material with new material.

1.6 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.

1.7 PROTECTION OF PROPERTY

Provide protection as specified in Section 07 53 23 ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING.

PART 2 PRODUCTS

2.1 INSULATION

2.1.1 Insulation Types

Roof insulation shall be one or an assembly of a maximum of three of the following materials and compatible with attachment methods for the specified insulation and roof membrane:

a. Polyisocyanurate Board: ASTM C1289 Type II, fibrous felt or glass mat membrane both sides, except minimum compressive strength shall be 20 pounds per square inch (psi).

b. Wood Fiberboard: ASTM C208, high density, except 4 by 4 feet maximum board size.

ASTM C208 Type II, Grade 1 or 2, roof insulating board, treated with sizing, wax or bituminous impregnation. Bituminous impregnation shall be limited to 4 percent by weight when used over steel decks. Maximum board size: 4 feet by 4 feet.

2.1.2 Recovered Materials

Provide thermal insulation materials containing recycled materials to the extent practical. The required minimum recycled material content for the listed materials are:

Perlite Composition Board:	75 percent postconsumer paper
Polyisocyanurate/polyurethane:	9 percent recovered material
Wood Fiberboard:	25 percent recovered material
Cellular Glass Insulation:	75 percent recovered content
Structural Fiberboard:	100 percent recovered content
Fiberglass Insulation:	20-25 percent recovered content
Fiber (felt) or Fiber composite:	50-100 percent recovered content
Rubber:	12-100 percent recovered content
Plastic or Plastic/Rubber composite:	100 percent recovered content
Wood/Plastic Composite:	100 percent Total Recovered content

2.1.3 Insulation Thickness

As necessary to provide a thermal resistance (R value) of 25 or more for average thickness of tapered system. Thickness shall be based on the "R" value for aged insulation. Insulation over steel decks shall satisfy both specified R value and minimum thickness for width of rib opening recommended in insulation manufacturer's published literature.

2.1.4 Tapered Roof Insulation

One layer of the tapered roof insulation assembly shall be factory tapered to a slope of not less than 1/4 inch per foot. Provide starter and filler blocks as required to provide the total thickness of insulation necessary to meet the specified slope and thermal conductance. Mitered joints shall be factory fabricated and shall consist of two diagonally cut boards or one board shaped to provide the required slopes. Identify each piece of tapered insulation board by color or other identity coding system, allowing the identification of different sizes of tapered insulation board required to complete the roof insulation system.

2.1.5 Cants and Tapered Edge Strips

Provide preformed cants and tapered edge strips of the same material as the roof insulation; or, when roof insulation material is unavailable, provide pressure-preservative treated wood, wood fiberboard, or rigid perlite board cants and edge strips as recommended by the roofing manufacturer, unless otherwise indicated. Face of cant strips shall have incline of 45 degrees and 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 PROTECTION BOARD

For use as a protection board for adhesively-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, 5/8 inch thick, 4 by 8 feet board size.

2.3 FASTENERS

Flush-driven through flat round or hexagonal steel or plastic plates. Steel plates shall be zinc-coated, flat round not less than 1 3/8 inch diameter or hexagonal not less than 28 gage. Plastic plates shall be high-density, molded thermoplastic with smooth top surface, reinforcing ribs and not less than 3 inches in diameter. Fastener head shall recess fully into the plastic plate after it is driven. Plates shall be formed to prevent dishing. Do not use bell-or cup-shaped plates. Fasteners shall conform to insulation manufacturer's recommendations except that holding power, when driven, shall be not less than 40 pounds each in steel deck. Fasteners for steel or concrete decks shall conform to FM APP GUIDE for Class I roof deck construction, and shall be spaced to withstand a design wind speed of 120 mph in accordance with ASCE 7 and/or other applicable building code requirements.

2.3.1 Fasteners for Steel Decks

Approved hardened penetrating fasteners or screws conforming to FM 4470 and listed in FM APP GUIDE for Class I roof deck construction. Quantity and placement to withstand a minimum uplift pressure of 90 psf conforming to FM APP GUIDE.

2.4 INSULATION ADHESIVES

Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:

a. Modified asphaltic, asbestos-free, cold-applied adhesive.

b. Bead-applied, low rise, one-component or multicomponent urethane adhesive.

c. Full-spread spray-applied, low-rise, two-component urethane adhesive.

2.5 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

Surfaces shall be clean, smooth, and dry. Check roof deck surfaces, including surfaces sloped to roof drains and outlets, for defects before starting work.

The Contractor shall inspect and approve the surfaces immediately before starting installation. Prior to installing insulation, 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.

3.1.2 Surface Preparation

Correct defects and inaccuracies in roof deck surface to eliminate poor drainage and hollow or low spots and perform the following:

a. Install wood nailers the same thickness as insulation at eaves, edges, curbs, walls, and roof openings for securing cant strips, gravel stops, gutters, and flashing flanges. On decks with slopes of one inch per foot or more, install wood nailers perpendicular to slope for securing insulation. Space nailers in accordance with approved shop drawings.

b. Cover steel decks with a layer of insulation board of sufficient thickness to span the width of a deck rib opening, and conforming to fire safety requirements. Secure with piercing or self-drilling, self-tapping fasteners of quantity and placement conforming to FM APP GUIDE. Insulation joints parallel to ribs of deck shall occur on solid bearing surfaces only, not over open ribs.

3.2 INSULATION INSTALLATION

Apply insulation in two layers with staggered joints when total required thickness of insulation exceeds 1/2 inch. Lay insulation so that continuous longitudinal joints are perpendicular to direction of roofing, as specified in Section 07 53 23 ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING, and end joints of each course are staggered with those of adjoining courses. When using multiple layers of insulation, joints of each succeeding layer shall be parallel and offset in both directions with respect to layer below. Keep insulation 1/2 inch clear of vertical surfaces penetrating and projecting from roof surface.

3.2.1 Installation Using Only Mechanical Fasteners and/or Adhesives

Secure total thickness of insulation with penetrating type fasteners and/or adhesives as per the requirements of the UL tested assembly and the manufacturer's written instructions.

3.2.2 Special Precautions for Installation of Foam Insulation

3.2.2.1 Polyisocyanurate Insulation

Where polyisocyanurate foam board insulation is provided, install 1/2 inch thick wood fiberboard, glass mat gypsum roof board, or 3/4 inch thick expanded perlite board insulation over top surface of foam board insulation. Stagger joints of insulation with respect to foam board insulation below.

3.2.3 Cant Strips

Where indicated, provide cant strips at intersections of roof with walls, parapets, and curbs extending above roof. Wood cant strips shall bear on and be anchored to wood blocking. Fit cant strips flush against vertical surfaces. Where possible, nail cant strips to adjoining surfaces. Where cant strips are installed against non-nailable materials, install in an approved adhesive.

3.2.4 Tapered Edge Strips

Where indicated, provide edge strips in the right angle formed by junction of roof and wood nailing strips that extend above level of roof. Install edge strips flush against vertical surfaces of wood nailing strips. Where possible, nail edge strips to adjoining surfaces. Where installed against non-nailable materials, install in an approved adhesive.

3.3 PROTECTION

3.3.1 Protection of Applied Insulation

Completely cover each day's installation of insulation with the finished roofing specified in Section 07 53 23 ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING on same day. Do not permit phased construction. 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. Do not permit storing, walking, wheeling, or trucking directly on insulation or on roofed surfaces. Provide smooth, clean board or plank walkways, runways, and platforms near supports, as necessary, to distribute weight to conform to indicated live load limits of roof construction. Exposed edges of the insulation shall be protected by cutoffs at the end of each work day or whenever precipitation is imminent. Cutoffs shall be 2 layers of bituminous-saturated felt set in plastic bituminous cement or EPDM membrane set in roof cement. Fill all profile voids in cut-offs to prevent entrapping of moisture into the area below the membrane. Cutoffs shall be removed when work is resumed.

3.3.2 Damaged Work and Materials

Restore work and materials that become damaged during construction to original condition or replace with new materials.

3.4 INSPECTION

The Contractor shall establish and maintain an inspection procedure to assure compliance of the installed roof insulation with the contract requirements. Any work found not to be in compliance with the contract shall be promptly removed and replaced or corrected in an approved manner. Quality control shall include, but not be 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 P9513.

c. Verification of proper storage and handling of insulation materials before, during, and after installation.

d. Inspection of mechanical fasteners; type, number, length, and spacing.

e. Coordination with other materials, cants, sleepers, and nailing strips.

f. Inspection of insulation joint orientation and laps between layers, joint width and bearing of edges of insulation on deck.

g. Installation of cutoffs and proper joining of work on subsequent days.

h. Continuation of complete roofing system installation to cover insulation installed same day.

-- End of Section --

SECTION 07 42 13

METAL WALL PANELS
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 ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 501.1	(2005) Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure
AAMA 800	(2010) Voluntary Specifications and Test Methods for Sealants

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 341	(2010) Seismic Provisions for Structural Steel Buildings

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI S100	(2012) North American Specification for the Design of Cold-Formed Steel Structural Members
AISI SG03-3	(2002; Suppl 2001-2004; R 2008) Cold-Formed Steel Design Manual Set

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7	(2010; Errata 2011; Supp 1 2013) Minimum Design Loads for Buildings and Other Structures

AMERICAN WELDING SOCIETY (AWS)

AWS A5.1/A5.1M	(2012) Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding
AWS D1.1/D1.1M	(2015; Errata 2015) Structural Welding Code - Steel
AWS D1.2/D1.2M	(2014) Structural Welding Code - Aluminum

ASTM INTERNATIONAL (ASTM)

ASTM A1008/A1008M	(2015) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability,

	Solution Hardened, and Bake Hardened
ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A424/A424M	(2009a) Standard Specification for Steel Sheet for Porcelain Enameling
ASTM A463/A463M	(2010; R 2015) Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process
ASTM A606/A606M	(2009a) Standard Specification for Steel Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance
ASTM A653/A653M	(2015) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A755/A755M	(2015) Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products
ASTM A780/A780M	(2009; R 2015) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A924/A924M	(2014) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B117	(2011) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM C286	(1999; R 2009) Standard Terminology Relating to Porcelain Enamel and Ceramic-Metal Systems
ASTM C920	(2014a) Standard Specification for Elastomeric Joint Sealants
ASTM D1056	(2014) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D1308	(2013) Effect of Household Chemicals on Clear and Pigmented Organic Finishes
ASTM D1654	(2008) Evaluation of Painted or Coated Specimens Subjected to Corrosive

	Environments
ASTM D1667	(2005; R 2011) Flexible Cellular Materials - Poly (Vinyl Chloride) Foam (Closed-Cell)
ASTM D2244	(2015a) Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D2247	(2015) Testing Water Resistance of Coatings in 100% Relative Humidity
ASTM D2794	(1993; R 2010) Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D3359	(2009; E 2010; R 2010) Measuring Adhesion by Tape Test
ASTM D3363	(2005; E 2011; R 2011; E 2012) Film Hardness by Pencil Test
ASTM D4214	(2007; R 2015) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
ASTM D4587	(2011) Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings
ASTM D522/D522M	(2014) Mandrel Bend Test of Attached Organic Coatings
ASTM D523	(2014) Standard Test Method for Specular Gloss
ASTM D5894	(2010) Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet)
ASTM D610	(2008; R 2012) Evaluating Degree of Rusting on Painted Steel Surfaces
ASTM D714	(2002; R 2009) Evaluating Degree of Blistering of Paints
ASTM D822	(2001; R 2006) Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings
ASTM D968	(2015) Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM E1592	(2005; R 2012) Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
ASTM E283	(2004; R 2012) Determining the Rate of Air

	Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E331	(2000; R 2009) Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E72	(2015) Conducting Strength Tests of Panels for Building Construction
ASTM E84	(2015b) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM G152	(2013) Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G153	(2013) Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)

MBMA MBSM	(2002) Metal Building Systems Manual

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM AMP 500	(2006) Metal Finishes Manual

PORCELAIN ENAMEL INSTITUTE (PEI)

PEI 1001	(1996) Specification for Architectural Porcelain Enamel (ALS-100)
PEI CG-3	(2005) Color Guide for Architectural Porcelain Enamel

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1793	(2012) Architectural Sheet Metal Manual, 7th Edition

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC	(2009) Leadership in Energy and Environmental Design(tm) New Construction Rating System

UNDERWRITERS LABORATORIES (UL)

UL Bld Mat Dir	(2012) Building Materials Directory

1.2 GENERAL REQUIREMENTS

Coordinate the specific requirements for sheet metal flashing and trim in

this section with the requirements for flashing adn sheet metal in Section 07 60 00 FLASHING AND SHEET METAL.

1.3 DEFINITIONS

Metal Wall Panel: Metal wall panels, attachment system components, miscellaneous metal framing, thermal insulation and accessories necessary for a complete weather-tight wall system.

1.4 DESCRIPTION OF WALL PANEL SYSTEM

Factory color finished metal wall panel system with concealed fastening attachment. Panel profile must be flush and smooth face as shown on drawings.

1.4.1 Metal Wall Panel General Performance

Comply with performance requirements, conforming to AISI S100, without failure due to defective manufacture, fabrication, installation, or other defects in construction. Wall panels and accessory components must conform to the following standards:

ASTM A1008/A1008M
ASTM A123/A123M
ASTM A36/A36M
ASTM A424/A424M, ASTM C286, PEI 1001, PEI CG-3 for Porcelain and Ceramic Enameling
ASTM A653/A653M
ASTM A463/A463M for aluminum coated steel sheet
ASTM A606/A606M
ASTM A755/A755M for metallic coated steel sheet for exterior coil pre-painted applications.
ASTM A780/A780M for repair of damage or uncoated areas of hot-dipped galvanized coating.
ASTM A924/A924M for metallic coated steel sheet
ASTM D522/D522M for applied coatings
UL Bld Mat Dir

1.4.2 Structural Performance

Maximum calculated fiber stress must not exceed the allowable value in the AISI or AA manuals; a one third overstress for wind is allowed. Midspan deflection under maximum design loads is limited to L/180. Contract drawings show the design wind loads and the extent and general assembly details of the metal siding. Contractor must provide design for members and connections not shown on the drawings. Siding panels and accessories must be the products of the same manufacturer.

Provide metal wall panel assemblies complying with the load and stress requirements in accordance with ASTM E1592. Wind Load force due to wind action governs the design for panels.

Wall systems and attachments are to resist the wind loads as determined by ASTM E72 and ASCE 7 in the geographic area where the construction will take place, in pounds per square foot. Submit five copies of wind load tests and seismic tests to the Contracting Officer.

Provide metal wall panel assembly for seismic conditions complying with the applicable requirements of AISC 341 when required.

1.4.3 Air Infiltration

Air leakage must conform to the limits through the wall assembly area when tested according to ASTM E283.

1.4.4 Water Penetration Under Static Pressure

No water penetration when tested according to ASTM E331.

1.4.5 Water Penetration Under Dynamic Pressure

No evidence of water leakage when tested according to AAMA 501.1.

1.5 SUBMITTALS

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

SD-01 Preconstruction Submittals

Submit Documentation for the following items:

Qualification of Manufacturer; G
Qualification of Installation Contractor; G
Qualification of Welders; G
Sample Warranty; G

SD-02 Shop Drawings

Installation Drawings ; G

SD-03 Product Data

Recycled Content; (LEED NC)

Submit Manufacturer's data indicating percentage of recycle material in wall panels to verify sustainable acquisition compliance.

Submit Manufacturer's catalog data for the following items:

Wall Panels ; G

Factory Color Finish
Closure Materials
Pressure Sensitive Tape
Sealants and Caulking
Galvanizing Repair Paint
Enamel Repair Paint
Aluminized Steel Repair Paint
Accessories

SD-04 Samples

Submit as required each of the following samples:

Wall Panels, 12 inches long by actual panel width; G
Fasteners; G
Metal Closure Strips, 10 inches long of each type; G

Color chart and chips ; G

Submit manufacturer's color charts and chips, approximately 4 by 4 inches, showing full range of colors, textures and patterns available for wall panels with factory applied finishes.

SD-05 Design Data

Wind load design analysis ; G

As applicable, submit the following wind load design analysis data, to include, but not limited to:

wind speed
exposure category,co-efficient,importance factor
type of facility
negative pressures for each zone
methods and requirements of attachment

SD-06 Test Reports

Submit test reports for the following in accordance with the referenced articles in this section.

Leakage Tests; G
Wind Load Tests; G
Coating Tests; G
Chalking Tests; G
Seismic Tests; G

SD-07 Certificates

Submit certificates for the following items showing conformance with referenced standards contained in this section:

Coil Stock; G
Fasteners; G
Galvanizing Repair Paint; G
Enamel Repair Paint; G

SD-08 Manufacturer's Instructions

Include detailed application instructions and standard manufacturer drawings altered as required by these specifications.

Installation of Wall panels; G

SD-09 Manufacturer's Field Reports

Submit 3 bound copies of the Manufacturer's Field Reports; G

SD-11 Closeout Submittals

Warranty; G
Maintenance Instructions; G

20 year "No Dollar Limit" warranty for labor and material

1.6 QUALITY ASSURANCE

1.6.1 Delegated-Design Information

Design Calculations for Metal Panel Assemblies: Design metal wall panel assemblies 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.

Initial Certification Letter from Contractor's Delegated-Design 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. Initial 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 wall panel assemblies.
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 Wall Panel assemblies have been performed in accordance with the Professional Engineer's design.

Final Certification Letter from Contractor's Delegated-Design Professional Engineer: After construction of the metal wall panel assemblies is complete, submit a signed and sealed Certification Letter from the responsible design professional stating that the fabrication and installation of the metal wall panel assemblies have been performed in

accordance with the Professional Engineer's design. Final Certification Letter shall be submitted for record only.

1.6.2 Pre-Installation Conference

Upon notification of submittal receipt and approval by the Contracting Officer; and prior to the commencement of the work, the Contractor must attend a pre-installation conference to review the following:

a. Drawings and Specifications.

b. Qualification of Installer, Qualification of Welders.

c. Sustainable acquisition

d. Approved Warranty

e. Sample wall panels, 12 inches long by actual panel width

f. Sample metal closure strips, 10 inches long of each type

g. Color charts and chips

h. Coatings and base metal tests, chalking tests

i. Construction schedule, availability of materials, Installer's personnel, equipment and facilities required to progress with the work without delay.

j. Methods and procedures related to installation of wall panels, including manufacturer's written instructions. Explicitly identify in writing, differences between manufacturer's instructions and the specified requirements.

k. Support conditions for compliance with requirements, including alignment between and attachment to structural members.

l. Flashing, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.

m. Governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.

n. Temporary protection requirements for metal wall panel assembly during and after installation.

o. Wall panel observation and repair procedures after metal wall panel installation. Provide detailed written instructions including copies of Material Safety Data Sheets for maintenance and repair materials, and manufacturer's maintenance instructions.

1.6.2.1 Installation Drawings

Installation shop drawings for wall panels, flashing, accessories, and anchorage systems must indicate completely dimensioned structural frame and erection layouts, openings in the wall, special framing details, and construction details at corners, building intersections and flashing, location and type of mastic and metal filler strips.

1.6.2.2 Wind Load Design Analysis

Wind design analysis must include wall plan delineating dimensions and attachment patterns for each zone. Wind design analysis must be prepared and sealed by Licensed Project Engineer in the geographic area where the construction will take place.

1.6.3 Manufacturer's Technical Representative

The representative must have authorization from manufacturer to approve field changes and be thoroughly familiar with the products and installations in the geographical area where construction will take place.

1.6.4 Qualification of Manufacturer

Certify that metal wall panel system manufacturer has a minimum of five (5) years experience in manufacturing metal wall system and accessory products.

Manufacturer must also provide engineering services by an authorized engineer; currently licensed in the geographical area where construction will take place, having a minimum of four (4) years experience as an engineer knowledgeable in wind load design analysis, protocols and procedures per MBMA MBSM, "Metal Building Systems Manual"; ASCE 7, and ASTM E1592 and seismic design conforming to AISC 341.

Provide certified engineering calculations, using the products submitted, for Wind load requirements in accordance with ASCE 7.

1.6.4.1 Manufacturer's Certificates

Also provide the following certifications from the manufacturer:

Coil Stock
Fasteners
Galvanizing Repair Paint
Enamel Repair Paint

Submit certification from coil stock manufacturer or supplier that the machinery used will form the provided coil stock without warping, waviness, or rippling that is not a part of the panel profile, and without damage, abrasion or marring of the finish coating.

Provide evidence that products used within this specification are manufactured in the United States.

1.6.5 Certified Qualification of Installation Contractor

The installation contractor must be approved and certified by the metal wall panel manufacturer prior to beginning the installation of the metal wall panel system. Subcontracting by Certified Contractor for the metal wall panel work is not permitted.

1.6.5.1 Qualifications for Welding Work

Qualification of welders and welding must conform to AWS A5.1/A5.1M, AWS D1.1/D1.1Mfor steel or AWS D1.2/D1.2M for aluminum.

1.6.6 Single Source

Obtain each type of metal wall panels, clips, closure materials and other accessories from the standard products of the single source from a single manufacturer to operate as a complete system for the intended use.

1.6.7 Manufacturer's Maintenance Instructions

Provide manufacturer's detailed written instructions including copies of Material Safety Data Sheets for maintenance and repair materials.

1.7 DELIVERY, HANDLING, AND STORAGE

Deliver and protect package components, sheets, metal wall panels, and other manufactured items to prevent damage or deformation during transportation and handling.

Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.

Stack and store metal wall panels horizontally on platforms or pallets, covered with suitable weather-tight and ventilated covering to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.

Retain strippable protective covering on metal wall panel until actual installation.

1.8 PROJECT CONDITIONS

1.8.1 Field Measurements

Verify locations of wall framing and opening dimensions by field measurements before metal wall panel fabrication and indicate measurements on Shop Drawings.

1.8.2 Weather Limitations

Proceed with installation preparation only when existing and forecasted weather conditions permit Work to proceed without water entering into wall system or building.

1.9 WARRANTY

Warranty must conform to the Sample Warranty as reviewed and approved by the Contracting Officer.

1.9.1 20 Year "No Dollar Limit" Warranty for Labor and Material

Furnish manufacturer's no-dollar-limit warranty for the metal wall panel system. The warranty period is to be no less than twenty (20) years from the date of Government acceptance of the work. The warranty is to be issued directly to the Government. The warranty is to provide that if within the warranty period the metal wall panel system shows evidence of corrosion, perforation, rupture or excess weathering due to deterioration of the wall panel system resulting from defective materials and correction of the defective workmanship is to be the responsibility of the metal wall panel system manufacturer. Repairs that become necessary because of

defective materials and workmanship while metal wall panel system is under warranty are to be performed within 24 hours after notification, unless additional time is approved by the Contracting Officer. Failure to perform repairs within 24 hours of notification will constitute grounds for having emergency repairs performed by others and not void the warranty.

PART 2 PRODUCTS

2.1 FABRICATION

Unless approved otherwise, fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated and specified performance requirements. Comply with indicated profiles and with dimensional and structural requirements. See section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total recycled content requirements.

Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel. Fabricate metal wall panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weather-tight and minimize noise from movements within panel assembly.

2.1.1 Sheet Metal Accessories

Fabricate flashing and trim to comply with recommendations in SMACNA 1793 that apply to the design, dimensions, metal, and other characteristics of item indicated:

a. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

b. End Seams: fabricate nonmoving end seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

c. Sealed Joints: form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA 1793.

d. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

e. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA 1793 or by metal wall panel manufacturer for application, but not less than thickness of metal being secured.

2.2 PANEL MATERIALS

2.2.1 Steel Sheet

Roll-form steel wall panels to the specified profile, with 26 and 22 gauge and depth as indicated. Material must be plumb and true, and within the tolerances listed:

a. Galvanized Steel Sheet conforming to ASTM A653/A653M and AISI SG03-3.

b. Individual panels must be continuous length to cover the entire length

of any unbroken wall area with no joints or seams and formed without warping, waviness, or ripples that are not part of the panel profile and free of damage to the finish coating system.

c. Provide panels with thermal expansion and contraction consistent with the type of system specified.

1. Smooth, flat surface texture.

2.2.2 Factory Color Finish

Comply with NAAMM AMP 500 for recommendations for applying and designating finishes. Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

All panels are to receive a factory-applied polyvinylidene fluoride finish consisting of a baked-on top-coat with a manufacturer's recommended prime coat conforming to the following:

2.2.2.1 Metal Preparation

Carefully prepare all metal surface for painting on a continuous process coil coating line by alkali cleaning, hot water rinsing, application of chemical conversion coating, cold water rinsing, sealing with acid rinse, and thorough drying.

2.2.2.2 Prime Coating

Apply a base coat of epoxy paint, specifically formulated to interact with the top-coat, to the prepared surfaces by roll coating to a dry film thickness of 0.20 plus 0.05 mils. Prime coat must be oven cured prior to application of finish coat.

2.2.2.3 Exterior Finish Coating

Roll coat the finish coating over the primer by roll coating to dry film thickness of 0.80 plus 5 mils (3.80 plus 0.50 mils for Vinyl Plastisol) for a total dry film thickness of 1.00 plus 0.10 mils (4.00 plus 0.10 mils for Vinyl Plastisol). Oven-cure finish coat.

2.2.2.4 Interior Finish Coating

Apply a wash-coat on the reverse side over the primer by roll coating to a dry film thickness of 0.30 plus 0.05 mils for a total dry film thickness of 0.50 plus 0.10 mils. Oven-cured the wash coat.

2.2.2.5 Color

Provide exterior finish color as selected by the Contracting Officer from the manufacturer's standard color chart.

2.2.2.6 Physical Properties

Coating must conform to the industry and manufacturer's standard performance criteria as listed by the following certified test reports:

General:	ASTM D5894 and ASTM D4587
Abrasion:	ASTM D968
Adhesion:	ASTM D3359
Chalking:	ASTM D4214
Chemical Pollution:	ASTM D1308
Color Change and Conformity:	ASTM D2244
Creepage:	ASTM D1654
Cyclic Corrosion Test:	ASTM D5894
Flame Spread:	ASTM E84
Flexibility:	ASTM D522/D522M
Formability:	ASTM D522/D522M
Gloss at 60 and 85 degrees:	ASTM D523
Humidity:	ASTM D2247 and ASTM D714
Oxidation:	ASTM D610
Pencil Hardness:	ASTM D3363
Reverse Impact:	ASTM D2794
Salt Spray:	ASTM B117
Weatherometer:	ASTM G152, ASTM G153 and ASTM D822

2.3 MISCELLANEOUS METAL FRAMING

Cold-formed metallic-coated steel sheet conforming to ASTM A653/A653M and specified in Section 05 40 00 COLD-FORMED METAL FRAMING unless otherwise indicated.

2.3.1 Fasteners for Miscellaneous Metal Framing

Type, material, corrosion resistance, size and sufficient length to penetrate the supporting member a minimum of 1 inch with other properties required to fasten miscellaneous metal framing members to supporting members and substrates in accordance with the wall panel manufacturer's and ASCE 7 requirements.

2.4 FASTENERS

2.4.1 General

2.4.1.1 Exposed Fasteners

Provide corrosion resistant fasteners for wall panels, made of coated steel, aluminum, or nylon capped steel compatible with the sheet panel or flashing and of a type and size recommended by the manufacturer to meet the performance requirements and design loads.

Fasteners for accessories must be the manufacturer's standard. Provide an integral metal washer matching the color of attached material with compressible sealing EPDM gasket approximately 3/32 inch thick.

2.4.1.2 Hidden Fasteners

Provide corrosion resistant fasteners recommended by the manufacturer to meet the performance requirements and design loads.

2.4.1.3 Screws

Screws to be corrosion resistant coated steel, aluminum and/or stainless steel being the type and size recommended by the manufacturer to meet the performance requirements.

2.4.1.4 Rivets

Rivets to be closed-end type, corrosion resistant coated steel, aluminum or stainless steel where watertight connections are required.

2.4.1.5 Attachment Clips

Fabricate clips from steel hot-dipped galvanized in accordance with ASTM A653/A653M, Z275 G 90 or Series 300 stainless steel. Size, shape, thickness and capacity as required meeting the insulation thickness and design load criteria specified.

2.5 ACCESSORIES

2.5.1 General

All accessories must be compatible with the metal wall panels. Sheet metal flashing, trim, metal closure strips, caps and similar metal accessories must not be less than the minimum thickness specified for the wall panels. Exposed metal accessories/finishes to match the panels furnished, except as otherwise indicated. Molded foam rib, ridge and other closure strips must be non-absorbent closed-cell or solid-cell synthetic rubber or pre-molded neoprene to match configuration of the panels.

2.5.2 Rubber Closure Strips

Provide closed-cell, expanded cellular rubber conforming to ASTM D1056 and ASTM D1667; extruded or molded to the configuration of the specified wall panel and in lengths supplied by the wall panel manufacturer.

2.5.3 Metal Closure Strips

Provide factory fabricated steel closure strips to be the same gauge,

thickness, color, finish and profile of the specified wall panel.

2.5.4 Joint Sealants

2.5.4.1 Sealants and Caulking

Provide approved gun type sealants for use in hand- or air-pressure caulking guns at temperatures above 4 degrees C (or frost-free application at temperatures above 10 degrees F with minimum solid content of 85 percent of the total volume. Sealants must dry with a tough, durable surface skin which permit remaining soft and pliable underneath, providing a weather-tight joint. No migratory staining is permitted on painted or unpainted metal, stone, glass, vinyl, or wood.

Prime all joints receiving sealants with a compatible one-component or two-component primer as recommended by the wall panel manufacturer.

2.5.4.2 Shop-Applied

Sealant for shop-applied caulking must be non-curing butyl compliant with AAMA 800 to ensure the sealant's plasticity at the time of field erection.

2.5.4.3 Field-Applied

Sealant for field-applied caulking must be an approved gun grade, non-sag one component polysulfide or two-component polyurethane with an initial maximum Shore A durometer hardness of 25, and conforming to ASTM C920, Type II. Color to match panel colors.

2.5.4.4 Pressure Sensitive Tape

Provide pressure sensitive tape sealant, 100 percent solid with a release paper backing; permanently elastic, non-sagging, non-toxic and non-staining as approved by the wall panel manufacturer.

2.6 SHEET METAL FLASHING AND TRIM

2.6.1 Fabrication

Shop fabricate sheet metal flashing and trim where practicable to comply with recommendations in SMACNA 1793 that apply to design, dimensions, metal, and other characteristics of item indicated. Obtain field measurements for accurate fit before shop fabrication.

Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

2.7 REPAIR OF FINISH PROTECTION

Repair paint for color finish enameled wall panel must be compatible paint of the same formula and color as the specified finish furnished by the wall panel manufacturer. Provide 2 quarts of repair paint matching the specified wall panels.

PART 3 EXECUTION

3.1 EXAMINATION

Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of the Work.

Examine primary and secondary wall framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal wall panel manufacturer, UL, ASTM, ASCE 7 and as required for the geographical area where construction will take place.

Examine solid wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.

Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.

Submit to the Contracting Officer a written report, endorsed by Installer, listing conditions detrimental to performance of the Work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment. Miscellaneous framing installation, including sub-purlins, girts, angles, furring, and other miscellaneous wall panel support members and anchorage must be according to metal wall panel manufacturer's written instructions.

3.3 WALL PANEL INSTALLATION

Provide full length metal wall panels, from sill to eave as indicated, unless otherwise indicated or restricted by shipping limitations. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement in accordance with MBMA MBSM.

Erect wall panel system in accordance with the approved erection drawings, the printed instructions and safety precautions of the manufacturer.

Sheets are not to be subjected to overloading, abuse, or undue impact. Bent, chipped, or defective sheets shall not be applied.

Sheets must be erected true and plumb and in exact alignment with the horizontal and vertical edges of the building, securely anchored, and with the indicated eave, and sill.

Work is to allow for thermal movement of the wall panel, movement of the building structure, and to provide permanent freedom from noise due to wind pressure.

Field cutting metal wall panels by torch is not permitted.

3.3.1 Steel Wall Panels

Use stainless-steel fasteners for exterior surfaces and galvanized steel fasteners for interior surfaces.

3.3.2 Anchor Clips

Anchor metal wall panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

3.3.3 Metal Protection

Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal wall panel manufacturer.

3.3.4 Joint Sealers

Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.

3.4 FASTENER INSTALLATION

Anchor metal wall panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

3.5 FLASHING, TRIM AND CLOSURE INSTALLATION

3.5.1 General Requirements

Comply with performance requirements, manufacturer's written installation instructions, and SMACNA 1793. Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams to form permanently watertight and weather resistant.

Install sheet metal work is to form weather-tight construction without waves, warps, buckles, fastening stresses or distortion, and allow for expansion and contraction. Cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades is to be performed by sheet metal mechanics.

3.5.2 Metal Flashing

Install exposed metal flashing at building corners, sills and eaves, junctions between metal siding and walling. Exposed metal flashing must be the same material, color, and finish as the specified metal wall panel.

Fasten flashing at a minimum of 8 inches on center, except where flashing is held in place by the same screws that secure covering sheets.

Flashing is to be furnished in at least 8 foot lengths. Exposed flashing is to have 1 inch locked and blind-soldered end joints, and expansion joints at intervals of not more than 16 feet.

Exposed flashing and flashing subject to rain penetration to be bedded in the specified joint sealant.

Isolate flashing which is in contact with dissimilar metals by means of the specified asphalt mastic material to prevent electrolytic deterioration.

Form drips to the profile indicated, with the edge folded back 1/2 inch to form a reinforced drip edge.

3.5.3 Closures

Install metal closure strips at open ends of corrugated or ribbed pattern walls, and at intersection of wall and wall unless open ends are concealed with formed eave flashing; and in other required areas.

Install mastic closure strips at intersection of the wall with metal walling; top and bottom of metal siding; heads of wall openings; and in other required locations.

3.6 WORKMANSHIP

Make lines, arises, and angles sharp and true. Free exposed surfaces from visible wave, warp, buckle, and tool marks. Fold back exposed edges neatly to form a 1/2 inch hem on the concealed side. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction.

Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections which might affect the application. For installation of items not shown in detail or not covered by specifications conform to the applicable requirements of SMACNA 1793. Provide sheet metal flashing in the angles formed where roof decks abut walls, curbs, ventilators, pipes, or other vertical surfaces and wherever indicated and necessary to make the work watertight.

3.7 ACCEPTANCE PROVISIONS

3.7.1 Erection Tolerances

Erect metal wall panels straight and true with plumb vertical lines correctly lapped and secured in accordance with the manufacturer's written instructions.

3.7.2 Leakage Tests

Finished application of metal wall panels are to be subject to inspection and test for leakage by request of the Contracting Officer, Architect/Engineer. Conduct inspection and tests at no cost to the Government.

Inspection and testing is to be made promptly after erection to permit correction of defects and the removal and replacement of defective materials.

3.7.3 Repairs to Finish

Scratches, abrasions, and minor surface defects of finish may be repaired with the specified repair materials. Finished repaired surfaces must be uniform and free from variations of color and surface texture.

Repaired metal surfaces that are not acceptable to the project requirements and/or Contracting Officer are to be immediately removed and replaced with new material.

3.7.4 Paint-Finish Metal Siding

Paint-finish metal siding will be tested for color stability by the Contracting Officer during the manufacturer's specified guarantee period.

Panels that indicate color changes, fading, or surface degradation, determined by visual examination, must be removed and replaced with new panels at no expense to the Government.

New panels will be subject to the specified tests for an additional year from the date of their installation.

3.8 FIELD QUALITY CONTROL

3.8.1 Construction Monitoring

Make visual inspections as necessary to ensure compliance with specified requirements. Additionally, verify the following:

a. Materials comply with the specified requirements.

b. All materials are properly stored, handled and protected from damage. Damaged materials are removed from the site.

c. Framing and substrates are in acceptable condition, in compliance with specification, prior to application of wall panels.

d. Panels are installed without buckles, ripples, or waves and in uniform alignment and modulus.

e. Side laps are formed, sealed, fastened or seam locked as required.

f. The proper number, type, and spacing of attachment clips and fasteners are installed.

g. Installer adheres to specified and detailed application parameters.

h. Associated flashing and sheet metal are installed in a timely manner in accord with the specified requirements.

Provide five bound copies of Manufacturer's Field Reports to the Contracting Officer two weeks prior to project close-out.

3.9 CLEAN-UP AND DISPOSAL

Clean all exposed sheet metal work at completion of installation. Remove metal shavings, filings, nails, bolts, and wires from work area. Remove grease and oil films, excess sealants, handling marks, contamination from steel wool, fittings and drilling debris and scrub the work clean. Exposed metal surfaces must be free of dents, creases, waves, scratch marks, solder

or weld marks, and damage to the finish coating.

Collect and place scrap/waste materials in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site; transport demolished materials from government property and legally dispose of them.

-- End of Section --

SECTION 07 52 00

MODIFIED BITUMINOUS MEMBRANE ROOFING (BID OPTION)
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	(2010; Errata 2011; Supp 1 2013) Minimum Design Loads for Buildings and Other Structures

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.24	(2014) Roofing - Safety Requirements of Low-Sloped Roofs

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 C1289	(2014a) Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
ASTM D1970/D1970M	(2015) Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
ASTM D2170/D2170M	(2010) Kinematic Viscosity of Asphalts (Bitumens)
ASTM D3746	(2008) Standard Test Method for Impact Resistance of Bituminous Roofing Systems
ASTM D41/D41M	(2011) Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
ASTM D4272	Standard Test Method for Total Energy Impact of Plastic Films By Dart Drop
ASTM D4402/D4402M	(2013) Viscosity Determination of Asphalt at Elevated Temperatures Using a Rotational Viscometer

ASTM D4586/D4586M	(2007; E 2012; R 2012) Asphalt Roof Cement, Asbestos-Free
ASTM D4637/D4637M	(2014; E 2014) EPDM Sheet Used in Single-Ply Roof Membrane
ASTM D5147/D5147M	(2014) Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material
ASTM D6164/D6164M	(2011) Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements
ASTM E108	(2011) Fire Tests of Roof Coverings
ASTM G152	(2013) Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G154	(2012a) Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials
ASTM G155	(2013) Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

FM GLOBAL (FM)

FM 4450	(1989) Approval Standard for Class 1 Insulated Steel Deck Roofs
FM 4470	(2010) 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/

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

NRCA C3701	(2002) Repair Manual for Low Slope Membrane Roof Systems
NRCA Details	(2003) NRCA Roof Perimeter Flashing Systems Construction Details for Class 1 Roof Construction
NRCA RoofMan	(2011 thru 2014) 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	(2011) Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems

UNDERWRITERS LABORATORIES (UL)

UL 790	(2004; Reprint Jul 2014) 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 two-ply SBS modified bitumen roof membrane consisting of modified bitumen base sheet 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 Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Roof plan; G drawing depicting wind loads and boundaries of enhanced perimeter and corner attachments of roof system components, as applicable

SD-03 Product Data

Modified Bitumen Sheets; G

Asphalt

Cold-Applied Membrane Adhesive; G

Fiberglass Felt; 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. Products must be as listed in the applicable wind uplift and fire rating classification listings, unless approved otherwise by the Contracting Officer.

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 entitled "Qualification of Manufacturer."

Qualification of Applicator

Certify that the applicator meets requirements specified under paragraph entitled "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.

Bill of Lading

Submit bill of lading when labels of asphalt containers do not bear the flash point (FP), finished blowing temperature (FBT), and equiviscous temperature (EVT).

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

Temperature Limitations for Asphalt

Torches

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

Ventilating Base Sheets

Coating Application; G

Cold Weather Installation; G

Include detailed application instructions and standard manufacturer drawings altered as required by these specifications. Include membrane manufacturer requirements for nailers and backnailing of roof membrane on steep slopes. 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 Material Safety Data Sheets for maintenance/repair materials.

Submit 20 year "No-Dollar-Limit" warranty for labor and materials.

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 Performance Requirements

1.4.3.1 General Performance

Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.

a. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.

b. Impact Resistance: Roofing system shall resist impact damage when

tested according to ASTM D3746 or ASTM D4272.

1.4.3.2 Material Compatibility

Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

1.4.3.3 Roofing System Design

Provide a membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to the applicable codes, as indicated on the drawings.

1.4.3.4 FM Global Listing

Roofing, base flashings, and component materials shall comply with requirements in FM 4450 or FM 4470 as part of a roofing system, and shall be listed in FM Global's "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings

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

The complete roof system assembly shall be rated and installed to resist wind loads indicated and validated by uplift resistance testing in accordance with Factory Mutual (FM) test procedures. Non-rated systems must not be installed, except as approved by the Contracting Officer. Base wind uplift measurements on a design wind speed of 120 mph in accordance with ASCE 7and/or 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. 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 ASSE/SAFE A10.24, Fire Marshall, and 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. Labels or bill of lading for roofing asphalt must indicate asphalt type, FP, FBT, and EVT, that is, the temperature at which the viscosity is either 125 centistokes when tested in accordance with ASTM D2170/D2170M or 75 centipoise when tested in accordance with ASTM D4402/D4402M. 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 and/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 Details, and are installed as the work progresses. Ensure temporary protection measures are in place to preclude moisture intrusion or damage to installed materials. Application of roofing must immediately follow 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. Minimum manufacturer warranty shall have no dollar limit, cover full system water-tightness, and shall have 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 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

The entire roofing and flashing system must be 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 SUSTAINABILITY REPORTING

Coordinate with Section 01 33 29 LEED(tm) DOCUMENTATION.

1.10.1 Recycled Materials

Contractor shall select materials so that the sum of post-consumer recycled content value plus one-half of post-industrial recycled content value constitutes at least 10 percent of the total materials cost for the project. EPA Comprehensive Procurement Guidelines has a supplier database: http://www.epa.gov/cpg/products/

1.10.2 Local/Regional Materials

Contractor shall select materials so that a minimum of 10 percent (by

dollar value) of materials and products for the project are extracted, harvested, or recovered, as well as manufactured, regionally within a 500 mile radius of the project site. The following technical sections include regional material requirements so that, if available, a minimum of 10 percent (by dollar value) of materials and products for the project are extracted, harvested, or recovered, as well as manufactured, regionally within a 500 mile radius of the project site.

PART 2 PRODUCTS

2.1 MODIFIED BITUMEN SHEETS AND FIBERGLASS FELT MATERIALS

Furnish a combination of specified materials that comprise the modified bitumen manufacturer's standard system of the number and type of plies specified. Materials provided must be 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 D6164/D6164M, Type I or II, Grade S, polyester-reinforced, minimum 80 mils thick.

b. SBS Cap Sheet: ASTM D6164/D6164M; Type I, Grade G, minimum 145 mils thick, and as required to provide specified fire safety rating.

2.2 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. Flashing membranes must meet or exceed the properties of the material standards specified for the modified bitumen base and cap sheet, except that flashing membrane thickness must be as recommended by the membrane manufacturer.

2.3 COLD-APPLIED MEMBRANE ADHESIVE

Membrane manufacturer's recommended cold process adhesive for application of the membrane plies.

2.4 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.

2.5 PRIMER

ASTM D41/D41M, or other primer compatible with the application and as approved in writing by the modified bitumen membrane manufacturer.

2.6 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.

2.7 CANT AND TAPERED EDGE STRIPS

Provide standard cants and tapered edge strips of 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 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.

2.8 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.

2.8.1 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.

2.8.2 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.

2.9 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.

2.9.1 Pre-fabricated Curbs

Provide 14 gauge G90 galvanized curbs with minimum 4 inch flange for attachment to roof nailers. Curbs must be minimum height of 10 inch above the finished roof membrane surface.

2.10 WALKPADS

Roof walkpads must be 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.

2.11 PAVER BLOCKS

Precast concrete, minimum 1-1/2 inch thick, minimum 18 inch square for walkways and minimum 6 inch by 12 inch for use in supporting surface bearing components but extending not less than 2 inch beyond all sides of surface bearing bases. Install walkpad material under all paver blocks.

2.12 ROOF INSULATION BELOW MODIFIED BITUMEN MEMBRANE SYSTEM

Insulation must be compatible with the roof membrane, approved by the membrane manufacturer and meeting all the requirements as specified in Section 07 22 00 ROOF AND DECK INSULATION.

2.13 MEMBRANE LINER

Provide self-adhering modified bitumen underlayment conforming to ASTM D1970/D1970M, EPDM membrane liner conforming to ASTM D4637/D4637M, or other waterproof membrane liner material as approved by the Contracting Officer.

PART 3 EXECUTION

3.1 EXAMINATION

Ensure that the following conditions exist prior to application of the roofing materials:

a. Curbs, cants, control joints, expansion joints, perimeter walls, roof penetrating components, and equipment supports are in place.

b. 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.

c. 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.

d. Substrate is sloped as indicated to provide positive drainage.

e. Walls and vertical surfaces are constructed to receive counter flashing, and will permit mechanical fastening of the base flashing materials.

f. 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.

g. 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. Surface-applied nailers are the same thickness as the roof insulation.

h. 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.

i. Exposed nail heads in wood substrates are properly set. Warped and split boards and sheets have been replaced. There are no cracks or end joints 1/4 inch in width or greater. Knot holes are covered with sheet metal and nailed in place. Wood and Plywood decks are covered with rosin paper or unsaturated felt prior to base sheet or roof membrane application. Joints in plywood substrates are taped or otherwise sealed to prevent air leakage from the underside.

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. 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.

3.2.3 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. Avoid flammable primer material conditions in torch applied membrane applications.

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.

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.

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 Application Method

3.3.2.1 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 torch or hot air welder as required by membrane manufacturer. Minimize traffic on installed membrane during the adhesive cure and set time.

3.3.3 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.

3.3.4 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.

3.3.4.1 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.

3.3.5 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.

3.3.5.1 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.

3.3.5.2 Pre-fabricated Curbs

Securely anchor prefabricated curbs to nailer or other base substrate and flash with modified bitumen membrane.

3.3.5.3 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. Specific method of installing set-on accessories must 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.

3.3.5.4 Lightning Protection

Flash and attach lightning protection system components to the roof membrane in a manner acceptable to the roof membrane manufacturer.

3.3.6 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. Provide walkpad or an additional layer of cap sheet under precast concrete paver blocks to protect the roofing.

3.3.7 Paver Blocks

Install paver blocks where indicated and as necessary to support surface bearing items traversing the roof area. Set paver block on a layer of walkpad or cap sheet applied over the completed roof membrane.

3.3.8 Correction of Deficiencies

Where any form of deficiency is found, additional measures will be taken as deemed necessary by the Contracting Officer to determine the extent of the deficiency and corrective actions must be performed as directed by the Contracting Officer.

3.3.9 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, additional measures must be taken as deemed necessary by the Contracting Officer to determine the extent of the deficiency and corrective actions must be 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 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.

(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 heating, hot mopping, or adhesive application is provided uniformly and as necessary to ensure full adhesion of roll materials. Asphalt is heated and applied within the specified temperature range.

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.

3.6.1.1 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.

3.6.2 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.

3.6.3 Roof Drain Test

After completing roofing, but prior to Government acceptance, perform the following test for watertight integrity. Plug roof drains and fill with water to edge of drain sump for 8 hours. Do not plug secondary overflow drains at the same time as adjacent primary drain. To ensure some drainage from roof, do not test all drains at same time. 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.

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. 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 --

SECTION 07 53 23

ETHYLENE-PROPYLENE-DIENE-MONOMER 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	(2010; Errata 2011; Supp 1 2013) Minimum Design Loads for Buildings and Other Structures

ASTM INTERNATIONAL (ASTM)

ASTM D4637/D4637M	(2014; E 2014) EPDM Sheet Used in Single-Ply Roof Membrane
ASTM D4811/D4811M	(2006; E 2013; R 2013) Nonvulcanized (Uncured) Rubber Sheet Used as Roof Flashing
ASTM D6369	(1999; R 2006) Design of Standard Flashing Details for EPDM Roof Membranes
ASTM E108	(2011) Fire Tests of Roof Coverings

FM GLOBAL (FM)

FM 4470	(2010) 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/

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

NRCA RoofMan	(2011 thru 2014) The NRCA Roofing Manual

UNDERWRITERS LABORATORIES (UL)

UL 790	(2004; Reprint Jul 2014) Standard Test Methods for Fire Tests of Roof Coverings
UL RMSD	(2012) Roofing Materials and Systems Directory

1.2 DESCRIPTION OF ROOF MEMBRANE SYSTEM

Fully adhered EPDM roof membrane system applied over insulation and recovery board substrate.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Roof Plan Drawing; G

Wind Load Calculations; G

Boundaries of Enhanced Perimeter; G

Corner Attachments of Roof System Components

Location of Perimeter Half-Sheets

Slopes and Drain Locations; G

SD-03 Product Data

Cement

EPDM Sheet; G

Seam Tape

Bonding Adhesive

Lap Splice Adhesive

Water Cutoff Mastic/Water Block

Lap Cleaner, Lap Sealant, and Edge Treatment

Flashings

Flashing Accessories

Flashing Tape

Fasteners and Plates

Roof Insulation

Pre-Manufactured Accessories

Sample warranty certificate; G

Submit all data required together with requirements of this section. Include a written acceptance by the roof membrane manufacturer of the insulation and other products and accessories

to be provided. List products in the applicable wind uplift and fire rating classification listings, unless approved otherwise by the Contracting Officer.

SD-07 Certificates

Qualification of Manufacturer

Certify that the manufacturer of the roof membrane meets requirements specified under paragraph entitled "Qualification of Manufacturer."

Qualification of Applicator

Certify that the applicator meets requirements specified under paragraph entitled "Qualification of Applicator."

Wind Uplift Resistance classification, as applicable; G

Fire Resistance classification; G

Submit the roof system assembly wind uplift and fire rating classification listings.

SD-08 Manufacturer's Instructions

Application; G

Application Method; G

Membrane Flashing; G

Seam Tape

Tape Seams / Lap Splices

Adhesive Seams / Lap Splices

Perimeter Attachment

Primer

Fasteners

Pre-Manufactured Accessories

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 printed instructions and the specified requirements.

SD-11 Closeout Submittals

Warranty

Information Card

Instructions To Government Personnel

Include copies of Material Safety Data Sheets for maintenance/repair materials.

1.3.1 Shop Drawings

Roof plan drawing depicting wind load calculations and boundaries of enhanced perimeter and corner attachments of roof system components, location of perimeter half-sheets as applicable. The drawing must reflect the project roof plan of each roof level and conditions indicated. Provide all slopes and drain locations.

1.4 QUALITY ASSURANCE

1.4.1 Qualification of Manufacturer

EPDM sheet roofing membrane manufacturer must have at least 5 years experience in manufacturing EPDM roofing products.

1.4.2 Qualification of Applicator

Roofing system applicator must be approved, authorized, or licensed in writing by the roof membrane manufacturer and must have a minimum of three 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 5 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 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 the UL RMSD or Class I roof deck construction in the FM APP GUIDE.

FM or UL approved components of the roof covering assembly must bear the appropriate FM or UL label.

1.4.4 Wind Uplift Resistance

The complete roof system assembly shall be rated and installed to resist wind loads indicated 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. Base wind uplift measurements based on a design wind speed of 120 mph in accordance with ASCE 7 and/or other applicable building code requirements

1.4.5 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, 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 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 representative;

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; and

e. Quality control plan for the roof system installation;

f. Safety requirements.

Coordinate preroofing conference scheduling with the Contracting Officer. The conference must be attended by the Contractor, the Contracting Officer's designated personnel, 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, and 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 their original, unopened containers or wrappings with labels intact and legible. Where materials are covered by a referenced specification number, the labels must bear the specification number, type, class, and shelf life expiration date where applicable. Deliver materials in sufficient quantity to allow continuity of work.

1.5.2 Storage

Store and protect materials from damage and weather in accordance with manufacturer's printed instructions, except as specified otherwise. Keep materials clean and dry. Store and maintain adhesives, sealants, primers and other liquid materials above 60 degrees F. Insulated hot boxes or other enclosed warming devices must be required in cold weather. Mark and remove damaged materials from the site. Use pallets to support and canvas tarpaulins to completely cover material materials stored outdoors. Do not use polyethylene as a covering. Locate materials temporarily stored on the roof in approved areas, and distribute the load to stay within the live load limits of the roof construction. Remove unused materials from the roof at the end of each days work.

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 so as not to damage materials or applied roofing. Do not use materials contaminated by exposure or moisture. Remove contaminated materials from the site. When hazardous materials are involved, adhere to the special precautions of the manufacturer. Adhesives may contain petroleum

distillates and may be extremely flammable; prevent personnel from breathing vapors, and do not use near sparks or open flame.

1.6 ENVIRONMENTAL REQUIREMENTS

Do not install EPDM sheet roofing during high winds or inclement weather, or when there is ice, frost, moisture, or visible dampness on the substrate surface, or when condensation develops on surfaces during application. Unless recommended otherwise by the EPDM sheet manufacturer and approved by the Contracting Officer, do not install EPDM sheet when air temperature is below 40 degrees F or within 5 degrees F of the dewpoint. Follow manufacturer's printed instructions for installation during cold weather conditions.

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 counterflashing are installed as the work progresses. Ensure temporary protection measures are in place to preclude moisture intrusion or damage to installed materials. Application of roofing must immediately follow 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. Minimum manufacturer warranty shall have no dollar limit, cover full system water-tightness, and shall have 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, and accessories necessary for a watertight roof system construction. The warranty must run directly to the Government and commence 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, splits, tears, cracks, delaminates, separates at the seams, shrinks to the point of bridging or tenting membrane at transitions, 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 must be the responsibility of the roof membrane manufacturer. The roof membrane manufacturer is responsible for all costs associated with the repair or replacement work.

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.

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 Continuance of Warranty

Approve repair or replacement work that becomes necessary within the warranty period and accomplish 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

The entire roofing and flashing system must be in accordance with specified and indicated requirements, including fire and wind resistance requirements. Work not specifically addressed and any deviation from specified requirements must be in general accordance with recommendations of the NRCA RoofMan, membrane manufacturer published recommendations and details, ASTM D6369, 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 roof-top fall protection tie-offs where indicated. Coordinate design and installation of fall protection anchorage with roofing system.

1.11 COOL ROOFS

Roofing is to qualify for LEED Credit 7.2 Heat Island Effect - Roof.

1.12 SUSTAINABILITY REQUIREMENTS

Coordinate with Section 01 33 29 LEED(tm) DOCUMENTATION.

1.12.1 Recycled Materials

Contractor shall select materials so that the sum of post-consumer recycled content value plus one-half of post-industrial recycled content value constitutes at least 20 percent of the total materials cost for the project. EPA Comprehensive Procurement Guidelines has a supplier database: http://www.epa.gov/cpg/products/

1.12.2 Local/Regional Materials

The following technical sections include regional material requirements so that, if available, a minimum of 20 percent (by dollar value) of materials

and products for the project are extracted, harvested, or recovered, as well as manufactured, regionally within a 500 mile radius of the project site.

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.

2.1.1 EPDM Sheet

Ethylene Propylene Diene Terpolymer (EPDM), ASTM D4637/D4637M, Type I, non-reinforced, 0.090 inch nominal thickness for fully adhered application. The minimum thickness must not be less than minus 10 percent of the specified thickness value. EPDM membrane thickness specified is exclusive of backing material on the EPDM membrane. Principal polymer used in manufacture of the membrane sheet must be greater than 95 percent EPDM. Width and length of sheet must be as recommended by the manufacturer.

2.1.2 Seam Tape

Double-sided synthetic rubber tape, minimum 0.03 inch thick, minimum 3 inch wide. The roof membrane manufacturer must supply seam tape recommended by the manufacturer's printed data for forming watertight bond of EPDM sheet materials to each other for the application specified and conditions encountered. 6 inch wide tape is required for seam seals along lines of mechanical attachment of membrane.

2.1.3 Lap Splice Adhesive

Low volatile organic compound (VOC) synthetic rubber adhesive as supplied by roof membrane manufacturer and recommended by the manufacturer's printed data for forming watertight bond of EPDM sheet membrane materials to each other.

2.1.4 Bonding Adhesive

Low volatile organic compound (VOC) synthetic rubber adhesive as supplied by roof membrane manufacturer and recommended by the manufacturer's printed data for bonding EPDM membrane materials to insulation, wood, metal, concrete or other substrate materials. Do not use bonding adhesive to bond membrane materials to each other.

2.1.5 Lap Cleaner, Lap Sealant, and Edge Treatment

As supplied by the roof membrane manufacturer and recommended by the manufacturer's printed data.

2.1.6 Water Cutoff Mastic/Water Block

As supplied by the roof membrane manufacturer and recommended by the manufacturer's printed data.

2.1.7 Membrane Flashings and Flashing Accessories

Membrane flashing, including self-adhering membrane flashing, perimeter flashing, flashing around roof penetrations, and prefabricated pipe seals, must be minimum 0.045 inch minimum cured EPDM, as recommended by the roof membrane manufacturer or minimum 0.055 inch thick uncured EPDM sheet in compliance with ASTM D4811/D4811M, Type I. Use cured EPDM membrane to the maximum extent recommended by the roof membrane manufacturer. Limit uncured flashing material to reinforcing inside and outside corners and angle changes in plane of membrane, and to flash scuppers, pourable sealer pockets, and other formed penetrations or unusually shaped conditions as recommended by the roof membrane manufacturer where the use of cured material is impractical.

2.1.7.1 Flashing Tape

EPDM-backed synthetic rubber tape, minimum 6 inch wide as supplied by the roof membrane manufacturer and recommended by the manufacturer's printed data.

2.1.8 Membrane Fasteners and Plates

Coated, corrosion-resistant fasteners as recommended by the roof membrane manufacturer and meeting the requirements of FM 4470 and FM APP GUIDE for Class I roof deck construction and the wind uplift resistance specified. As supplied and warranted for the substrate type(s) by EPDM sheet manufacturer and recommended by EPDM sheet manufacturer's printed data.

2.1.8.1 Stress Plates for Fasteners

Flat corrosion-resistant round stress plates as recommended by the roof membrane manufacturer's printed instructions and meeting the requirements of FM 4470; not less than 2 inch in diameter. Provide pre-formed discs to prevent dishing or cupping.

2.1.8.2 Auxiliary Fasteners

Corrosion resistance screws, nails, or anchors suitable for intended attachment purpose and as recommended by the roof membrane manufacturer.

2.1.8.3 Powder-Driven Fasteners

Powder-driven fasteners may be used only when approved in writing.

2.1.8.4 Metal Disks

Provide flat metal disks of minimum 1 inch in diameter. Metal disks must be of nonferrous material compatible with the nails or fasteners.

2.1.9 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 roof membrane manufacturer.

2.1.9.1 Pre-fabricated Curbs

Provide 14 gauge G90 galvanized curbs with minimum 4 inch flange for attachment to roof nailers. Provide minimum height of 10 inch above the

finished roof membrane surface.

2.1.9.2 Roof-Top Fall Protection Tie-Offs

Refer to Section 11 24 23 for fall protection requirements.

2.1.10 Rubber Walkboards

Provide the following:

2.1.10.1 Rubber Walkboards

Preformed reprocessed rubber, compatible with the EPDM sheet, 1/4 inch minimum thickness, and weighing not less than 1-1/2 pounds per square foot.

2.1.11 Roof Insulation Below EPDM Sheet

Insulation system and facer material must be compatible with membrane application specified and as approved by the roof membrane manufacturer.

2.1.12 Wood Products

Do not allow fire retardant treated materials be in contact with EPDM membrane or EPDM accessory products, unless approved by the membrane manufacturer and the Contracting Officer.

2.2 FLASHING CEMENT

Provide a self-vulcanizing butyl compound flashing cement for splicing laps and for flashings workable at 20 degrees F. Obtain a recommendation for such flashing cement from the roofing membrane manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

Ensure that the following conditions exist prior to application of the roofing materials:

a. Ccurbs, control joints, expansion joints, perimeter walls, roof penetrating components, and equipment supports are in place.

b. Surfaces are rigid, clean, dry, smooth, and free from cracks, holes, and sharp changes in elevation.

c. The plane of the substrate does not vary more than 1/4 inch within an area 10 by 10 feet when checked with a 10 foot straight edge placed anywhere on the substrate.

d. Substrate is sloped to provide positive drainage.

e. Walls and vertical surfaces are constructed to receive counterflashing, and will permit mechanical fastening of the base flashing materials.

f. 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.

g. Pressure-preservative 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. Surface-applied nailers are the same thickness as the roof insulation.

h. Avoid contact of EPDM materials with fire retardant treated wood, except as approved by the roof membrane manufacturer and Contracting Officer.

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.

3.2 APPLICATION

Apply entire EPDM sheet utilizing fully adhered application method. Apply roofing materials as specified herein unless approved otherwise by the Contracting Officer.

3.2.1 Special Precautions

a. Do not dilute coatings or sealants unless specifically recommended by the materials manufacturer's printed application instructions. Do not thin liquid materials with cleaners used for cleaning EPDM sheet.

b. Keep liquids in airtight containers, and keep containers closed except when removing materials.

c. Use liquid components, including adhesives, within their shelf life period. Store adhesives at 60 to 80 degrees F prior to use. Avoid excessive adhesive application and adhesive spills, as they can be destructive to some elastomeric sheets and insulations; follow adhesive manufacturer's printed application instructions. Mix and use liquid components in accordance with label directions and manufacturer's printed instructions.

d. Provide clean, dry cloths or pads for applying membrane cleaners and cleaning of membrane

e. Do not use heat guns or open flame to expedite drying of adhesives or primers.

f. Require workmen and others who walk on the membrane to wear clean, soft-soled shoes to avoid damage to roofing materials.

g. Do not use equipment with sharp edges which could puncture the EPDM sheet.

h. Shut down air intakes and any related mechanical systems and seal open vents and air intakes when applying solvent-based materials in the area of the opening or intake. Coordinate shutdowns with the Contracting Officer.

3.2.2 EPDM Sheet Roofing

Provide a watertight roof membrane sheet free of contaminants and defects that might affect serviceability. Provide a uniform, straight, and flat edge. Unroll EPDM sheet roofing in position without stretching membrane. Inspect for holes. Remove sections of EPDM sheet roofing that are damaged. Allow sheets to relax minimum 30 minutes before seaming. Lap sheets as specified, to shed water, and as recommended by the roof membrane manufacturer's published installation instructions for the application required but not less than 3 inch in any case.

3.2.3 Application Method

3.2.3.1 Fully Adhered Membrane Application

Layout membrane and side lap adjoining sheets in accordance with membrane manufacturer's printed installation instructions. Allow for sufficient membrane to form proper membrane terminations. Remove dusting agents and dirt from membrane and substrate areas where bonding adhesives are to be applied. Apply specified adhesive evenly and continuously to substrate and underside of sheets at rates recommended by the roof membrane manufacturer's printed application instructions. When adhesive is spray applied, roll with a paint roller to ensure proper contact and coverage. Do not apply bonding adhesive to surfaces of membrane in seam or lap areas. Allow adhesive to flash off or dry to consistency prescribed by manufacturer before adhering sheets to the substrate. Roll each sheet into adhesive slowly and evenly to avoid wrinkles; broom or roll the membrane to remove air pockets and fishmouths and to ensure full, continuous bonding of sheet to substrate. Form field lap splices or seams as specified. Check all seams and ensure full lap seal. Apply lap sealant to all adhesive formed seams and all cut edges of reinforced membrane materials.

3.2.4 Tape Seams / Lap Splices

Field form seams, or lap splices, with seam tape in accordance with membrane manufacturer's printed instructions and as specified. Clean and prime mating surfaces in the seam area. After primer has dried or set in accordance with membrane manufacturer's instructions, apply seam tape to bottom membrane and roll with a 3 inch to 4 inch wide smooth silicone or steel hand roller, or other manufacturer approved rolling device, to ensure full contact and adhesion of tape to bottom membrane. Tape end laps must be minimum 1 inch. Roll top membrane into position to check for proper overlap and alignment. Remove release paper from top of seam tape and form seam splice. Ensure top membrane contact with seam tape as release paper is removed. Roll the closed seam with a smooth silicone or steel hand roller, rolling first across the width of the seam then along the entire length, being careful not to damage the membrane. Apply minimum 9 inch long strip of membrane-backed flashing tape over T-intersections of roof membrane. Roll tape to ensure full adhesion and seal over T-joint.

3.2.5 Adhesive Seams / Lap Splices

Use only field-applied adhesive formed seams in flashing areas where approved by the membrane manufacturer and the Contracting Officer. Do not use adhesive formed seams for field of roof membrane seaming, except as approved by the membrane manufacturer and the Contracting Officer. Thoroughly and completely clean mating surfaces of materials throughout the lap area. Remove all dirt, dust, and contaminants and allow to dry.

Apply primer as recommended by the membrane manufacturer. Apply splice adhesive with a 3 inch to 4 inch wide, 1/2 inch thick, solvent-resistant brush in a smooth, even coat with long brush strokes. Bleed out brush marks. Do not apply adhesive in a circular motion. Simultaneously apply adhesive to both mating surfaces in an approximate 0.025 to 0.030 inch wet film thickness, or other thickness as recommended by the roof membrane manufacturer's printed instructions.

Allow the splice adhesive to set-up in accordance with membrane manufacturer's printed instructions. Perform manufacturer recommended field check to test for adhesive readiness prior to closing seam. Apply a 1/8 inch to 1/4 inch bead of in-seam sealant approximately 1/2 inch from the inside edge of the lower membrane sheet prior to closing the seam. Ensure the in-seam sealant does not extend onto the splice adhesive. Maintain the full adhered seam width required. Roll the top membrane onto the mating surface. Roll the seam area with a 2 inch to 3 inch wide, smooth silicone or steel hand roller. A minimum of 2 hours after joining sheets and when the lap edge is dry, clean the lap edge with membrane manufacturer's recommended cleaner and apply a 1/4 inch to 3/8 inch bead of lap sealant centered on the seam edge. With a feathering tool, immediately feather the lap sealant to completely cover the splice edge, leaving a mound of sealant over the seam edge. Apply lap sealant to all adhesive formed seams.

3.2.6 Perimeter Attachment

Adhesive bond or mechanically secure roof membrane sheet at roof perimeter in a manner to comply with wind resistance requirements and in accordance with membrane manufacturer's printed application instructions. When adhesively bonding a mechanically fastened system in perimeter areas, the perimeter boundary of the adhesive bond must be the same as the boundary required for additional perimeter mechanical fastening to meet wind resistance requirements.

3.2.7 Securement at Base Tie-In Conditions

Mechanically fasten the roof membrane at penetrations, at base of curbs and walls, and at all locations where the membrane turns and angle greater than 4 degrees (1:12). Space fasteners a maximum of 12 inch on center, except where more frequent attachment is required to meet specified wind resistance or where recommended by the roof membrane manufacturer. Flash over fasteners with a fully adhered layer of material as recommended by the roof membrane manufacturer's printed data.

3.3 FLASHINGS

3.3.1 General

Provide flashings in the angles formed at walls and other vertical surfaces and where required to make the work watertight, except where metal flashings are indicated.

Provide a one-ply flashing membrane, as specified for the system used, and install immediately after the roofing membrane is placed and prior to finish coating where a finish coating is required. Flashings must be stepped where vertical surfaces abut sloped roof surfaces. Provide sheet metal reglet in which sheet metal cap flashings are installed of not more than 16 inch nor less than 8 inch above the roofing surfaces. Exposed joints and end laps of flashing membrane must be made and sealed in the

manner required for roofing membrane.

3.3.2 Membrane Flashing

Install flashing and flashing accessories as the roof membrane is installed. Apply flashing to cleaned surfaces and as recommended by the roof membrane manufacturer and as specified. Utilize cured EPDM membrane flashing and prefabricated accessory flashings to the maximum extent recommended by the roof membrane manufacturer. Limit uncured flashing material to reinforcing inside and outside corners and angle changes in plane of membrane, and to flashing scuppers, pourable sealer pockets, and other formed penetrations or unusually shaped conditions as recommended by the roof membrane manufacturer where the use of cured material is impractical. Extend base flashing not less than 8 inch above roofing surface and as necessary to provide for seaming overlap on roof membrane as recommended by the roof membrane manufacturer.

Seal flashing membrane for a minimum of 3 inch on each side of fastening device used to anchor roof membrane to nailers. Completely adhere flashing sheets in place. Seam flashing membrane in the same manner as roof membrane, except as otherwise recommended by the membrane manufacturer's printed instructions and approved by the Contracting Officer. Reinforce all corners and angle transitions by applying uncured membrane to the area in accordance with roof membrane manufacturer recommendations. Mechanically fasten top edge of base flashing with manufacturer recommended termination bar fastened at maximum 12 inch on center. Install sheet metal flashing over the termination bar in the completed work. Mechanically fasten top edge of base flashing for all other terminations in a manner recommended by the roof membrane manufacturer. 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.

3.3.3 Pre-Fabricated Curbs

Securely anchor prefabricated curbs to nailer or other base substrate and flashed with EPDM membrane flashing materials.

3.3.4 Set-On Accessories

Where pipe or conduit blocking, supports and similar roof accessories, or isolated paver block, are set on the membrane, adhere reinforced membrane or walkpad material, as recommended by the roof membrane manufacturer, to bottom of accessories prior to setting on roofing membrane. Specific method of installing set-on accessories must 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.

3.3.5 Lightning Protection

Flash lightning protection system components or attach to the roof membrane in a manner acceptable to the roof membrane manufacturer.

3.3.6 Roof-Top Fall Protection Tie-Offs

Flash anchor plate and projecting tie-off as indicated in the manufacturer's printed instructions and as approved by the roofing

manufacturer.

3.4 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 roof membrane manufacturer's printed instructions. Provide minimum 6 inch separation between adjacent walkpads to accommodate drainage.

3.5 CORRECTION OF DEFICIENCIES

Where any form of deficiency is found, additional measures must be taken as deemed necessary by the Contracting Officer to determine the extent of the deficiency and corrective actions must be as directed by the Contracting Officer.

3.6 CLEAN UP

Remove debris, scraps, containers and other rubbish and trash resulting from installation of the roofing system from job site each day.

3.7 PROTECTION OF APPLIED ROOFING

At the end of the day's work and when precipitation is imminent, protect applied membrane roofing system from water intrusion.

3.7.1 Water Cutoffs

Straighten insulation line using loose-laid cut insulation sheets and seal the terminated edge of the roof membrane 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.

3.7.2 Temporary Flashing for Permanent Roofing

Provide temporary flashing at curbs, walls and other penetrations and terminations of roofing sheets until permanent flashings can be applied. Remove temporary flashing before applying permanent flashing.

3.7.3 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.

3.8 FIELD QUALITY CONTROL

3.8.1 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. Equipment is in working order. Metering devices are accurate.

b. Materials are not installed in adverse weather conditions.

c. Substrates are in acceptable condition, in compliance with specification, prior to application of subsequent materials.

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.

The proper number, type, and spacing of fasteners are installed.

Materials comply with the specified requirements.

All materials are properly stored, handled and protected from moisture or other damages. Liquid components are properly mixed prior to application.

Membrane is allowed to relax prior to seaming. Adhesives are applied uniformly to both mating surfaces and checked for proper set prior to bonding mating materials. Mechanical attachments are spaced as required, including additional fastening of membrane in corner and perimeter areas as required.

Membrane is properly overlapped.

Membrane seaming is as specified and seams are hand rolled to ensure full adhesion and bond width. In-seam sealant is applied when adhesive seams are used in the field of the roof. All seams are checked at the end of each work day.

Membrane is fully adhered without ridges, wrinkles, kinks, fishmouths.

Installer adheres to specified and detailed application parameters.

Associated flashings 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.

3.8.2 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. Do not exceed additional inspections 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 overall quality of work, deficiencies and any other concerns, and recommended corrective action.

3.9 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.

3.10 INFORMATION CARD

For each roof, furnish a typewritten information card for facility records and a photoengraved 0.032 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. 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 60 00

FLASHING AND SHEET METAL
08/08

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WELDING SOCIETY (AWS)

AWS D1.2/D1.2M	(2014) Structural Welding Code - Aluminum

ASTM INTERNATIONAL (ASTM)

ASTM A167	(2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A653/A653M	(2013) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
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
ASTM B32	(2008; R 2014) Standard Specification for Solder Metal
ASTM D1784	(2011) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D226/D226M	(2009) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D41/D41M	(2011) Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
ASTM D4586/D4586M	(2007; E 2012; R 2012) Asphalt Roof Cement, Asbestos-Free

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1793	(2012) Architectural Sheet Metal Manual,

1.2 GENERAL REQUIREMENTS

Finished sheet metalwork will form a weathertight construction without waves, warps, buckles, fastening stresses or distortion, which allows for expansion and contraction. Sheet metal mechanic is responsible for cutting, fitting, drilling, and other operations in connection with sheet metal 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 roofing operations.

For additional information and requirements regarding flashing and sheet metal related to metal roofing and insulated metal panels, see specification Section 07 61 14.00 20 STEEL STANDING SEAM ROOFING and Section 07 42 63 FABRICATED WALL PANEL ASSEMBLIES respectively. Coordinate the specific requirements regarding finishing and matching of those sections with the general requirements of this section.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Covering on flat, sloped, or curved surfaces; G

Gutters; G

Downspouts; G

Gravel stops and fascias; G

Splash pans; G

Base flashing; G

Counterflashing; G

Flashing at roof penetrations; G

Reglets; G

Copings; G

Drip edge; G

Eave flashing; G

Indicate thicknesses, dimensions, fastenings and anchoring methods, expansion joints, and other provisions necessary for thermal expansion and contraction. Scaled manufacturer's catalog data may be submitted for factory fabricated items.

SD-11 Closeout Submittals

Quality Control Plan

Submit for sheet metal work in accordance with paragraph entitled "Field Quality Control."

1.4 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 immediately before installation.

PART 2 PRODUCTS

2.1 MATERIALS

Do not use lead, lead-coated metal. Use any metal listed by SMACNA Arch. Manual for a particular item, unless otherwise specified or indicated. Conform to the requirements specified and to the thicknesses and configurations established in SMACNA Arch. Manual for the materials. Different items need not be of the same metal. Similar items are to be of the same material.

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:

2.1.1 Exposed Sheet Metal Items

Must be of the same material. Consider the following as exposed sheet metal: gutters, including hangers; downspouts; gravel stops and fascias; cap, valley, steeped, base, and eave flashings and related accessories. Accessories to metal roofing and insulated metal panels are to be finished as specified for those products.

2.1.2 Drainage

Do not use copper for an exposed item if drainage from that item will pass over exposed masonry, stonework or other metal surfaces.

2.1.3 Steel Sheet, Zinc-Coated (Galvanized)

ASTM A653/A653M.

2.1.3.1 Finish

Exposed exterior items of zinc-coated steel sheet must have a baked-on, factory-applied color coating of polyvinylidene fluoride or other equivalent fluorocarbon coating applied after metal substrates have been

cleaned and pretreated. Provide finish coating dry-film thickness of 0.8 to 1.3 mils and color as selected.

2.1.4 Stainless Steel

ASTM A167, Type 302 or 304, 2D Finish, fully annealed, dead-soft temper.

2.1.5 Aluminum Alloy Sheet and Plate

ASTM B209 color as selected, form alloy, and temper appropriate for use.

2.1.5.1 Alclad

When fabricated of aluminum, fabricate the items Alclad 3003, Alclad 3004, Alclad 3005, clad on both sides unless otherwise indicated.

a. Gutters, downspouts, and hangers

b. Gravel stops and fascias

c. Flashing

2.1.5.2 Finish

Exposed exterior sheet metal items of aluminum must have a baked-on, factory-applied color coating of polyvinylidene fluoride (PVF2) or other equivalent fluorocarbon coating applied after metal substrates have been cleaned and pretreated. Provide finish coating dry-film thickness of 0.8 to 1.3 mils and color as selected.

2.1.6 Aluminum Alloy, Extruded Bars, Rods, Shapes, and Tubes

ASTM B221.

2.1.7 Solder

ASTM B32, 95-5 tin-antimony.

2.1.8 Polyvinyl Chloride Reglet

ASTM D1784, Type II, Grade 1, Class 14333-D, 0.075 inch minimum thickness.

2.1.9 Bituminous Plastic Cement

ASTM D4586/D4586M, Type I.

2.1.10 Roofing Felt

ASTM D226/D226M Type I.

2.1.11 Asphalt Primer

ASTM D41/D41M.

2.1.12 Fasteners

Use the same metal or a metal compatible with the item fastened. Use stainless steel fasteners to fasten 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 inch. 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 inch and over in width. Space cleats evenly not over 12 inch on center unless otherwise specified or indicated. Unless otherwise specified, provide cleats of 2 inch wide by 3 inch 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. Pretin 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 inch 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 inch.

3.1.5.3 Loose-Lock Expansion Seams

Not less than 3 inch 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. Pretin 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

Treat with soldering acid flux the edges of stainless steel to be pretinned. 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 inch maximum on center. Where end lap fasteners are required to improve closure, locate the end lap fasteners not more than 2 inch 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 fascias by expansion and contraction joints spaced not more than 12 feet apart.

3.1.10 Base Flashing

Provide base flashing as an accessory to metal roofing see Section 07 61 14.00 20 STEEL STANDING SEAM ROOFING. Coordinate details with roofing system. Where finish wall coverings form a counterflashing, extend the vertical leg of the flashing up behind the applied wall covering not less than 6 inch. Overlap the flashing strips with the previously laid flashing not less than 3 inch, provide for expansion and contraction. 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 inch above roof decks, extend down vertical surfaces over upturned vertical leg of base flashings not less than 3 inch. Fold the exposed edges of counterflashings 1/2 inch. Where stepped counterflashings are required, they may be installed in short lengths as indicated or may be of the preformed one-piece type. Provide end laps in counterflashings not less than 3 inch and make it weathertight with plastic cement. Do not make lengths of metal counterflashings exceed 10 feet. Form the flashings to the required shapes before installation. Factory-form the corners not less than 12 inch from the angle. Secure the flashings in the reglets with lead wedges and space not more than 18 inch apart. 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 inch 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

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.

3.1.12.1 Caulked Reglets

Provide with rounded edges and metal strap brackets or other anchors for securing to the concrete forms. Provide reglets with a core to protect them from injury during the installation. Provide built-up mitered corner pieces for internal and external angles. Wedge the flashing in the reglets with lead wedges every 18 inch, caulked full and solid with an approved compound.

3.1.12.2 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 snaplock receiver. Insert the flashing the full depth of the slot and lock by indentations made with a dull-pointed tool, wedges, and filled with a sealant. For friction reglets, install flashing snaplock receivers at 24 inch on center maximum. When the flashing has been inserted the full depth, caulk the slot and lock with wedges and fill with sealant.

3.1.13 Polyvinyl Chloride Reglets Temporary Construction Installation

Rigid polyvinyl chloride reglets ASTM D1784, Type II, Grade 1, Class 14333-D, 0.075 inch minimum thickness may be provided in lieu of metal reglets for temporary construction.

3.1.14 Gravel Stops and Fascias

Prefabricate in the shapes and sizes indicated and in lengths not less that 8 feet. Extend flange at least 4 inch onto roofing. Provide prefabricated, mitered corners internal and external corners. Install gravel stops and fascias 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 fascias 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 inch on center, in two staggered rows.

3.1.14.1 Edge Strip

Hook the lower edge of fascias 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 inchmaximum on center. Where fastening is made to concrete or masonry, use screws spaced 12 inch 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 fascias 1/4 inch and backed with a formed flashing plate, mechanically fastened in place and lapping each section end a minimum of 4 inch set laps in plastic cement. Face nailing will not be permitted. Install prefabricated aluminum gravel stops and fascias in accordance with the manufacturer's printed instructions and details.

3.1.15 Metal Drip Edge

Provide metal drip edge as an accessory to Section 07 61 14.00 20 STEEL STANDING SEAM ROOFING. Design to allow water run-off to drip free of underlying construction, at eaves and rakes prior to the application of roofing. Apply directly per manufacturer's instructions and shop drawings.

3.1.16 Gutters

The hung type of shape indicated and supported on underside by brackets that permit free thermal movement of the gutter. Provide gutters in sizes indicated complete with mitered corners, end caps, outlets, brackets, and other accessories necessary for installation. Bead with hemmed edge or reinforce the outer edge of gutter with a stiffening bar not less than 3/4 by 3/16 inch of material compatible with gutter. Fabricate gutters in sections not less than 8 feet. Lap the sections a minimum of one inch in the direction of flow or provide with concealed splice plate 6 inch minimum. Join the gutters, other than aluminum, by riveted and soldered joints. Join aluminum gutters with riveted sealed joints. Provide expansion-type slip joints midway between outlets. Install gutters below slope line of the roof so that snow and ice can slide clear. Support gutters on as indicated. Adjust gutters to slope uniformly to outlets, with high points occurring midway between outlets. Fabricate hangers and fastenings from metals. Coordinate gutter construction and finish with metal roof, see Section 07 61 14.00 20 STEEL STANDING SEAM ROOFING.

3.1.17 Downspouts

Space supports for downspouts according to the manufacturer's recommendation for the masonry substrate. Types, shapes and sizes are indicated. Provide complete including elbows and offsets. Provide downspouts in approximately 10 foot lengths. Provide end joints to telescope not less than 1/2 inch and lock longitudinal joints. Provide gutter outlets with wire ball strainers for each outlet. Provide strainers to fit tightly into outlets and be of the same material used for gutters. Keep downspouts not less than one inch away from walls. Fasten to the walls at top, bottom, and at an intermediate point not to exceed 5 feet on center with leader straps or concealed rack-and-pin type fasteners. Form straps and fasteners of metal compatible with the downspouts.

3.1.17.1 Terminations

Neatly fit into the drainage connection the downspouts terminating in drainage lines and fill the joints with a portland cement mortar cap sloped away from the downspout. Provide downspouts terminating in splash blocks with elbow-type fittings. Provide splash pans as specified.

3.1.18 Splash Pans

Install splash pans where downspouts discharge on roof surfaces and at

other locations as indicated. Unless otherwise shown, provide pans not less than 24 inch long by 18 inch wide with metal ribs across the bottom of the pan. Form the sides of the pan with vertical baffles not less than one inch high in the front, and 4 inch high in the back doubled over and formed continuous with horizontal roof flanges not less than 4 inch wide. Bend the rear flange of the pan to contour of cant strip and extend up 6 inch 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.

3.1.19 Open Valley Flashing

Valley flashing for metal roofs is specified in Section 07 61 14.00 20 STEEL STANDING SEAM ROOFING.

3.1.20 Eave Flashing

Eave flashing for metal roofs is specified in Section 07 61 14.00 20 STEEL STANDING SEAM ROOFING

3.1.21 Sheet Metal Covering on Flat, Sloped, or Curved Surfaces

Except as specified or indicated otherwise, cover and flash all minor flat, sloped, or curved surfaces such as crickets, bulkheads, dormers and small decks with metal sheets of the material used for flashing; maximum size of sheets, 16 by 18 inch. Fasten sheets to sheathing with metal cleats. Lock seams and solder. Lock aluminum seams as recommended by aluminum manufacturer. Provide an underlayment of roofing felt for all sheet metal covering.

3.1.22 Expansion Joints

Provide expansion joints in continuous sheet metal at 40 foot intervals for copper and stainless steel and at 32 foot intervals for aluminum, aluminum gravel stops and fascias which must have expansion joints at not more than 12 foot spacing. Provide evenly spaced joints. 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 spacing. Conform to the requirements of Table I.

3.1.23 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. Goose-necks, rainhoods, power roof ventilators, are specified in mechanical sections of the specification.

3.1.24 Single Pipe Vents

See Table I, footnote (d). Set flange of sleeve in bituminous plastic cement and nail 3 inch on center. Bend the top of sleeve over and extend down into the vent pipe a minimum of 2 inch. 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 inch roof flange in bituminous plastic cement and nailed 3 inch on center. Extend sleeve a minimum of8 inch above the roof deck and lapped a minimum of 3 inch 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.

3.1.25 Copings

Provide coping using copper sheets 8 or 10 feet long joined by a 3/4 inch locked and soldered seam. Terminate outer edges in edge strips. Install with sealed lap joints as indicated.

3.2 PAINTING

Field-paint sheet metal for separation of dissimilar materials.

3.2.1 Aluminum Surfaces

Shall be solvent cleaned and given one coat of zinc-molybdate primer and one coat of aluminum paint.

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	Terne-Coated Stainless Steel, inch	Zinc-Coated Steel, U.S. Std. Gage
Building Expansion Joints					
Cover	16	.032	.015	.015	24
Waterstop-bellows or flanged, U-type.	16	-	.015	.015	-
Covering on minor flat, pitched or curved surfaces	20	.040	.018	.018	-
Downspouts and leaders	16	.032	.015	.015	24
Downspout clips and anchors	-	.040 clip .125 anchor	-	-	-
Downspout straps, 2-inch	48 (a)	.060	.050	-	-
Flashings:					
Base	20	.040	.018	.018	24
Cap (Counter-flashing	16	.032	.015	.015	26
Eave	16	-	.015	.015	24
Spandrel beam	10	-	.010	.010	-
Bond barrier	16	-	.015	.015	-
Valley	16	.032	.015	.015	-
Pipe vent sleeve (d)					
Coping	16	-	-	-	-
Gravel stops and fascias:					
Extrusions	-	.075	-	-	-

TABLE I. SHEET METAL WEIGHTS, THICKNESSES, AND GAGES					
Sheet Metal Items	Copper kilograms per square foot	Aluminum, inch	Stainless Steel, inch	Terne-Coated Stainless Steel, inch	Zinc-Coated Steel, U.S. Std. Gage
Sheets, corrugated	16	.032	.015	.015	-
Sheets, smooth	20	.050	.018	.018	24
Edge strip	24	.050	.025	-	-
Gutters:					
Gutter section	16	.032	.015	.015	24
Continuous cleat	16	.032	.015	.015	24
Hangers, dimensions	1 inch by 1/8 inch (a)	1 inch by .080 inch (c)	1 inch by inch	-	-
Joint Cover plates (See Table II)	16	.032	.015	.015	24
Reglets (c)	10	-	.010	.010	-
Splash pans	16	.040	.018	.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 entitled "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 producer's recommended hard setting sealant for locked aluminum joints. Fill each metal expansion joint with a joint sealing compound 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, sealed expansion joint, cleated.	One inch flat locked, locked, cleated one inch loose locked, sealed expansion joints, cleated	Same as base flashing.
Stepped	3 inch lap	3 inch lap	--
Valley	6 inch lap cleated	6 inch lap cleated	--
Edge strip	Butt	Butt	--
Gravel stops:			

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.
Sheet, corrugated	Butt with 1/4 inch space	Butt with 1/4 inch space	Use sheet flashing beneath and a cover plate or a combination unit
Gutters	1.5 inch lap, riveted and soldered	One inch flat locked riveted and sealed	Aluminum producers recommended hard setting sealant for locked aluminum joints.
(a) Provide a 3 inch lap elastomeric flashing with manufacturer's recommended sealant.			
(b) Seal Polyvinyl chloride reglet with manufacturer's recommended sealant.			

-- End of Section --

SECTION 07 61 14.00 20

STEEL STANDING SEAM ROOFING
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 IRON AND STEEL INSTITUTE (AISI)

AISI SG03-3	(2002; Suppl 2001-2004; R 2008) Cold-Formed Steel Design Manual Set

ASTM INTERNATIONAL (ASTM)

ASTM A1008/A1008M	(2015) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened
ASTM A1011/A1011M	(2014) Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability and Ultra-High Strength
ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A653/A653M	(2013) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A792/A792M	(2010) Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
ASTM C1289	(2014a) Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
ASTM D2244	(2015) Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D2247	(2011) Testing Water Resistance of Coatings in 100% Relative Humidity
ASTM D4214	(2007) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films

ASTM D522/D522M	(2014) Mandrel Bend Test of Attached Organic Coatings
ASTM D523	(2014) Standard Test Method for Specular Gloss
ASTM E1592	(2005; R 2012) Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
ASTM G152	(2013) Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G153	(2013) Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1793	(2012) Architectural Sheet Metal Manual, 7th Edition

1.2 DEFINITIONS

1.2.1 Field-Formed Seam

Seams of panels so configured that when adjacent sheets are installed the seam is sealed utilizing mechanical or hand seamers. Crimped (45 degree bend), roll formed (180 degree bend), double roll formed (2 - 180 degree bends), and roll and lock systems are types of field-formed seam systems.

1.2.2 Pre-Formed

Formed to the final, less field-formed seam, profile and configuration in the factory.

1.2.3 Roofing System

The roofing system is defined as the assembly of roofing components, including roofing panels, flashing, fasteners, and accessories which, when assembled properly result in a watertight installation.

1.3 SYSTEM DESCRIPTION

1.3.1 Design Requirements

a. Panels shall be continuous lengths up to manufacturer's standard longest lengths, with no joints or seams, except where indicated or specified. Ribs of adjoining sheets shall be in continuous contact from eave to ridge.

b. There shall be no exposed or penetrating fasteners except where shown on approved shop drawings. Fasteners into steel shall be stainless steel, zinc cast head, or cadmium plated steel screws inserted into predrilled holes. There shall be a minimum of two fasteners per clip. Single fasteners will be allowed when supporting structural members are

prepunched or predrilled.

c. Field-formed seam type systems shall be mechanically locked closed by the manufacturer's locking tool. The seam shall include a continuous factory applied sealant when required by the manufacturer to withstand the wind loads specified.

d. Roof panel anchor clips shall be concealed and designed to allow for longitudinal thermal movement of the panels, except where specific fixed points are indicated. Provide for lateral thermal movement in panel configuration or with clips designed for lateral and longitudinal movement.

1.3.2 Design Conditions

The system shall be designed to resist positive and negative loads specified herein in accordance with the AISI SG03-3. Panels shall support walking loads without permanent distortion or telegraphing of the structural supports.

1.3.2.1 Wind Uplift

The design uplift pressures for the roof system shall be computed and applied using a basic wind speed of 120 miles per hour (mph). Roof system and attachments shall resist the wind loads as indicated on drawing S002.

The design uplift force for each connection assembly shall be that pressure given for the area under consideration, multiplied by the tributary load area of the connection assembly, and multiplied by the appropriate factor of safety, as follows:

a. Single fastener in a connection: 3.0

b. Two or more fasteners in each connection: 2.25

1.3.2.2 Roof Live Loads

Loads shall be applied on the horizontal projection of the roof structure. The minimum roof design live load shall be 20 psf. Design roofing to support rib mounted fall protection system. Coordinate loads with fall protection system requirements.

1.3.2.3 Thermal Movement

System shall be capable of withstanding thermal movement based on a temperature range of 10 degrees F below 0 degrees F and 180 degrees F.

1.3.2.4 Deflection

Panels shall be capable of supporting design loads between unsupported spans with deflection of not greater than L/180 of the span.

1.3.3 Structural Performance

The structural performance test methods and requirements of the Standing Seam Roofing Systems (SSRS) shall be in accordance with ASTM E1592.

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. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Roofing; G

Submit roofing drawings to supplement the instructions and diagrams. Drawings shall include design and erection drawings containing an isometric view of the roof showing the design uplift pressures and dimensions of edge, ridge and corner zones; and show typical and special conditions including flashings, materials and thickness, dimensions, fixing lines, anchoring methods, sealant locations, sealant tape locations, fastener layout, sizes, and spacing, terminations, penetrations, attachments, and provisions for thermal movement. Details of installation shall be in accordance with the manufacturer's Standard Instructions and details or the SMACNA 1793. Prior to submitting shop drawings, have drawings reviewed and approved by the manufacturer's technical engineering department.

SD-03 Product Data

Roofing panels; G

Attachment clips

Closures

Accessories

Fasteners

Sealants

Insulation, including joint sealing measures for vapor barrier facing

Gutters and Downspouts; G

Sample warranty certificate; G

Submit for materials to be provided. Submit data sufficient to indicate conformance to specified requirements.

SD-04 Samples

Roofing panel

Submit a 12 inch long by full width section of typical panel.

For color selection, submit 2 by 4 inch metal samples in color, finish and texture selected.

Accessories

Submit each type of accessory item used in the project including, but not limited to each type of anchor clip, closure, fastener, and leg clamp.

Sealants

Intermediate Support Section

Submit full size samples of each intermediate support section, 12 inches long.

SD-05 Design Data

Design calculations

Initial Certification Letter from Contractor's Delegated-Design Professional Engineer

SD-06 Test Reports

Field Inspection; G

Submit manufacturer's technical representative's field inspection reports as specified in paragraph entitled "Manufacturer's Field Inspection."

Structural performance tests

Finish tests

SD-07 Certificates

Manufacturer's Technical Representative's Qualifications

Statement of Installer's Qualifications

Submit documentation from roofing manufacturer proving the manufacturer's technical representative meets below specified requirements. Include name, address, telephone number, and experience record.

Submit documentation proving the installer is factory-trained, has the specified experience, and authorized by the manufacturer to install the products specified.

Coil stock compatibility; G

Provide certification of coil compatibility with roll forming machinery to be used for forming panels without warping, waviness, and rippling not part of panel profile; to be done without damage, abrasion or marking of finish coating.

SD-08 Manufacturer's Instructions

Installation manual; G

Submit manufacturers printed installation manual, instructions, and standard details.

SD-11 Closeout Submittals

Final Certification Letter from Contractor's Delegated-Design Professional Engineer

Information card

For each roofing installation, submit a typewritten card or photoengraved aluminum card containing the information listed on Form 1 located at the end of this section.

1.5 DESIGN CALCULATIONS

Design Calculations for Steel Standing Seam Roofing: Design Steel Standing Seam Roofing 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.

Initial Certification Letter from Contractor's Delegated-Design 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. Initial 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 Steel Standing Seam Roofing.
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 Steel Standing Seam Roofing have been performed in accordance with the

Professional Engineer's design.

Final Certification Letter from Contractor's Delegated-Design Professional Engineer: After construction of the Steel Standing Seam Roofing is complete, submit a signed and sealed Certification Letter from the responsible design professional stating that the fabrication and installation of the Steel Standing Seam Roofing have been performed in accordance with the Professional Engineer's design. Final Certification Letter shall be submitted for record only.

Provide design calculations prepared by a professional engineer specializing in structural engineering verifying that system supplied and any additional framing meets design load criteria indicated. Coordinate calculations with manufacturer's test results. Include calculations for:

Wind load uplift design pressure at roof locations specified in paragraph entitled "Wind Uplift."

Clip spacing and allowable load per clip.

Fastening of clips to structure or intermediate supports.

Intermediate support spacing and framing and fastening to structure when required.

Allowable panel span at anchorage spacing indicated.

Safety factor used in design loading.

Governing code requirements or criteria.

Edge and termination details.

1.6 QUALITY ASSURANCE

1.6.1 Preroofing Conference

After submittals are received and approved but before roofing and insulation work, including associated work, is performed, the Contractor shall hold a preroofing conference to review the following:

a. The drawings and specifications

b. Procedure for on site inspection and acceptance of the roofing substrate and pertinent structural details relating to the roofing system

c. Contractor's plan for coordination of the work of the various trades involved in providing the roofing system and other components secured to the roofing

d. Safety requirements

The preroofing conference shall be attended by the Contractor and personnel directly responsible for the roofing and insulation installation, and the roofing manufacturer's technical representative. Conflicts among those attending the preroofing conference shall be resolved and confirmed in writing before roofing work, including associated work, is begun. Prepare written minutes of the preroofing conference and submit to the Contracting

Officer.

1.6.2 Manufacturer

The SSMRS shall be the product of a metal roofing industry - recognized manufacturer who has been in the practice of manufacturing SSMRS for a period of not less than 5 years and who has been involved in at least 5 projects similar in size and complexity to this project.

1.6.3 Manufacturer's Technical Representative

The representative shall have authorization from manufacturer to approve field changes and be thoroughly familiar with the products and with installations in the geographical area where construction will take place. The manufacturer's representative shall be an employee of the manufacturer with at least 5 years experience in installing the roof system. The representative shall be available to perform field inspections and attend meetings as required herein, and as requested by the Contracting Officer.

1.6.4 Installer's Qualifications

The roofing system installer shall be factory-trained, approved by the metal roofing system manufacturer to install the system, and shall have a minimum of three years experience as an approved applicator with that manufacturer. The applicator shall have applied five installations of similar size and scope as this project within the previous 3 years.

1.6.5 Single Source

Roofing panels, clips, closures, and other accessories shall be standard products of the same manufacturer; shall be the latest design by the manufacturer; and shall have been designed by the manufacturer to operate as a complete system for the intended use. Fabricated metal wall panel assemblies are to be from the same source manufacturer.

1.6.6 Laboratory Tests For Panel Finish

The term "appearance of base metal" refers to the metal coating on steel. Panels shall meet the following test requirements:

a. Formability Test: When subjected to a 180 degree bend over a 1/8 inch diameter mandrel in accordance with ASTM D522/D522M, exterior coating film shall show only slight microchecking and no loss of adhesion.

b. Accelerated Weathering Test: Withstand a weathering test for a minimum of 2000 hours in accordance with ASTM G152 and ASTM G153, Method 1 without cracking, peeling, blistering, loss of adhesion of the protective coating, or corrosion of the base metal. Protective coating that can be readily removed from the base metal with a penknife blade or similar instrument shall be considered to indicate loss of adhesion.

c. Chalking Resistance: After the 2000-hour weatherometer test, exterior coating shall not chalk greater than No. 8 rating when measured in accordance with ASTM D4214 test procedures.

d. Color Change Test:

After the 3000-hour weatherometer test, exterior coating color change shall not exceed 5 NBS units when measured in accordance with ASTM D2244

test procedure.

e. Humidity Test: When subjected to a humidity cabinet test in accordance with ASTM D2247 for 1000 hours, a scored panel shall show no signs of blistering, cracking, creepage, or corrosion.

f. Gloss Test: The gloss of the finish shall be 30 plus or minus 5 at an angle of 60 degrees, when measured in accordance with ASTM D523.

1.7 WARRANTY

Furnish manufacturer's no-dollar-limit materials and workmanship warranty for the roofing system. The warranty period shall be not less than 20 years from the date of Government acceptance of the work. The warranty shall be issued directly to the Government. The warranty shall provide that if within the warranty period the metal roofing system becomes non-watertight or shows evidence of corrosion, perforation, rupture or excess weathering due to deterioration of the roofing system resulting from defective materials or installed workmanship the repair or replacement of the defective materials and correction of the defective workmanship shall be the responsibility of the roofing system manufacturer. Repairs that become necessary because of defective materials and workmanship while roofing is under warranty shall be performed within 7 days after notification, unless additional time is approved by the Contracting Officer. Failure to perform repairs within the specified period of time will constitute grounds for having the repairs performed by others and the cost billed to the manufacturer. The Contractor shall also provide a 2 year contractor installation warranty.

1.8 DELIVERY, STORAGE AND HANDLING

Deliver, store, and handle preformed panels, bulk roofing products and other manufactured items in a manner to prevent damage or deformation.

1.8.1 Delivery

Provide adequate packaging to protect materials during shipment. Crated materials shall not be uncrated until ready for use, except for inspection. Immediately upon arrival of materials at the jobsite, inspect materials for damage, dampness, and staining. Damaged or permanently stained materials that cannot be restored to like-new condition shall be replaced with satisfactory material. If materials are wet, remove the moisture and re-stack and protect the panels until used.

1.8.2 Storage

Stack materials on platforms or pallets and cover with tarpaulins or other suitable weathertight covering which prevents water trapping or condensation. Store materials so that water which might have accumulated during transit or storage will drain off. Do not store the panels in contact with materials that might cause staining, such as mud, lime, cement, fresh concrete or chemicals. Protect stored panels from wind damage.

1.8.3 Handling

Handle material carefully to avoid damage to surfaces, edges and ends.

PART 2 PRODUCTS

2.1 ROOFING PANELS

Panels shall have interlocking ribs for securing adjacent sheets. System for securing the roof covering to structural framing members shall be concealed clip fastening system with no fasteners penetrating the panels except at the ridge or eave, rakes, penetrations, and end laps. Backing plates and ends of panels at end laps shall be predrilled or prepunched; factory prepare ends of panels to be lapped by trimming part of seam, die-setting or swaging ends of panels. Length of sheets shall be sufficient to cover the entire length of any unbroken roof slope when such slope is 30 feet or less. When length of run exceeds 30 feet, each sheet in the run shall extend over two or more spans. Sheets longer than 30 feet may be furnished if approved by the Contracting Officer. Width of sheets shall provide not less than 12 inches of coverage in place. Height of corrugations of adjacent roof sheets shall be not less than 2 inches (nominal). Make provisions for expansion and contraction at either ridge or eave, consistent with the type of system to be used. Panels from coil stock shall be formed without warping, waviness or ripples not part of the panel profile and shall be free of damage to the finish coating system.

2.1.1 Material

Zinc-coated steel conforming to ASTM A653/A653M, G90coating designation or aluminum-zinc alloy coated steel conforming to ASTM A792/A792M, AZ 55 coating. Minimum thickness to be 0.023 inch thick (24 gage) minimum except when mid field of roof is subject to design wind uplift pressures of 60 psf or greater, entire roof system shall have a minimum thickness of 0.030 inch (22 gage).

2.1.2 Texture

Smooth with raised intermediate ribs for added stiffness.

2.1.3 Finish

Factory color finish.

2.1.3.1 Factory Color Finish

Provide factory applied, thermally cured coating to exterior and interior of metal roof and wall panels and metal accessories. Provide exterior finish top coat of 70 percent resin polyvinylidene fluoride with not less than 0.8 mil dry film thickness. Provide exterior primer standard with panel manufacturer with not less than 0.8 mil dry film thickness. Interior finish shall consist of 0.5 mil dry film thickness backer coat. Provide exterior and interior coating meeting test requirements specified below. Tests shall have been performed on the same factory finish and thickness provided. Provide clear factory edge coating on all factory cut or unfinished edges.

2.2 INTERMEDIATE SUPPORTS

Fabricate panel subgirts, subpurlins, T-bars, Z-bars and tracks from galvanized steel conforming to ASTM A653/A653M, G90, Grade D (16 gage and heavier), Grade A (18 gage and lighter); or steel conforming to ASTM A36/A36M, ASTM A1011/A1011M , or ASTM A1008/A1008M prime painted with zinc-rich primer. Size, shape, thickness and capacity as required to meet

the load, insulation thickness and deflection criteria specified.

2.3 ATTACHMENT CLIPS

Fabricate clips from ASTM A1011/A1011M, or ASTM A1008/A1008M steel hot-dip galvanized in accordance with ASTM A653/A653M, G 90, or Series 300 stainless steel. Size, shape, thickness and capacity as required to meet the load, insulation thickness and deflection criteria specified.

2.4 ACCESSORIES

Sheet metal flashings, gutters, downspouts, trim, moldings, closure strips, pre-formed crickets, caps, equipment curbs, and other similar sheet metal accessories used in conjunction with preformed metal panels shall be of the same material as used for the panels. Provide metal accessories with a factory color finish to match the roofing panels, except that such items which will be concealed after installation may be provided without the finish if they are stainless steel. Metal shall be of a thickness not less than that used for the panels. Thermal spacer blocks and other thermal barriers at concealed clip fasteners shall be as recommended by the manufacturer except that wood spacer blocks are not allowed.

2.4.1 Closures

2.4.1.1 Rib Closures

Corrosion resisting steel, closed-cell or solid-cell synthetic rubber, neoprene or polyvinyl chloride pre-molded to match configuration of rib opening. Material for closures shall not absorb water.

2.4.1.2 Ridge Closures

Metal-clad foam or metal closure with foam secondary closure matching panel configuration for installation on surface of roof panel between panel ribs at ridge and headwall roof panel flashing conditions and terminations. Foam material shall not absorb water.

2.4.1.3 Gutters and Downspouts

Formed from same material as roof panels. Gutter profile to match that indicated on drawings. Fabricate in minimum 96-inch-long pieces. Fabricate downspout in 10-foot-long sections. Fabricate both gutters and downspouts of size and metal thickness according to SMACNA 1793.

2.4.2 Fasteners

Zinc-coated steel, corrosion resisting steel, zinc cast head, or nylon capped steel, type and size specified below or as otherwise approved for the applicable requirements. Design the fastening system to withstand the design loads specified. Exposed fasteners shall be gasketed or have gasketed washers on the exterior side of the covering to waterproof the penetration. Washer material shall be compatible with the covering; have a minimum diameter of 3/8 inch for structural connections; and gasketed portion of fasteners or washers shall be neoprene or other equally durable elastomeric material approximately 1/8 inch thick.

2.4.2.1 Screws

Not smaller than No. 14 diameter if self-tapping type and not smaller than

No. 12 diameter if self-drilling and self-tapping.

2.4.2.2 Bolts

Not smaller than 1/4 inch diameter, shouldered or plain shank as required, with proper nuts.

2.4.2.3 Automatic End-Welded Studs

Automatic end-welded studs shall be shouldered type with a shank diameter of not smaller than 3/16 inch and cap or nut for holding covering against the shoulder.

2.4.2.4 Explosive Driven Fasteners

Fasteners for use with explosive actuated tools shall have a shank diameter of not smaller than 0.145 inch with a shank length of not smaller than 1/2 inch for fastening to steel and not smaller than one inch for fastening to concrete.

2.4.2.5 Rivets

Blind rivets shall be stainless steel with 1/8 inch nominal diameter shank. Rivets shall be threaded stem type if used for other than the fastening of trim. Rivets with hollow stems shall have closed ends.

2.4.3 Sealants

Elastomeric type containing no oil or asphalt. Exposed sealant shall cure to a rubberlike consistency. Concealed sealant shall be the non-hardening type. Seam sealant shall be factory-applied, non-skinning, non-drying, and shall conform to the roofing manufacturer's recommendations. Silicone-based sealants shall not be used in contact with finished metal panels and components unless approved otherwise by the Contracting Officer.

2.4.4 Gaskets and Insulating Compounds

Nonabsorptive and suitable for insulating contact points of incompatible materials. Insulating compounds shall be nonrunning after drying.

2.4.5 Fall Protection Tie-Offs

Refer to Section 11 24 23 for fall protection requirements.

2.5 THERMAL INSULATION

Faced, Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 2 felt or glass-fiber mat, Grade 3, with maximum flame spread and smoke developed indexes of 75 and 450 respectively, based on tests performed on unfaced core. Provide a thermal resistance R value of 25.

PART 3 EXECUTION

3.1 EXAMINATION

Examine surfaces to receive standing seam metal roofing and flashing. Ensure that surfaces are plumb and true, clean, even, smooth, as dry and free from defects and projections which might affect the installation.

3.2 PROTECTION FROM CONTACT WITH DISSIMILAR MATERIALS

3.2.1 Cementitious Materials

Paint metal surfaces which will be in contact with mortar, concrete, or other masonry materials with one coat of alkali-resistant coating such as heavy-bodied bituminous paint.

3.2.2 Contact with Wood

Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.3 INSTALLATION

Install in accordance with the approved manufacturer's erection instructions, shop drawings, and diagrams. Panels shall be in full and firm contact with attachment clips. Where prefinished panels are cut in the field, or where any of the factory applied coverings or coatings are abraded or damaged in handling or installation, they shall, after necessary repairs have been made with material of the same color as the weather coating, be approved before being installed. Seal completely openings through panels. Correct defects or errors in the materials. Replace materials which cannot be corrected in an approved manner with nondefective materials. Provide molded closure strips where indicated and where necessary to provide weathertight construction. Use shims as required to ensure attachment clip line is true. Use a spacing gage at each row of panels to ensure that panel width is not stretched or shortened.

3.3.1 Roof Panels

Apply roofing panels with the standing seams parallel to the slope of the roof. Provide roofing panels in longest practical lengths from ridge to eaves (top to eaves on shed roofs), with no transverse joints except at the junction of ventilators, curbs, skylights, chimneys, and similar openings. Install flashing to assure positive water drainage away from roof penetrations. Locate panel end laps such that fasteners do not engage supports or otherwise restrain the longitudinal thermal movement of panels. Form field-formed seam type system seams in the field with an automatic mechanical seamer approved by the manufacturer. Attach panels to the structure with concealed clips incorporated into panel seams. Clip attachment shall allow roof to move independently of the structure, except at fixed points as indicated.

3.3.2 Insulation Installation

Insulation shall be installed between covering and supporting members to present a neat appearance. Extend insulation in thickness indicated to cover entire roof. Erect insulation and fasten in place with appropriate screws and plates spaced as required to resist wind loads.

3.3.3 Flashings

Provide flashing, related closures and accessories as indicated and as necessary to provide a weathertight installation. Install flashing to ensure positive water drainage away from roof penetrations. Flash and seal the roof at the ridge, eaves and rakes, and projections through the roof. Place closure strips, flashing, and sealing material in an approved manner

that will assure complete weathertightness. Details of installation which are not indicated shall be in accordance with the SMACNA 1793, panel manufacturer's approved printed instructions and details, or the approved shop drawings. Allow for expansion and contraction of flashing.

3.3.4 Flashing Fasteners

Fastener spacings shall be in accordance with the panel manufacturer's recommendations and as necessary to withstand the design loads indicated. Install fasteners in roof valleys as recommended by the manufacturer of the panels. Install fasteners in straight lines within a tolerance of 1/2 inch in the length of a bay. Drive exposed penetrating type fasteners normal to the surface and to a uniform depth to seat gasketed washers properly and drive so as not to damage factory applied coating. Exercise extreme care in drilling pilot holes for fastenings to keep drills perpendicular and centered. Do not drill through sealant tape. After drilling, remove metal filings and burrs from holes prior to installing fasteners and washers. Torque used in applying fasteners shall not exceed that recommended by the manufacturer. Remove panels deformed or otherwise damaged by over-torqued fastenings, and provide new panels.

3.3.5 Gutters

Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches o.c. Provide end closures and seal watertight. Provide for thermal expansions.

3.3.6 Downspouts

Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls at a spacing of approximately 60 inches on center.

3.3.7 Rib and Ridge Closure/Closure Strips

Set closure/closure strips in joint sealant material and apply sealant to mating surfaces prior to adding panel.

3.3.8 Protection Tie-Offs

Prepare roofing for attachment of fall protection tie-offs to roofing ribs using the manufacturer's clamps appropriate for the roofing profile.

3.4 PROTECTION OF APPLIED ROOFING

Do not permit storing, walking, wheeling, and trucking directly on applied roofing materials. Provide temporary walkways, runways, and platforms of smooth clean boards or planks as necessary to avoid damage to applied roofing materials, and to distribute weight to conform to indicated live load limits of roof construction.

3.5 CLEANING

Clean exposed sheet metal work at completion of installation. Remove metal shavings, filings, nails, bolts, and wires from roofs. Remove grease and oil films, excess sealants, handling marks, contamination from steel wool, fittings and drilling debris and scrub the work clean. Exposed metal surfaces shall be free of dents, creases, waves, scratch marks, solder or

weld marks and damage to the finish coating.

3.6 MANUFACTURER'S FIELD INSPECTION

Manufacturer's technical representative shall visit the site as necessary during the installation process to assure panels, flashings, and other components are being installed in a satisfactory manner. Manufacturer's technical representative shall perform a field inspection during the first 20 squares of roof panel installation and at substantial completion prior to issuance of warranty, as a minimum, and as otherwise requested by the Contracting Officer. Additional inspections shall not exceed one for 100 squares of total roof area with the exception that follow-up inspections of previously noted deficiencies or application errors shall be performed as requested by the Contracting Officer. Each inspection visit shall include a review of the entire installation to date. After each inspection, a report, signed by the manufacturer's technical representative, shall be submitted to the Contracting Officer noting the overall quality of work, deficiencies and any other concerns, and recommended corrective actions in detail. Notify Contracting Officer a minimum of 2 working days prior to site visit by manufacturer's technical representative.

3.7 COMPLETED WORK

Completed work shall be plumb and true without oil canning, dents, ripples, abrasion, rust, staining, or other damage detrimental to the performance or aesthetics of the completed roof assembly.

3.8 INFORMATION CARD

For each roof, provide a typewritten card, laminated in plastic and framed for interior display or a photoengraved 0.032 inch thick aluminum card for exterior display. Card to be 8 1/2 by 11 inches minimum and contain the information listed on Form 1 at end of this section. Install card near point of access to roof, or where indicated. Send a photostatic paper copy to EFACHESNAVFACENGCOM, Code 102, Building 212, Washington Navy Yard, Washington, DC 20374-2121.

3.9 FORM ONE

FORM 1 - PREFORMED STEEL STANDING SEAM ROOFING SYSTEM COMPONENTS

1. Contract Number:

2. Building Number & Location:

3. NAVFAC Specification Number:

4. Deck/Substrate Type:

5. Slopes of Deck/Roof Structure:

6. Insulation Type & Thickness:

7. Insulation Manufacturer:

8. Vapor Retarder: ( )Yes ( )No

9. Vapor Retarder Type:

10. Preformed Steel Standing Seam Roofing Description:

a. Manufacturer (Name, Address, & Phone No.):
b. Product Name: c. Width: d. Gage:
e. Base Metal: f. Method of Attachment:

11. Repair of Color Coating:

a. Coating Manufacturer (Name, Address & Phone No.):
b. Product Name:
c. Surface Preparation:
d. Recoating Formula:
e. Application Method:

12. Statement of Compliance or Exception:_____
_____
_____

13. Date Roof Completed:

14. Warranty Period: From_____ To_____

15. Roofing Contractor (Name & Address):

16. Prime Contractor (Name & Address):

Contractor's Signature _____ Date:

Inspector's Signature _____ Date:

-- End of Section --

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; E 2008; R 2008) Acoustically Absorptive Materials Applied by Trowel or Spray
ASTM E119	(2014) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E605	(1993; R 2011) 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	(1992; R 2011) Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members
ASTM E760	(1992; R 2011) Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members
ASTM E761	(1992; R 2011) Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E859	(1993; R 2011) Air Erosion of Sprayed Fire-Resistive Materials (SFRMS) Applied to Structural Members

ASTM E937	(1993; R 2011) Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members
ASTM G21	(2013) Determining Resistance of Synthetic Polymeric Materials to Fungi

ICC EVALUATION SERVICE, INC. (ICC-ES)

ICC-ES AC23	(2004; R 2008; R 2011) Acceptance Criteria for Spray-Applied and Intumescent Mastic Coating Fire-Protection Materials

UNDERWRITERS LABORATORIES (UL)

UL 263	(2011) 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	X701
Columns supporting more than one floor	2	X701

Fire Rating Schedule		
Element	Hourly Rating	UL Design Reference
Columns supporting roof	2	X701
Floor decks	2	D902
Floor supports	2	N706
Roof decks	1	P741
Roof supports	1	P701

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 Contractor Quality Control approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. **For this specification, NAVFAC signifies the office that will review the submittal for the Government to be Washington Division, EFA Washington Naval Facilities Engineering Command Fire Protection Engineer.** Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Fireproofing Material; G

SD-04 Samples

Spray-Applied Fireproofing; G

SD-06 Test Reports

Fire Resistance Rating; G
Field Tests; G
Evaluation Reports; G

SD-07 Certificates

Installer Qualifications; G
Surface Preparation Report; G
Manufacturer's Inspection Report; G

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 40 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

Provide spray-applied fireproofing material, 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 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.

2.1.3 Bond-Impact

Spray-applied fireproofing material shall not crack, spall or delaminate when tested in accordance with ASTM E760.

2.1.4 Compressive Strength

The minimum compressive strength shall be 1000 psf when tested in accordance with ASTM E761.

2.1.5 Corrosion

Spray-applied fireproofing material shall not contribute to corrosion of test panels when tested as specified in ASTM E937.

2.1.6 Air Erosion

Dust removal shall not exceed 0.025 gram per square foot when tested in accordance with ASTM E859.

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 contrasting in color to facilitate inspection.

2.3 WATER

Water used for material mixing and surface preparation shall be potable.

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 0.375 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.

3.5 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. Determine densities in accordance with ASTM E605 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 indicated or 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 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	(2014) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E1399/E1399M	(1997; E 2013;R 2013) Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems
ASTM E1966	(2007; R 2011) Fire-Resistive Joint Systems
ASTM E2174	(2010a; E 2011) Standard Practice for On-Site Inspection of Installed Fire Stops
ASTM E2307	(2010) 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 E814	(2013a) Standard Test Method for Fire Tests of Through-Penetration Fire Stops
ASTM E84	(2015a) 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	(2012) International Building Code

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

UNDERWRITERS LABORATORIES (UL)

UL 1479	(2003; Reprint Oct 2012) Fire Tests of Through-Penetration Firestops
UL 2079	(2004; Reprint Dec 2012) Tests for Fire Resistance of Building Joint Systems
UL 723	(2008; Reprint Aug 2013) Test for Surface Burning Characteristics of Building Materials
UL Fire Resistance	(2014) Fire Resistance Directory

1.2 SYSTEM DESCRIPTION

1.2.1 General

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.

1.2.2 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.

1.2.3 Submittals Requirements

a. 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 shall 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.

b. 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.

c. Submit documentation of training and experience for Installer.

d. 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.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Firestopping Materials; G

SD-06 Test Reports

Inspection; G

SD-07 Certificates

Inspector Qualifications
Firestopping Materials
Installer Qualifications; G

1.4 QUALITY ASSURANCE

1.4.1 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. 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 written certification of training, and retain proof of certification for duration of firestop installation.

1.4.2 Inspector Qualifications

The inspector shall have a minimum of two 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.

1.5 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 MATERIALS

Provide firestopping materials, supplied from a single domestic manufacturer, consisting of commercially manufactured, asbestos-free, nontoxic products FM APP GUIDE approved, or UL listed, for use with applicable construction and penetrating items, complying with the following minimum requirements:

2.1.1 VOC Content

VOC content of firestop materials installed on project is limited to 250g/l as calculated by EPA Method 24.

2.1.2 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.

2.1.3 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. Firestop material must be free from Ethylene Glycol, PCB, MEK, or other types of hazardous chemicals.

2.1.4 Color

Provide products in red color when available. If red color is not available, product is to be field painted red.

2.1.5 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.

2.1.5.1 Through-Penetrations

Firestopping materials for through-penetrations, as described in paragraph SYSTEM DESCRIPTION, shall provide "F", "T" and "L" fire resistance ratings in accordance with ASTM E814 or UL 1479. Fire resistance ratings shall be as follows:

2.1.5.1.1 Penetrations of Fire Resistance Rated Walls and Partitions

F Rating = Rating of wall or partition being penetrated.

2.1.5.1.2 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.

2.1.5.1.3 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 or a total cumulative leakage of 50 cfm for any 100 square feet of wall area or floor area where L rating is required.

2.1.5.2 Construction Joints and Gaps

Fire resistance ratings of construction joints, as described in paragraph SYSTEM DESCRIPTION, 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.

PART 3 EXECUTION

3.1 PREPARATION

Areas to receive firestopping shall 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 shall 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 shall be capable of supporting the same load as the floor is designed to support or shall 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 00 00 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM. 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 and devices as indicated.

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* 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

3.3.1 General Requirements

For Navy projects, install one of each type of penetration and have it inspected and accepted by the Washington Division, Naval Facilities Engineering Command, Fire Protection Engineer prior to the installation of the remainder of the penetrations. At this inspection, the manufacturer's technical representative of the firestopping material shall be present. For all projects, the remainder of the firestopped areas shall not be covered or enclosed until inspection is complete and approved by the Contracting Officer. The inspector shall 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.

3.3.2 Inspection Standards

Inspect all firestopping in accordance to ASTM E2393 and ASTM E2174 for firestop inspection, and document inspection results to be submitted.

-- End of Section --

SECTION 07 92 00

JOINT SEALANTS
01/07

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 C1247	(2014) Standard Test Method for Durability of Sealants Exposed to Continuous Immersion in Liquids
ASTM C1248	(2012) Standard Test Method for Staining of Porous Substrate by Joint Sealants
ASTM C1330	(2002; R 2013) Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants
ASTM C734	(2006; R 2012) Low-Temperature Flexibility of Latex Sealants After Artificial Weathering
ASTM C834	(2014) Latex Sealants
ASTM C920	(2014a) Standard Specification for Elastomeric Joint Sealants
ASTM E283	(2004; R 2012) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E330	(2002; R 2010) Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E331	(2000; R 2009) Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E547	(2009) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials

ASTM E90	(2009) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

U.S. FOOD AND DRUG ADMINISTRATION

21CFR177.2600	(2015) Substances for Use Only as Components of Articles Intended for Repeated Use

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Sealants; G

Primers

Bond breakers

Backstops

Manufacturer's descriptive data including storage requirements, shelf life, curing time, instructions for mixing and application, and primer data (if required). Provide a copy of the Material Safety Data Sheet for each solvent, primer or sealant material.

SD-07 Certificates

Sealant

Certificates of compliance; G

1.3 ENVIRONMENTAL CONDITIONS

Apply sealant when the ambient temperature is between 40 and 90 degrees F.

1.4 DELIVERY AND STORAGE

Deliver materials to the job site in unopened manufacturers' external shipping containers, with brand names, date of manufacture, color, and material designation clearly marked thereon. Label elastomeric sealant containers to identify type, class, grade, and use. Carefully handle and store materials to prevent inclusion of foreign materials or subjection to sustained temperatures exceeding 90 degrees F or less than 0 degrees F.

1.5 QUALITY ASSURANCE

1.5.1 Certificates of Compliance

Provide Certificates of Compliance stating that the materials conform to the specified requirements.

1.5.2 Compatibility with Substrate

Verify that each of the sealants are compatible for use with joint substrates.

1.5.3 Joint Tolerance

Provide joint tolerances in accordance with manufacturer's printed instructions.

1.5.4 Mock-Up

Project personnel is responsible for installing sealants in mock-up prepared by other trades, using materials and techniques approved for use on the project.

1.6 SPECIAL WARRANTY

Guarantee sealant joint against failure of sealant and against water penetration through each sealed joint for five years.

PART 2 PRODUCTS

2.1 SEALANTS

Provide sealant that has been tested and found suitable for the substrates to which it will be applied.

a. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
b. Liquid-Applied Joint Sealant: Comply with ASTM C920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.
c. Suitability for Immersion in Liquids: Where sealants are indicated for use for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.
d. Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C1248 and have non-stained porous joint substrates indicated for Project.

2.1.1 Interior Sealant

Provide ASTM C920, Type S or M, Grade NS, Class 50, Use NT. Location(s) and color(s) of sealant for the following. Provide FDA/USDA approved sealant in food service areas where sealant may come into contact with food. Sealants indicated for joints that will come in repeated contact with food are to comply with 21CFR177.2600

LOCATION	COLOR
a. Small voids between walls or partitions and adjacent lockers, casework, shelving, door frames, built-in or surface-mounted equipment and fixtures, and similar items.	As selected
b. Perimeter of frames at doors, windows, and access panels which adjoin exposed interior concrete and masonry surfaces.	As selected
c. Joints of interior masonry walls and partitions which adjoin columns, pilasters, concrete walls, and exterior walls unless otherwise detailed.	As selected
d. Joints between edge members for acoustical tile and adjoining vertical surfaces.	As selected
e. Interior locations, not otherwise indicated or specified, where small voids exist between materials specified to be painted.	As selected
f. Joints between bathtubs and ceramic tile; joints between shower receptors and ceramic tile; joints formed where nonplaner tile surfaces meet.	As selected
g. Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occurring where substrates change.	As selected
h. Behind escutcheon plates at valve pipe penetrations and showerheads in showers.	As selected

2.1.2 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 100/50, Use NT. Provide location(s) and color(s) of sealant as follows:

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.	As selected
b. Joints between new and existing exterior masonry walls.	As selected
c. Masonry joints where shelf angles occur.	As selected

LOCATION	COLOR
d. Joints in wash surfaces of stonework.	As selected
e. Expansion and control joints.	As selected
f. Interior face of expansion joints in exterior concrete or masonry walls where metal expansion joint covers are not required.	As selected
g. Voids where items pass through exterior walls.	As selected
h. Metal reglets, where flashing is inserted into masonry joints, and where flashing is penetrated by coping dowels.	As selected
i. Metal-to-metal joints where sealant is indicated or specified.	As selected
j. Joints between ends of gravel stops, fascias, copings, and adjacent walls.	As selected

2.1.3 Floor Joint Sealant

ASTM C920, Type S or M, Grade P, Class 25, Use T. Provide location(s) and color(s) of sealant as follows:

LOCATION	COLOR
a. Seats of metal thresholds for exterior doors.	As selected
b. Control and expansion joints in floors, slabs, ceramic tile, and walkways.	As selected

2.1.4 Acoustical Sealant

Latex-based acoustical sealant conforming to ASTM C834 must have a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84. Acoustical sealant is to effectively reduce airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90, and must remain flexible and adhesive after 500 hours of accelerated weathering as specified in ASTM C734, and must be non-staining.

2.1.5 Preformed Sealant

2.1.5.1 Sheet Sealant (S/PF)

Pre-cured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.

2.1.5.2 Tape and Bead

Provide preformed sealant of polybutylene or isoprene-butylene based pressure sensitive weather resistant tape or bead sealant 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, the sealant must be non-bleeding and no loss of adhesion.

a. Tape sealant: Provide cross-section dimensions as indicated.
b. Bead sealant: Provide cross-section dimensions as indicated.

2.1.5.3 Foam Strip

Urethane Pre-formed (U/PF): Preformed, pre-compressed, open-cell foam sealant that is manufactured from high-density urethane foam impregnated with a nondrying, water-repellent agent; is factory produced in pre-compressed sizes in roll or stick form to fit joint widths indicated; is coated on one side with a pressure-sensitive adhesive and covered with protective wrapping; develops a watertight and airtight seal when compressed to the degree specified by manufacturer.

a. Properties: Permanently elastic, mildew resistant, non-migratory, non-staining and compatible with joint substrates and other joint sealants.
b. Density: 10 lb/cu. ft.

2.2 PRIMERS

Provide a nonstaining, quick-drying type and consistency recommended by the sealant manufacturer for the particular application.

2.3 BOND BREAKERS

Provide the type and consistency recommended by the sealant manufacturer to prevent adhesion of the sealant to backing or to bottom of the joint.

2.4 BACKSTOPS

Provide glass fiber roving or 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. Make backstop material compatible with sealant. Do not use oakum and other types of absorptive materials as backstops.

2.5 JOINT SEALANT BACKING

2.5.1 General

Provide sealant backings of material that are non-staining; are compatible

with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

2.5.2 Cylindrical Sealant Backings

ASTM C1330, Type C (closed-cell material with a surface skin) or Type B (bi-cellular material with a surface skin) as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

2.6 ENGINEERED TRANSITION ASSEMBLY

Translucient Air and Vapor Transition (ETA)

a. Material shall be evaluated in accordance with the following standards:

    1. ASTM E283
    2. ASTM E330
    3. ASTM E331
    4. ASTM E547

b. Pre-engineered, finished aluminum and silicone materials used as a transition assembly. The system assembly is mechanically attached to the window assembly to assure a durable seal is achieved. The engineered transitions assembly is comprised of the following components.

    1. Silicone Rubber Sheet (SRS): Extruded, 40 durometer, translucent silicone, with a lock-in rubber dart.
    2. Silicone Rubber Corners (SRC): Pre-molded, 40 durometer, translucent silicone, with a lock in rubber dart.
    3. Silicone Sealants: Comply with ASTM C920, single-component, neutral-curing silicone; Class 100/50, Grade NS, Use O. Product shall be Spectrem 1 as manufactured by Tremco.
    4. Extruded Aluminum Attachment (EAA): Alodine finished, with pre-engineered race for receiving silicone lock-in rubber dart. Extrusion is supplied in 5 foot lengths with predrilled holes. Butyl Tape: 100% solid Polyisobutylene-cross linked butyl preformed sealant.

2.7 CLEANING SOLVENTS

Provide type(s) recommended by the sealant manufacturer except for aluminum and bronze surfaces that will be in contact with sealant.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Clean surfaces from dirt frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter that would tend to destroy or impair adhesion. Remove oil and grease with solvent. Surfaces must be wiped 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, contact sealant manufacturer for specific recommendations.

3.1.1 Steel Surfaces

Remove loose mill scale by sandblasting or, if sandblasting is impractical or would damage finish work, scraping and wire brushing. Remove protective coatings by sandblasting or using a residue-free solvent.

3.1.2 Aluminum or Bronze Surfaces

Remove temporary protective coatings from surfaces that will be in contact with sealant. When masking tape is used as a protective coating, remove tape and any residual adhesive just prior to sealant application. For removing protective coatings and final cleaning, use nonstaining solvents recommended by the manufacturer of the item(s) containing aluminum or bronze surfaces.

3.1.3 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.

3.1.4 Wood Surfaces

Keep wood surfaces to be in contact with sealants free of splinters and sawdust or other loose particles.

3.2 SEALANT PREPARATION

Do not add liquids, solvents, or powders to the sealant. Mix multicomponent elastomeric sealants in accordance with manufacturer's instructions.

3.3 APPLICATION

3.3.1 Joint Width-To-Depth Ratios

a. 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 2 inch	1/2 inch	5/8 inch

JOINT WIDTH	JOINT DEPTH	
	Minimum	Maximum
Over 2 inch	As recommended by sealant manufacturer	

b. 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 not required on metal surfaces.

3.3.2 Masking Tape

Place masking tape on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Remove masking tape within 10 minutes after joint has been filled and tooled.

3.3.3 Backstops

Install backstops dry and free of tears or holes. Tightly pack the back or bottom of joint cavities with backstop material to provide a joint of the depth specified. Install backstops in the following locations:

a. Where indicated.

b. Where backstop is not indicated but joint cavities exceed the acceptable maximum depths specified in paragraph entitled, "Joint Width-to-Depth Ratios".

3.3.4 Primer

Immediately prior to application of the sealant, clean out loose particles from joints. Where recommended by sealant manufacturer, apply primer to joints in concrete masonry units, wood, and other porous surfaces in accordance with sealant manufacturer's instructions. Do not apply primer to exposed finish surfaces.

3.3.5 Bond Breaker

Provide bond breakers to the back or bottom of joint cavities, as recommended by the sealant manufacturer for each type of joint and sealant used, to prevent sealant from adhering to these surfaces. Carefully apply the bond breaker to avoid contamination of adjoining surfaces or breaking bond with surfaces other than those covered by the bond breaker.

3.3.6 Sealants

Provide a sealant compatible with the material(s) to which it is applied. Do not use a sealant that has exceeded shelf life or has jelled and can not be discharged in a continuous flow from the gun. Apply the sealant in accordance with the manufacturer's printed instructions with a gun having a nozzle that fits the joint width. Force sealant into joints to fill the joints solidly without air pockets. Tool sealant after application to ensure adhesion. Make sealant uniformly smooth and free of wrinkles. Upon completion of sealant application, roughen partially filled or unfilled joints, apply sealant, and tool smooth as specified. Apply sealer over the sealant when and as specified by the sealant manufacturer.

3.4 PROTECTION AND CLEANING

3.4.1 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.

3.4.2 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 scrape off fresh sealant that has been smeared on masonry and rub clean with a solvent as recommended by the sealant manufacturer. Allow excess sealant to cure for 24 hour then remove by wire brushing or sanding.

b. Metal and Other Non-Porous Surfaces: Remove excess sealant with a solvent-moistened cloth.

-- End of Section --

SECTION 07 95 00

EXPANSION CONTROL
07/08

PART 1 GENERAL

1.1 SUMMARY

This Section includes the following:

1. Architectural joint systems for building interiors.
2. Architectural joint systems for building exteriors.

1.2 DEFINITIONS

A. Maximum Joint Width: Widest linear gap a joint system tolerates and in which it performs its designed function without its functional capabilities.

B. Minimum Joint Width: Narrowest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.

C. Movement Capability: Value obtained from the difference between widest and narrowest widths of a joint opening typically expressed in numerical values (mm or inches) or a percentage (plus or minus) of nominal value of joint width.

D. Nominal Joint Width: The width of the linear opening specified in practice and in which the joint system is installed.

1.3 REFERENCES

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

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 611	(1998; R 2004) Voluntary Specification for Anodized Architectural 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
ASTM C711	(2009) Standard Test Method for Low-Temperature Flexibility and Tenacity of One-Part, Elastomeric, Solvent-Release Type Sealants

ASTM D2240	(2005; R 2010) Standard Test Method for Rubber Property - Durometer Hardness
ASTM D3574	(2011) Standard Test Methods for Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams
ASTM D816	(2011) Standard Test Methods for Rubber Cements
ASTM E1966	(2007; R 2011) Fire-Resistive Joint Systems
ASTM E96/E96M	(2014) Standard Test Methods for Water Vapor Transmission of Materials

INTERNATIONAL CODE COUNCIL (ICC)

ICC A117.1	(2009) Accessible and Usable Buildings and Facilities

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 94	(2013; Reprint Jan 2015) Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances

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. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings; G

SD-04 Samples

Samples; G

SD-06 Test Reports

Test Reports; G

Based on evaluation of comprehensive tests performed by a qualified testing agency, for current products.

SD-07 Certificates

Installer Qualifications; G

1.5 GENERAL REQUIREMENTS

Shop Drawings:

Placement Drawings: Include line diagrams showing plans, elevations, sections, details, splices, blockout requirement, entire route of each joint system, and attachments to other work. Where joint systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

Architectural Joint System Schedule: Prepared by or under the supervision of the supplier. Include the following:

a. Manufacturer and model number for each joint system.
b. Joint system location cross-referenced to drawing.
c. Nominal joint width.
d. Movement capability.
e. Classification as thermal or seismic.
f. Materials, colors, and finishes.
g. Product options.
h. Fire-resistance ratings.
i. Test reports.

1.6 SAMPLES

Provide full width, 6 inches in length, for each joint system indicated. Include manufacturer's color charts showing the full range of colors and finishes available for each exposed metal and elastomeric seal material.

1.7 QUALITY ASSURANCE

Obtain joint systems through one source from a single manufacturer. Manufacturer shall have a minimum 10 years experience specializing in the design and manufacture of expansion joint control systems.

1.7.1 Installer Qualifications

Submit qualifications of a manufacturer's factory-trained certified applicator or installer with a minimum of 5 years documented experience on projects of similar size and scope.

1.7.2 Product Options

The Contract Drawings indicate size, profiles, and dimensions of joint systems required. Do not modify design intent or desired aesthetic without prior approval of the Contracting Officer. If modifications are required, submit comprehensive explanatory data to the Contracting Officer prior to installation.

1.7.3 Accessibility Requirements

Comply with applicable requirements of 36 CFR 1191 "Americans with Disabilities Act (ADA) Accessibility Guidelines (ADAAG)" and ICC A117.1.

1.7.4 Joint Systems in Fire-Rated Assemblies

Where joint systems are indicated in the Contract Drawings to be installed

in fire-rated assemblies, system shall be approved for use in a fire-rated barrier. System shall be tested by a testing and inspecting agency and comply with requirements of ASTM E1966.

1.8 COORDINATION

Coordinate installation of exterior wall joint systems with roof expansion assemblies to ensure that wall transitions are watertight. Refer to Section 07 53 23 ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING for expansion control in roof assemblies.

1.9 WARRANTY

Provide manufacturer's standard 5 year warranty.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Aluminum

ASTM B221, Alloy 6063-T5 for extrusions; ASTM B209, Alloy 6061-T6 for sheet and plate; Class II, clear anodic finish complying with AAMA 611.

Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.

2.1.2 Elastomeric Seals

Preformed elastomeric membranes or extrusions; designed and fabricated to be installed in metal frames.

2.1.3 Strip Seals

Preformed elastomeric membrane or tubular extrusions having an internal baffle system and secured in or over a joint by a metal locking rail.

2.1.4 Elastomeric Concrete

Modified epoxy or polyurethane extended into a prepackaged aggregate blend, specifically designed for bonding to concrete substrates.

2.1.5 Fire Barriers

Any material, or combination of materials, designed to resist the passage of flame and hot gases through a movement joint. Fire barrier shall be UL listed for specific application.

2.1.6 Moisture Barrier

Flexible elastomeric material, minimum 30 mils thick.

2.1.7 Accessories

Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for a complete installation.

2.2 ARCHITECTURAL CONTROL JOINT SYSTEMS, GENERAL

Provide control joint systems of design, basic profile, materials, and operation indicated on the Contract Drawings. Joint systems shall be capable of accommodating multi-directional movement without stress to its components.

Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where joint changes direction or abuts other materials.

Include factory-fabricated closure materials and transition pieces, tee-joints, corners, curbs, cross-connections, and other accessories as required to provide a complete installation.

Design architectural control joint systems for the following movement characteristics:

1. Nominal Joint Width: As indicated on the drawings.
2. Maximum Joint Width: As indicated on the drawings.
3. Minimum Joint Width: As indicated on the drawings.
4. Movement Capability: Plus or minus 25 percent.
5. Type of Movement: Thermal and wind sway.

2.3 INTERIOR EXPANSION JOINT CONTROL SYSTEMS

Provide expansion joint control systems compliant with the following. Wall and ceiling interior expansion joint covers are to be as selected.

2.3.1 Wall-to-Wall Ceiling-to-Ceiling Joint System

Provide wall-to-wall and ceiling-to-ceiling joint system capable of accommodating multi-directional movement without stress to components. System shall consist of lightweight elastomeric seal attached to an aluminum extrusion which is mechanically fastened to the adjoining wall construction in a concealed way, either covered by GWB topping or otherwise.

Type: Accordion elastomeric seal attached to an aluminum extrusion.

Exposed Metal: Aluminum extrusion; conforming to ASTM B221, Alloy 6063-T5. Profile shall feature a continuous groove designed to accept pre-formed flange of the accordion elastomeric seal.

Elastomeric Seal: Extruded polyvinyl chloride profile, designed to be received by continuous groove in aluminum extrusion. Color: Manufacturer's standard.

Attachment Method: Method of attachment shall be appropriate for ceiling construction. Spacing not to exceed 18 inches on center.

2.4 EXTERIOR EXPANSION JOINT CONTROL SYSTEMS

Provide expansion joint control systems compliant with the following.

2.4.1 Exposed Wall-to-Wall Joint System (Finished Preformed Cellular Foam)

Wall to wall expansion joint shall be a polyurethane foam impregnated with a waterproof polymer sealing compound. Expansion joint shall be installed in the joint in a pre-compressed state with a silicone coating on the

exposed face. When compressed to 50 percent of its fully expanded size, expansion joint must provide a watertight joint. The manufacturer shall furnish a Certificate of Compliance with these requirements.

PROPERTY	TEST METHOD	VALUE
Density	--	160kg/m3
Thermal Conductivity	--	0.05 W/m. deg C
Temperature Stability Range	---	-40 deg C 85 deg C
Tensile Strength	ASTM D3574	145 kPa min.
Ultimate Elongation	ASTM D3574	125 percent ±20 percent
Resistance to Compression Set	--	Max 2.5 percent
Shear Strength	--	Min 8N/cm2
Mildew Resistance	--	Excellent
Staining	--	None
Flammability	UL 94 VO Meets CAL 117	Self Extinguishing
Flash Point	--	590 Deg F
Durometer Hardness	ASTM D2240	Shore A 15 pts.

Finish: See EXTERIOR MATERIAL FINISH CHART on Drawing A-501 for color, finish, and/or style.

Attachment method: Method of attachment shall be appropriate for condition. Refer to joint manufacturer's written instructions to ensure proposed system is suitable for application. System shall be compression type secured with adhesive.

2.4.2 Back-up Wall-to-Wall Joint System (Preformed Cellular Foam)

Provide a preformed expanding foam sealant produced by impregnating permanently elastic, high-density, open-cell polyurethane foam with water-based, polymer-modified asphalt with the following properties:

Property	Value	Test Method
Base Material	Open Cell, High Density Polyurethane Foam	N/A
Impregnation	Polymer-modified asphalt	N/A
Color	Black	N/A
Density (uncompressed)	9-10 lb/ft^3	
Density (compressed to 25% of uncompressed width)	36-40 lb/ft^3	
Tensile strength	21 psi min	ASTM D3574
Elongation - ultimate	150% min	ASTM D3574

Property	Value	Test Method
Temperature range High - permanent High - short term Low	 185 deg F 203 deg F -40 deg F	ASTM C711
Softening Point	140 deg F min	ASTM D816
UV resistance	Excellent	
Mildew resistance	Excellent	
Resistance to aging	Excellent	
Bleeding -40 deg F to 180 deg F	None	
Compression set 158 deg F 50% RH after 72 hrs	3% max	ASTM D3574
Thermal Conductivity	0.34 Btu.ft^2,deg F	ASTM D3574
Low temperature flexibility 32 deg F to -10 deg F	No cracking or splitting	ASTM C711
Water vapor transmission at 25% compression	0.011 PERMS	ASTM E96/E96M

PART 3 EXECUTION

3.1 EXAMINATION

Examine surfaces where expansion control joint systems will be installed. Ensure field conditions are suitable for installation and comply with manufacturer's written instructions prior to start of work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

Prepare substrates according to joint system manufacturer's written instructions. Repair concrete slabs and blockouts as necessary using repair grout of compressive strength adequate for anticipated structural loadings. Coordinate and furnish anchors, setting drawings, and instructions for installing joint systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide secure attachment of joint systems to substrate.

3.3 INSTALLATION

3.3.1 General

Comply with manufacturer's written instructions for storing, handling, and installing joint system materials.

Metal Frames: Perform cutting, drilling, and fitting required to install joint systems. Install in true alignment and proper relationship to joints and adjoining finished surfaces measure from established lines and levels. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames. Locate in continuous contact with adjacent surfaces. Repair or group blockouts as required for continuous frame support and to bring frame into proper alignment; use of shims will not be allowed. Locate anchors at interval recommended by manufacturer, but not less than (3 inches) from each end and not more than (24 inches) on center.

Use of Compression Seals: In joints with an angle too acute for attachment of metal frame with mechanical anchorage, use compression seals held in position with adhesive. Follow manufacturer's written instructions for this installation type.

Terminate exposed ends of joint assemblies with field- or factory-fabricated termination devices.

Fire-Resistance-Rated Assemblies: Coordinate installation of joint system materials and associated work so complete assemblies comply with performance requirements. Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

Moisture Barrier: Provide moisture barrier at all exterior joint locations and where called for on drawings.

3.3.2 Exterior Expansion Joint Control System

3.3.2.1 Preparation

Verify that the joint is clean, sound, and will provide an appropriate surface for installation of the expansion joint. Check material for the appropriate lengths, widths, and depths. Prepare the material for seams and proper lengths.

3.3.2.2 Installation

Run a bead of the supplied silicone adhesive along both sides of the joint approximately back from the substrate surface. When fully prepared to install, open the sealant material by removing the shrink packaging and masonite strapping. Remove the white release liner on both sides of the material. Insert the material into the joint while pressing the material against the side of the joint activating the PSA (Pressure Sensitive Adhesive). Tool the silicone over all seams and transitions to allow for a clean, aesthetic finish.

3.3.2.3 Clean Up

Remove any excess silicone left on the surface of the material or substrate. Remove all waste materials from the jobsite. Do not reuse waste material. Leave site to the satisfaction of the Government.

3.4 PROTECTION

Do not remove protective covering until finish work in adjacent areas is

complete. When protective covering is removed, clean exposed metal surfaces according to manufacturer's written instruction.

Protect the installation from damage. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over joints. Reinstall cover plates or seals prior to Substantial Completion of the Work.

-- End of Section --

SECTION 08 11 13

STEEL DOORS AND FRAMES
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 in the text by the basic designation only.

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2010; Errata 2011) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A653/A653M	(2013) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A879/A879M	(2012) 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	(2014) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM C578	(2014a) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C591	(2013) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C612	(2014) Mineral Fiber Block and Board Thermal Insulation
ASTM D2863	(2013) Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
ASTM E1300	(2012a; E 2012) Determining Load Resistance of Glass in Buildings
ASTM E283	(2004; R 2012) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM F1233	(2008; R 2013) Security Glazing Materials

	and Systems
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	(2006) Hardware Preparation in Steel Doors and Steel Frames

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM HMMA HMM	(1999; R2000) Hollow Metal Manual

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 105	(2013) Standard for Installation of Smoke Door Assemblies and Other Opening Protectives
NFPA 252	(2012) Standard Methods of Fire Tests of Door Assemblies
NFPA 80	(2013) Standard for Fire Doors and Other Opening Protectives

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR 111	(2009) Recommended Selection and Usage Guide for Standard Steel Doors, Frames and Accessories
SDI/DOOR 113	(2001; R2006) Standard Practice for Determining the Steady State Thermal Transmittance of Steel Door and Frame Assemblies
SDI/DOOR A250.11	(2001) Recommended Erection Instructions for Steel Frames
SDI/DOOR A250.6	(2003; R2009) Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames
SDI/DOOR A250.8	(2003; R2008) Recommended Specifications for Standard Steel Doors and Frames

UNDERWRITERS LABORATORIES (UL)

UL 10C	(2009) Standard for 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 Contractor Quality Control approval. The following shall be submitted in accordance with Section

01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Doors; G

Frames; G

Accessories

Weatherstripping

Show elevations, construction details, metal gages, hardware provisions, method of glazing, and installation details.

Schedule of doors; G

Schedule of frames; G

Submit door and frame locations.

SD-03 Product Data

Doors; G

Frames; G

Accessories

Weatherstripping

Submit manufacturer's descriptive literature for doors, frames, and accessories. Include data and details on door construction, panel (internal) reinforcement, insulation, and door edge construction. When "custom hollow metal doors" are provided in lieu of "standard steel doors," provide additional details and data sufficient for comparison to SDI/DOOR A250.8 requirements.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors, frames, and accessories undamaged and with protective wrappings or packaging. Provide temporary steel spreaders securely fastened to the bottom of each welded frame. Store doors and frames on platforms under cover in clean, dry, ventilated, and accessible locations, with 1/4 inch airspace between doors. Remove damp or wet packaging immediately and wipe affected surfaces dry. Replace damaged materials with new.

PART 2 PRODUCTS

2.1 STANDARD STEEL DOORS

SDI/DOOR A250.8, except as specified otherwise. Prepare doors to receive door hardware as specified in Section 08 71 00. Undercut where indicated. Exterior doors shall have top edge closed flush and sealed to prevent water intrusion. Doors shall be 1-3/4 inch thick, unless otherwise indicated. Provide exterior glazing in accordance with ASTM F2248 and ASTM E1300.

2.1.1 Classification - Level, Performance, Model

2.1.1.1 Extra Heavy Duty Doors

SDI/DOOR A250.8, Level 3, physical performance Level A, Model 3 with core construction as required by the manufacturer for interior doors and for exterior doors, of size(s) and design(s) indicated. Where vertical stiffener cores are required, the space between the stiffeners shall be filled with mineral board insulation at exterior doors and honeycomb at interior doors. Provide Level 3.

2.2 CUSTOM HOLLOW METAL DOORS

Provide custom hollow metal doors where nonstandard steel doors are indicated. At the Contractor's option, custom hollow metal doors may be provided in lieu of standard steel doors. Door size(s), design(s), materials, construction, gages, and finish shall be as specified for standard steel doors and shall comply with the requirement of NAAMM HMMA HMM. Fill all spaces in doors with insulation. Close top and bottom edges with steel channels not lighter than 16 gage. Close tops of exterior doors flush with an additional channel and seal to prevent water intrusion. Prepare doors to receive hardware specified in Section 08 71 00 DOOR HARDWARE. Undercut doors where indicated. Doors shall be 1-3/4 inch thick, unless otherwise indicated.

2.3 SOUND RATED STEEL DOORS

Interior doors shall have a Sound Transmission Class (STC) of 35; exterior doors shall have an STC of 25.

2.4 ACCESSORIES

2.4.1 Louvers

2.4.1.1 Interior Louvers

SDI/DOOR 111, Louvers shall be stationary sightproof type where scheduled. Detachable moldings on room or non security side of door; on security side of door, moldings to be integral part of louver. Form louver frames of 20 gage steel and louver blades of a minimum 24 gage. Sightproof louvers to be inverted "V" blade design with minimum 55 percent net-free opening.

2.4.2 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. For interior pairs of fire rated and smoke control doors, provide stainless steel astragals complying with NFPA 80 for fire rated assemblies and NFPA 105 for smoke control assemblies.

2.4.3 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. Muntins shall interlock at intersections and shall be fitted and welded to stationary moldings.

2.5 INSULATION CORES

Insulated cores shall be of type specified, and provide an apparent U-factor of .48 in accordance with SDI/DOOR 113 and shall conform 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.

2.6 STANDARD STEEL FRAMES

SDI/DOOR A250.8, Level 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. Interior window glazing, framing, connections, and supporting structural elements at the neighborhoods and primary gathering locations shall provide a one (1) minute time of delay against blunt tool and sharp tool impacts. The standards for interior window glazing as outlined in ASTM F1233, Standard Test Method for Security Glazing Materials and Systems will be applied.

2.6.1 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.

2.6.2 Mullions and Transom Bars

Mullions and transom bars shall be closed or tubular construction and be a member with heads and jambs butt-welded thereto. Bottom of door mullions shall have adjustable floor anchors and spreader connections.

2.6.3 Stops and Beads

Form 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.

2.6.4 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.

2.6.5 Anchors

Provide anchors to secure the frame to adjoining construction. Provide

steel anchors, zinc-coated or painted with rust-inhibitive paint, not lighter than 18 gage.

2.6.5.1 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

2.6.5.2 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.

2.7 FIRE AND SMOKE DOORS AND FRAMES

NFPA 80 and NFPA 105 and this specification. The requirements of NFPA 80 and NFPA 105 shall take precedence over details indicated or specified.

2.7.1 Labels

Fire doors and frames shall bear the label of Underwriters Laboratories (UL), Factory Mutual Engineering and Research (FM), or Warnock Hersey International (WHI) attesting to the rating required. Testing shall be in accordance with NFPA 252 or UL 10C. Labels shall be metal with raised letters, and shall bear the name or file number of the door and frame manufacturer. Labels shall be permanently affixed at the factory to frames and to the hinge edge of the door. Door labels shall not be painted.

2.7.2 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.

2.7.3 Astragal on Fire and Smoke Doors

On pairs of labeled fire doors, conform to NFPA 80 and UL requirements. On smoke control doors, conform to NFPA 105.

2.8 WEATHERSTRIPPING

As specified in Section 08 71 00 DOOR HARDWARE.

2.8.1 Integral Gasket

Black synthetic rubber gasket with tabs for factory fitting into factory slotted frames, or extruded neoprene foam gasket made to fit into a continuous groove formed in the frame, may be provided in lieu of head and jamb seals specified in Section 08 71 00 DOOR HARDWARE. Insert gasket in groove after frame is finish painted. Air leakage of weatherstripped doors shall not exceed 1.25 cubic feet per minute of air per square foot of door area when tested in accordance with ASTM E283.

2.9 HARDWARE PREPARATION

Provide minimum hardware reinforcing gages as specified in SDI/DOOR A250.6. 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. Locate hardware in accordance with the requirements of SDI/DOOR A250.8, as applicable. Punch door frames, with the exception of frames that will have weatherstripping or soundproof 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.

2.10 FINISHES

2.10.1 Factory-Primed Finish

All surfaces of doors and frames shall be thoroughly cleaned, chemically treated and factory primed 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.

2.10.2 Hot-Dip Zinc-Coated and Factory-Primed Finish

Fabricate exterior doors and frames from hot dipped zinc coated steel, alloyed type, that complies with ASTM A924/A924Mand ASTM A653/A653M. The coating weight shall 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.

2.10.3 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.

2.11 FABRICATION AND WORKMANSHIP

Finished doors and frames shall be strong and rigid, neat in appearance, and free from defects, waves, scratches, cuts, dents, ridges, holes, warp, and buckle. Molded members shall be 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 shall be well formed and in true alignment. Conceal fastenings where practicable. Design frames in

exposed masonry walls or partitions to allow sufficient space between the inside back of trim and masonry to receive caulking compound.

2.11.1 Grouted Frames

For frames to be installed in exterior walls and to be filled with mortar or grout, fill the stops with strips of rigid insulation to keep the grout out of the stops and to facilitate installation of stop-applied head and jamb seals.

2.12 PROVISIONS FOR GLAZING

Materials are specified in Section 08 81 00, GLAZING.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Frames

Set frames in accordance with SDI/DOOR A250.11. Plumb, align, and brace securely until permanent anchors are set. Anchor bottoms of frames with expansion bolts or powder-actuated fasteners. Build in or secure wall anchors to adjoining construction. Where frames require ceiling struts or overhead bracing, anchor frames to the struts or bracing. Backfill frames with mortar. Coat inside of frames with corrosion-inhibiting bituminous material. For frames in exterior walls, ensure that stops are filled with rigid insulation before grout is placed.

3.1.2 Doors

Hang doors in accordance with clearances specified in SDI/DOOR A250.8. After erection and glazing, clean and adjust hardware.

3.1.3 Fire and Smoke 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 and NFPA 105.

3.2 PROTECTION

Protect doors and frames from damage. Repair damaged doors and frames prior to completion and acceptance of the project or replace with new, as directed. Wire brush rusted frames until rust is removed. Clean thoroughly. Apply an all-over coat of rust-inhibitive paint of the same type used for shop coat.

3.3 CLEANING

Upon completion, clean exposed surfaces of doors and frames thoroughly. Remove mastic smears and other unsightly marks.

-- End of Section --

SECTION 08 11 16

ALUMINUM DOORS AND FRAMES
08/08

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 2604	(2010) Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
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
ASTM E1300	(2012a; E 2012) Determining Load Resistance of Glass in Buildings
ASTM E283	(2004; R 2012) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E331	(2000; R 2009) Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM F1233	(2008; R 2013) Security Glazing Materials and Systems
ASTM F1642	(2012) 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

1.2 PERFORMANCE REQUIREMENTS

1.2.1 Structural

Exterior doors, frames and hardware shall be designed to resist equivalent static design loads in accordance with ASTM F1642. Frame deflections shall not exceed L/160 of the unsupported member lengths. Equivalent static design loads for connections of window or door frame to the surrounding walls or hardware and associated connections, and glazing stop connections shall be in accordance with ASTM F2248 and ASTM E1300. Design supporting elements and their connections based on their ultimate capacities. Provide calculations of a Professional Engineer that substantiates compliance with these requirements. Use frames that provide an equivalent level of performance. Shapes and thicknesses of framing members shall be sufficient to withstand the design wind load indicated on Drawing Number S002with a deflection of not more than 1/175 times the length of the member and a safety factor of not less than 1.65. Provide glazing beads, moldings, and trim of not less than 0.050 inch nominal thickness. Refer to and coordiante with the requirements indicated in Specification Section 08 44 00.

1.2.2 Air Infiltration

When tested in accordance with ASTM E283, air infiltration shall not exceed 0.06 cubic feet per minute per square footof fixed area at a test pressure of 6.24 pounds per square foot (50 mile per hour wind).

1.2.3 Water Penetration

When tested in accordance with ASTM E331, there shall be no water penetration at a pressure of 8 pounds per square foot of fixed area.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Doors and frames; G

Show elevations of each door type, size of doors and frames, metal gages, details of door and frame construction, methods of anchorage, glazing details, weatherstripping, provisions for and location of hardware, and details of installation. See Section 08 44 00, Subsection 1.2 SUBMITTALS SD-09 Informational Submittals for additional engineering submittal requirements.

SD-04 Samples

Finish sample

SD-05 Design Data

Structural calculations for deflection; G

SD-08 Manufacturer's Instructions

Doors and frames

Submit detail specifications and instructions for installation, adjustments, cleaning, and maintenance.

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 nonabsorptive 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, except that no coatings or lacquers shall be applied to surfaces to which caulking and glazing compounds must adhere.

1.5 QUALITY CONTROL

1.5.1 Shop Drawing Requirements

Drawings shall indicate elevations of doors and frames, 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, method and materials for weatherstripping, material and method of attaching subframes, trim, installation details, and other related items.

1.5.2 Sample Requirements

1.5.2.1 Finish Sample Requirements

Submit color samples for verification.

PART 2 PRODUCTS

2.1 DOORS AND FRAMES

Swing-type aluminum doors and frames of size, design, and location indicated. Provide doors complete with frames, framing members, subframes, transoms, adjoining sidelights, adjoining window wall, trim, and accessories. Interior window glazing, framing, connections, and supporting structural elements at the neighborhoods and primary gathering locations shall provide a one (1) minute time of delay against blunt tool and sharp tool impacts. The standards for interior window glazing as outlined in ASTM F1233, Standard Test Method for Security Glazing Materials and Systems will be applied.

2.2 MATERIALS

2.2.1 Anchors

Stainless steel or steel with hot-dipped galvanized finish.

2.2.2 Weatherstripping

Continuous wool pile, silicone treated, or type recommended by door manufacturer.

2.2.3 Aluminum Alloy for Doors and Frames

ASTM B221, Alloy 6063-T5 for extrusions. ASTM B209, alloy and temper best suited for aluminum sheets and strips.

2.2.4 Fasteners

Hard aluminum or stainless steel.

2.2.5 Structural Steel

ASTM A36/A36M.

2.2.6 Aluminum Paint

Aluminum door manufacturer's standard aluminum paint.

2.3 FABRICATION

2.3.1 Aluminum Frames

Refer to and coordinate with the requirements indicated in specification Section 08 44 00.

2.3.2 Aluminum Doors

Of type, size, and design indicated and not less than 1-3/4 inch thick. Minimum wall thickness, 0.125 inch, except beads and trim, 0.050 inch. Door sizes shown are nominal and shall 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. Bevel single-acting doors 0.063 or 0.125 inch at lock, hinge, and meeting stile edges. Double-acting doors shall have rounded edges at hinge stile, lock stile, and meeting stile edges.

2.3.2.1 Full Glazed Stile and Rail Doors

Doors shall have stiles and rails as indicated. Fabricate from extruded aluminum hollow seamless tubes or from a combination of open-shaped members interlocked or welded together. Fasten top and bottom rail together by means of welding or by 3/8 or 1/2 inch diameter cadmium-plated tensioned steel tie rods. Provide an adjustable mechanism of jack screws or other methods in the top rail to allow for minor clearance adjustments after installation.

2.3.3 Weatherstripping

Provide on stiles and rails of exterior doors. Fit into slots which are integral with doors or frames. Weatherstripping shall be replaceable without special tools, and adjustable at meeting rails of pairs of doors. Installation shall allow doors to swing freely and close positively. Air leakage of a single leaf weatherstripped door shall not exceed 1.25 cubic feet per minute of air per square foot of door area when tested in accordance with ASTM E283.

2.3.4 Anchors

On the backs of subframes, provide anchors of the sizes and shapes indicated for securing subframes to adjacent construction. Anchor transom

bars at ends and mullions at head and sill. Where required to resist the structural loading, reinforce vertical mullions with structural steel members of sufficient length to extend up to the overhead structural slab or framing and secure thereto. Reinforce and anchor freestanding door frames to floor construction as indicated on approved shop drawings and in accordance with manufacturer's recommendation. Place anchors near top and bottom of each jamb and at intermediate points not more than 25 inch apart.

2.3.5 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.

2.3.6 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. Glazing beads shall have vinyl insert glazing gaskets. Design glazing beads to receive glass of thickness indicated or specified.

2.3.7 Finishes

Provide exposed aluminum surfaces with organic coating to match finish of surrounding curtain wall.

2.3.7.1 Organic Coating

Clean and prime exposed aluminum surfaces. Provide a high-performance finish in accordance with AAMA 2604 with total dry film thickness of not less than 1.2 mils. The finish color shall match surrounding curtain wall.

PART 3 EXECUTION

3.1 INSTALLATION

Plumb, square, level, and align frames and framing members to receive doors, transoms, adjoining sidelights, and, adjoining window walls. Anchor frames to adjacent construction as indicated and in accordance with manufacturer's printed instructions. Anchor bottom of each frame to rough floor construction with 3/32 inch thick 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 entitled "Aluminum Doors," of this section. 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 a good quality elastomeric sealant between the aluminum and the dissimilar metal.

c. Paint the dissimilar metal with one coat of primer and one coat of aluminum paint.

d. Use a nonabsorptive 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 the aluminum, the Contractor shall have the option of painting the wood or other absorptive surface with two coats of aluminum paint and sealing the joints with elastomeric sealant.

3.3 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.

3.4 PROTECTION

Protect doors and frames from damage and from contamination by other materials such as cement mortar. Prior to completion and acceptance of the work, restore damaged doors and frames to original condition, or replace with new ones.

-- End of Section --

SECTION 08 14 00

WOOD DOORS
08/11

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 in the text by the basic designation only.

ARCHITECTURAL WOODWORK INSTITUTE (AWI)

AWI AWS	(2009) Architectural Woodwork Standards

ASTM INTERNATIONAL (ASTM)

ASTM E2226	(2012) Standard Practice for Application of Hose Stream
ASTM E90	(2009) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 105	(2013) Standard for Installation of Smoke Door Assemblies and Other Opening Protectives
NFPA 252	(2012) Standard Methods of Fire Tests of Door Assemblies
NFPA 80	(2013) Standard for Fire Doors and Other Opening Protectives

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	Scientific Certification Systems (SCS)Indoor Advantage

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED GBDC	(2009) LEED Reference Guide for Green Building Design and Construction
LEED NC	(2009) Leadership in Energy and Environmental Design(tm) New Construction Rating System

UL ENVIRONMENT (ULE)

ULE Greenguard	UL Greenguard Certification Program

UNDERWRITERS LABORATORIES (UL)

UL 10B	(2008; Reprint Feb 2015) Fire Tests of Door Assemblies

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

ANSI/WDMA I.S.1A	(2013) Interior Architectural Wood Flush Doors
WDMA I.S.4	(2013) Preservative Treatment for Millwork
WDMA TM-7	(2008) Cycle Slam Test Method
WDMA TM-8	(2008) Hinge Loading Test Method

1.2 SUBMITTALS

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. Drawings and data shall indicate door type and construction, sizes, thickness, methods of assembly, door louvers, and glazing.

SD-03 Product Data

Doors; G

Accessories

Water-resistant sealer

Sample warranty

Sound transmission class rating; G

Fire resistance rating; G

Certification

Local/Regional Materials; (LEED NC)

LEED documentation relative to local/regional materials credit in accordance with LEED GBDC. Include in LEED Documentation Notebook.

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 finishes; G

Submit a minimum of three color selection samples , minimum 3 by 5 inches in size representing wood finish for selection by the Contracting Officer.

SD-06 Test Reports

Submit current test reports from an independent laboratory showing that the doors have been tested and meet all UL requirements for fire-rated doors.

Cycle-slam

Hinge loading resistance

Submit cycle-slam test report for doors tested in accordance with WDMA TM-7, and hinge loading resistance test report for doors tested in accordance with WDMA TM-8.

1.3 SUSTAINABLE DESIGN CERTIFICATION/DOCUMENTATION

Product shall be third party certified in accordance with ULE Greenguard Gold, SCS Scientific Certification Systems Indoor Advantage Gold or equal. Certification shall be performed annually and shall be current.

1.4 LOCAL/REGIONAL MATERIALS

Use products extracted, harvested, or recovered, as well as manufactured, within a 500 mile radius from the project site, if available from a minimum of three sources. Refer to Section 01 33 29 LEED DOCUMENTATION for cumulative total local material requirements. Wood doors may be locally available.

1.5 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.

1.6 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 Flush Doors

Conform to ANSI/WDMA I.S.1A for flush doors. Hardwood stile edge bands of

doors receives a natural finish, compatible with face veneer. 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.

2.1.1.1 Interior Flush Doors

Provide particleboard core, Type II flush doors conforming to ANSI/WDMA I.S.1A with faces of red oak. Hardwood veneers shall match the cut and match the red oak faced acoustical panels specified for this project.

2.1.2 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.

2.1.3 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 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. Flush type moldings for flush doors.

2.2.2 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 doors scheduled for restrooms, janitor closets and other possible wet locations with a water-repellent preservative treatment and so marketed at the manufacturer's plant in accordance with WDMA I.S.4.

2.3.4 Adhesives and Bonds

ANSI/WDMA I.S.1A. Use Type I bond for exterior doors and Type II bond for interior doors. Provide a nonstaining adhesive on doors with a natural finish.

2.3.5 Prefitting

Provide factory finished and 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 Door Finishes

2.3.6.1 Factory Finish

Provide doors finished at the factory by the door manufacturer as follows: AWI AWS Section 1500, specification for System No. 4 Conversion varnish alkyd urea or System No. 5 Vinyl catalyzed. The coating is AWI AWS premium, and is to match the color, sheen and grain effect of the red oak acoustic panels specified for use on the project. 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.

2.3.7 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 "B" and "C" label fire doors utilizing standard mortise leaf hinges:

a. Cycle-slam: 200,000 cycles with no loose hinge screws or other visible signs of failure when tested in accordance with the requirements of WDMA TM-7.

b. Hinge loading resistance: Averages of ten test samples not less than 700 pounds load when tested for direct screw withdrawal in accordance with WDMA TM-8 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

Before installation, seal top and bottom edges of doors with the approved water-resistant sealer. Seal cuts made on the job immediately after cutting using approved water-resistant sealer. Fit, trim, and hang doors with a 1/16 inch minimum, 1/8 inch maximum clearance at sides and top, and a 3/16 inch minimum, 1/4 inch maximum clearance over thresholds. Provide 3/8 inch minimum, 7/16 inch maximum clearance at bottom where no threshold occurs. Bevel edges of doors at the rate of 1/8 inch in 2 inch. Door warp shall not exceed1/4 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.

-- End of Section --

SECTION 08 33 13

METAL ROLLING COUNTER DOORS
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.

ASTM INTERNATIONAL (ASTM)

ASTM A240/A240M	(2015a) Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 80	(2013) Standard for Fire Doors and Other Opening Protectives

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)

1.2 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 local/ regional materials and recycled content and LEED documentation requirements.

1.3 SUBMITTALS

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

SD-02 Shop Drawings

Detail Drawings; G

SD-03 Product Data

Warranty
Rolling Counter Doors
Installation
Cleaning

SD-10 Operation and Maintenance Data

SD-11 Closeout Submittals

LEED Documentation

Rolling Counter Door (Non-Rated)

1.4 QUALITY ASSURANCE

Submit Detail Drawings showing elevations of each door type, details of anchorage, details of construction, location and description of hardware, shape and thickness of materials, details of joints and connections, and details of guides and fittings. Include a schedule showing the location of each counter door with the drawings.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver rolling counter doors to the jobsite wrapped in a protective covering with the brands and names clearly marked thereon. Store rolling counter doors in accordance with the manufacturer's instructions in a dry location that is adequately ventilated and free from dust, water, or other contaminants, and in a manner that permits easy access for inspecting and handling. Handle doors carefully to prevent damage. Replace damaged items that cannot be restored to like-new condition.

1.6 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period. Submit no later than 30 days prior to final inspection.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Furnish rolling counter doors of the type, size, and design indicated on the drawings. Provide the standard product of a manufacturer regularly engaged in the production of rolling counter doors. Provide each door with a permanent label showing the manufacturer's name and address and the model number of the door. Submit Manufacturer's descriptive data and catalog cuts.

2.2 BASIC COMPONENTS

2.2.1 Curtain

2.2.1.1 Exterior Curtain

Fabricate the curtain of extruded aluminum slats conforming to ASTM B221, Alloy 6063. Provide thickness of slat material as required by width of opening. Use slats approximately 1-1/4 to 1-1/2 inch wide with a depth of crown of 1/2 inch. Fit alternate slats with endlocks to maintain curtain alignment. Provide bottom of curtain with tubular bar reinforcement

matching the curtain, and fitted with a resilient bottom seal.

2.2.1.2 Interior Curtain

Construction similar to exterior curtain but with perforated slats. Slat perforations shall consist of 1/16 inch diameter holes with 41 percent open area over the length of the slat.

2.2.2 Frame

Pre-assembled integral stainless steel frame units to suit wall thickness, with 16 gauge jambs and head, hood and fascia. Grooves are formed into sides of frame for retaining curtain. Provide continuous replaceable strips of wool pile weatherstripping inserted into guide track to eliminate metal-to-metal contact and to provide air and dust seal around edges of curtain.

2.2.3 Guides

Furnish guides of 1/8 inch minimum thickness extruded aluminum conforming to ASTM B221, Alloy 6063, and fitted with neoprene silencers or replaceable heavy nap striping to eliminate noise and dust infiltration.

2.2.4 Counterbalance Shaft Assembly

Furnish the curtain coiled around a steel tube of sufficient thickness and diameter to prevent deflection exceeding 0.03 inch per foot. Provide a barrel containing oil tempered helical steel torsion springs capable of sufficient torque to counterbalance the weight of the curtain. Calculate the springs to provide a minimum of 7,500 operating cycles (one complete cycle of door operation will begin with the door in the closed position, move to the full open position and return to the closed position).

2.2.5 Brackets

Furnish brackets of a minimum 12 gauge thickness steel if flat plate, or 16 gauge thickness if there are a minimum of 3 returns of 3/4 inch width.

2.2.6 Hood

Provide a hood of 24 gauge stainless steel conforming to ASTM A240/A240M, Type 304 or Type 430.

2.2.7 Locks

Lock the curtain at each side of the bottom bar by an integral slide bolt. Locate lock on the interior room side of the counter door. Provide keying conforming to Section 08 71 00 DOOR HARDWARE.

2.3 ROLLING COUNTER DOOR (NON-RATED)

Construct rolling counter doors, curtains, guides and hood components of aluminum and stainless steel as indicated, conforming to the requirements specified herein. Submit Six complete copies of Data Package 2 for Rolling Counter Doors (Non-Rated)in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA. Provide a list of the parts recommended by the manufacturer to be replaced after 1 year and 3 years of service.

2.4 FINISH

Exposed parts of the counter door, including the curtain, bottom rail, and guides shall be of uniform finish and appearance. Furnish aluminum with a clear anodized finish. Frames, hood and fascia are to be stainless steel with a No. 4 finish. Give all other steel parts a shop coat of primer paint standard with the manufacturer. Provide a factory coated color.

PART 3 EXECUTION

3.1 OPENING SIZES, TOLERANCES AND CONDITIONS

Verify that opening sizes, tolerances and conditions are acceptable.

3.2 INSTALLATION

Install doors in accordance with approved detail drawings and manufacturer's instructions. Accurately locate anchors and inserts for guides, brackets, hardware, and other accessories. Upon completion, doors shall be free from warp, twist, or distortion. Lubricate, properly adjust, and demonstrate doors to operate freely. Conform fire-door installation with NFPA 80 for the class indicated and the manufacturer's instructions.

3.3 OPERATION

3.3.1 Manual Operation (Exterior Counter Doors)

Provide curtain operated by means of manual push-up with lift handles or continuous full width lift bar.

3.3.2 Power Operation (Interior Counter Doors)

Furnish a high-starting torque, reversible type motor of sufficient power and torque output to move the door in either direction from any position at the required speed. Provide power operator with an emergency push-up operation, limit switch, three-button type control marked "OPEN", "CLOSE", and "STOP". Provide control voltage of 120 vac. Provide conduit and wiring necessary for proper operation in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

3.4 ADJUSTING

Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.

Adjust hardware and operating assemblies for smooth and noiseless operation.

3.5 CLEANING

Clean aluminum and stainless steel doors in accordance with manufacturer's approved instructions. Submit Manufacturer's preprinted installation and cleaning instructions.

-- End of Section --

SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
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.

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 1503	(2009) Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections
AAMA 501	(2005) Methods of Test for Exterior Walls
AAMA 503	(2008) Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems
AAMA 800	(2010) Voluntary Specifications and Test Methods for Sealants

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1	(2009; Errata 2010) Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

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 E1105	(2000; R 2008) 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 2008) Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure and Temperature Differences Across the Specimen
ASTM E1886	(2013a) Standard Test Method for

	Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
ASTM E283	(2004; R 2012) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E330	(2002; R 2010) Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E331	(2000; R 2009) Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM F1642	(2012) Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.10	(2011) Power Operated Pedestrian Doors

GLASS ASSOCIATION OF NORTH AMERICA (GANA)

GANA Glazing Manual	(2004) Glazing Manual

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 4-010-01	(2012) DoD Minimum Antiterrorism Standards for Buildings

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

16 CFR 1201	Safety Standard for Architectural Glazing Materials

UNDERWRITERS LABORATORIES (UL)

UL 325	(2013; Reprint May 2015) Door, Drapery, Gate, Louver, and Window Operators and Systems

1.2 ADMINISTRATIVE REQUIREMENTS

1.2.1 Pre-Installation Meetings

Conduct pre-installation meeting to verify 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:

Listing of product installations

Sample warranty

Finish and color samples

Manufacturer's catalog data

Installation drawings

Fabrication drawings for custom fabrications

Concurrently submit certified test reports showing compliance with specified performance characteristics and UL 325 for the following:

a. Air Infiltration ASTM E283

b. Wind Load (Resistance) AAMA 501

c. Deflection ASTM F1642

d. Condensation Resistance and Thermal Transmittance Performance Requirements

e. Water Infiltration ASTM E1105

f. Structural Requirements ASTM F1642

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 LEED(TM) DOCUMENTATION. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Sample Warranty; G

Listing of Product Installations; G

SD-02 Shop Drawings

Installation Drawings; G

Fabrication Drawings; G

SD-03 Product Data

Manufacturer's Catalog Data; G

SD-04 Samples

Finish and Color Samples; G

SD-05 Design Data

Design Calculations; G, FIO

SD-06 Test Reports

Certified Test Reports; G

SD-07 Certificates

Manufacturer's Product Warranty; G

Initial Certification Letter from Contractor's Delegated-Design Professional Engineer; G, FIO

SD-11 Closeout Submittals

Final Certification Letter from Contractor's Delegated-Design Professional Engineer; G, FIO

1.4 QUALITY ASSURANCE

1.4.1 Design Calculations

See specification Section 08 44 00 CURTAIN WALL AND GLAZED ASSEMBLIES for requirements. Entrances and storefronts both installed within curtain wall and as fixed windows are to be designed under direct supervision of the manufacturer employed Professional Engineer. Provide the same documentation for the entrance and storefront design as required for the curtain wall design including: Calculations and certification letters.

1.4.2 Initial Certification Letter from Contractor's Delegated-Design 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. Initial 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 Curtain Wall.
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 Curtain Wall have been performed in accordance with the Professional Engineer's design.

1.4.3 Final Certification Letter from Contractor's Delegated-Design Professional Engineer

After construction of the Curtain Wall is complete, submit a signed and sealed Certification Letter from the responsible design professional stating that the fabrication and installation of the Curtain Wall have been performed in accordance with the Professional Engineer's design. Final Certification Letter shall be submitted for record only.

1.4.4 Qualifications

1.4.4.1 Installer Qualifications

See specification Section 08 44 00 CURTAIN WALL AND GLAZED ASSEMBLIES for requirements.

1.4.4.2 Manufacturer Qualifications

See specification Section 08 44 00 CURTAIN WALL AND GLAZED ASSEMBLIES for requirements.

1.4.5 Single Source Responsibility

When aluminum entrances are part of a building enclosure system, including storefront framing, windows, curtain wall system and related products, provide building enclosure system products from a single source manufacturer.

Provide design, structural engineering, and custom fabrication for door portal system and supply of all components, materials, and products based on a single manufacturer of sole responsibility. Provision of products from numerous sources for site assembly without complete single source design and supply responsibility is not acceptable. Work items and components to be fabricated or supplied by single source are:

a. Door and frame assemblies to be installed in door portal as specified in this section.

b. Glazed exterior wall to be constructed around door portal as specified in Section 08 44 00 CURTAIN WALL AND GLAZED ASSEMBLIES.

c. Fixed window units specified in this Section.

d. Door operating hardware to be installed on or within door portal as specified in Section 08 71 00 DOOR HARDWARE.

e. Glass as specified in Section 08 81 00 GLAZING.

f. Operable windows as specified in Section 08 44 00 CURTAIN WALL AND GLAZED ASSEMBLIES

1.4.6 Testing Requirements

See specification Section 08 44 00 CURTAIN WALL AND GLAZED ASSEMBLIES for requirements. Perform tests indicated in Section 08 44 00 that are appropriate to entrances and storefronts. As with the curtain wall requirements, tests need not be performed if the entrance and storefront system or component has been previously tested as required in Section 08 44 00.

1.5 DELIVERY, STORAGE, AND HANDLING

1.5.1 Ordering

Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

1.5.2 Packing, Shipping, Handling and Unloading

Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

1.5.3 Storage and Protection

Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities, and other hazards before, during and after storefront installation.

1.6 PROJECT / SITE CONDITIONS

1.6.1 Field Measurements

Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

1.7 WARRANTY

See Section 08 44 00 CURTAIN WALL AND GLAZED ASSEMBLIES. Provide the same warranties and warranty periods required for the curtain wall system and components.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

This Specification includes aluminum entrances and components.

Type of Aluminum Entrance includes:

Impact Resistance Entrances; medium stile, 3-1/2 inch vertical face dimension, 1-3/4 inch depth, interior structural silicone glazed, high traffic/impact resistant applications.

2.1.1 Design Requirements for Aluminum (Entrances and Components)

Design, size components, and install door portal system to withstand these loads without breakage, loss, failure of seals, product deterioration, and other defects, AAMA 503.

a. Design Loads: Design loads, including gravity, wind, seismic and blast shall be as indicated on Drawings S001 to S003.

b. Effects of applicable loads acting inward and outward normal to plane of wall.

d. Thermal Loads And Movement:

(1) Ambient Temperature Range: 120 degrees F.

(2) Material Surfaces Range: 180 degrees F.

e. Provide and install weatherstripping, exterior gaskets, sealants, and other accessories to resist water and air penetration.

f. Impact Protective Systems ASTM E1886.

g. Antiterrorism performance required by UFC 4-010-01. See drawings for additional requirements.

2.1.1.1 Material Standard

ASTM B221 ASTM B221M; 6063-T5 alloy and tempered.

Provide door stile and rail face dimensions of the entrance doors as follows:

Vertical Stile	Top Rail	Bottom Rail
5-1/2 inches	5-1/2 inches	10 inches

Provide major portions of the door members at.125 inches nominal in thickness and glazing molding to be .050 inches thick.

2.1.1.2 Tolerances

Reference to 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.

Provide either EPDM elastomeric extrusions or thermoplastic elastomer glazing gaskets. Structural silicone sealant is required.

2.1.2 Performance Requirements

2.1.2.1 Air Infiltration

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; maximum infiltration for a pair of 7 foot - 0 inch by 8 foot - 0 inch entrance doors and frame is 1.2 cfm/ft2.

b. Maximum allowable infiltration, for a completed storefront system is not to exceed 0.06 cfm/square foot when tested in accordance with ASTM E1424 at differential static pressure of 6.24 psf.

2.1.2.2 Deflection

Submit certified test reports showing compliance with specified performance characteristics as follows:

The maximum allowable deflection in any member when tested in accordance with ASTM E330 with allowable stress in accordance with AA Specifications for Aluminum Structures is L/175 or 3/4 inches maximum.

2.1.2.3 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 AAMA 1503 procedure and on the configuration specified therein.

(2) Thermal Transmittance ("U" Value) maximum 0.57 BTU/hr/sf/deg F at 15 mph exterior wind.

b. CRF Class Requirements:

(1) Perform test in accordance with AAMA 1503.

(2) Condensation Resistance Factor Requirements (CRF) minimum 62 for the frame and 68 for the glass when tested in accordance with AAMA 1503.

2.1.2.4 Water Infiltration

Submit certified test reports showing compliance with specified performance characteristics as follows:

System is designed to provide no uncontrolled water when tested in accordance with ASTM E331 at a static pressure of 8 psf.

2.2 FABRICATION

2.2.1 Entrance System Fabrication

Provide door corner construction consisting of mechanical clip fastening, SIGMA deep penetration plug welds and 1-1/8 inch long fillet welds inside and outside of all four corners. Provide hook-in type exterior glazing stop with EPDM glazing gaskets reinforced with non-stretchable cord. Provide interior glazing stop mechanically fastened to the door member incorporating a silicone compatible spacer used with silicone sealant.

Accurately fit and secure joints and corners. Make joints hairline in appearance. Prepare components with internal reinforcement for door hardware. Arrange fasteners and attachments to conceal from view.

2.2.2 Shop Assembly

Fabricate and assemble units with joints only at intersection of aluminum members with hairline joints; rigidly secure, and sealed in accordance with manufacturer's recommendations.

2.2.2.1 Welding

Conceal welds on aluminum members in accordance with AWS recommendations or methods recommended by manufacturer. Members showing welding bloom or

discoloration on finish or material distortion will be rejected.

2.2.3 Fabrication Tolerance

Fabricate and assemble units with joints only at intersection of aluminum members with hairline joints; rigidly secure, and sealed in accordance with manufacturer's recommendations.

Fabricate aluminum entrances in accordance with entrance manufacturer's prescribed tolerances.

2.2.3.1 Material Cuts

Square to 1/32 inch off square, over largest dimension; proportionate amount of 1/32 inch on the two dimensions.

2.2.3.2 Maximum Offset At Consecutive Members

1/64 inch in alignment between two consecutive members in line, end to end.

2.2.3.3 Maximum Offset At Glazing Pocket Corners

1/64 inch between framing members at glazing pocket corners.

2.2.3.4 Joints

(Between adjacent members in same assembly: Hairline and square to adjacent member.

2.2.3.5 Variation

In squaring diagonals for doors and fabricated assemblies: 1/16 inch.

2.2.3.6 Flatness

For doors and fabricated assemblies: plus/minus 1/16 inch of neutral plane.

2.2.3.7 Finishes

Provide exposed aluminum with organic coating to match finish of surrounding curtain wall.

2.2.4 Aluminum Doors

Of type, size, and design indicated and not less than 1-3/4 inch thick. Minimum wall thickness, 0.125 inch, except beads and trim, 0.050 inch. Door sizes shown are nominal and shall 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. Bevel single-acting doors 0.063 or 0.125 inch at lock, hinge, and meeting stile edges. Double-acting doors shall have rounded edges at hinge stile, lock stile, and meeting stile edges.

2.2.4.1 Full Glazed Stile and Rail Doors

Doors shall have stiles and rails as indicated. Fabricate from extruded aluminum hollow seamless tubes or from a combination of open-shaped members interlocked or welded together. Fasten top and bottom rail together by

means of welding or by 3/8 or 1/2 inch diameter cadmium-plated tensioned steel tie rods. Provide an adjustable mechanism of jack screws or other methods in the top rail to allow for minor clearance adjustments after installation.

2.3 ACCESSORIES

2.3.1 Fasteners

Provide stainless steel where exposed.

2.3.2 Perimeter Anchors

When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

2.3.3 Standard Entrance Hardware

2.3.3.1 Weatherstripping

Equip meeting stiles on pairs of doors with an adjustable astragal utilizing wool pile with polymeric fin.

Provide door weatherstripping on a single acting offset pivot or butt hung door and frame (single or pairs) comprised of a thermoplastic elastomer weatherstripping on a tubular shape with a semi-rigid polymeric backing.

Provide Sill Sweep Strips: 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.)

2.3.3.2 Other Hardware

See Section 08 71 00 DOOR HARDWARE for additional hardware required.

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.

2.4 RELATED MATERIALS

2.4.1 Sealants

Refer to Section 07 92 00 JOINT SEALANTS. Ensure all sealants conform to AAMA 800.

2.4.2 Glass

Refer to Section 08 81 00 GLAZING.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Site Verification of Conditions

Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions.

Verify openings are sized to receive storefront system and sill plate is level in accordance with manufacturer's acceptable tolerances.

3.2 INSTALLATION

Install entrance system in accordance with manufacturer's instructions and AAMA storefront and entrance guide specifications manual. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities. Provide alignment attachments and shims to permanently fasten system to building structure. Align assembly plumb and level, free of warp and twist. Maintain assembly dimensional tolerances aligning with adjacent work.

Set thresholds in bed of mastic and secure. Protect aluminum members in contact with masonry, steel, concrete, or dissimilar materials using nylatron pads or bituminous coating. Shim and brace aluminum system before anchoring to structure. Verify weep holes are open, and metal joints are sealed in accordance with manufacturer's installation instructions. Seal metal to metal joints using sealant recommended by system manufacturer.

3.2.1 Preparation

Field verify dimensions prior to fabricating components.

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 erection of door portal with installation of surrounding glass wall and door assemblies. Ensure adequate provision is made for support and anchorage of assembly components.

Coordinate electrical requirements for automatic door assemblies electrified door hardware to ensure proper power source, conduit, wiring, and boxes.

3.2.1.1 Adjacent Surfaces Protection

Protect adjacent work areas and finish surfaces from damage during product installation.

3.2.1.2 Aluminum Surface Protection

Protect aluminum surfaces from contact with lime, mortar, cement, acids, and other harmful contaminants.

3.2.2 Adjusting

Adjust operating hardware for smooth operation, and as recommended by the

manufacturer.

3.2.3 Related Products Installation Requirements

3.2.3.1 Sealants (Perimeter)

Refer to Section 07 92 00 JOINT SEALANTS.

3.2.3.2 Glass

Refer to Section 08 81 00 GLAZING.

3.2.3.3 Reference

ANSI Z97.1, 16 CFR 1201 and GANA Glazing Manual.

3.3 PROTECTION AND CLEANING

3.3.1 Protection

Protect installed product's finish surfaces from damage during construction. Protect aluminum storefront system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.

3.3.2 Cleaning

Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

3.4 WARRANTY

Warranty is to conform with and be included with the warranty required in Section 08 44 00 CURTAIN WALL AND GLAZED ASSEMBLIES.

-- End of Section --

SECTION 08 44 00

CURTAIN WALL AND GLAZED ASSEMBLIES
08/11

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.

ALUMINUM ASSOCIATION (AA)

AA ADM	(2015) Aluminum Design Manual
AA ASD1	(2009) Aluminum Standards and Data

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 2604	(2010) Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels
AAMA 2605	(2011) Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels
AAMA 501.1	(2005) Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure
AAMA 609 & 610	(2009) Cleaning and Maintenance Guide for Architecturally Finished Aluminum
AAMA 800	(2010) Voluntary Specifications and Test Methods for Sealants
AAMA CW-10	(2004) Care and Handling of Architectural Aluminum from Shop to Site
AAMA MCWM-1	(1989) Metal Curtain Wall Manual
AAMA/WDMA/CSA 101/I.S.2/A440	(2011; Update 1 2014) North American Fenestration Standard/Specification for Windows, Doors, and Skylights

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4	(1995; R 2004) Basic Hardboard

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISC/AISI 121	(2004) Standard Definitions for Use in the Design of Steel Structures

AISI SG03-3	(2002; Suppl 2001-2004; R 2008) Cold-Formed Steel Design Manual Set

AMERICAN WELDING SOCIETY (AWS)

AWS A5.1/A5.1M	(2012) Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding
AWS A5.10/A5.10M	(2012) Welding Consumables - Wire Electrodes, Wires and Rods for Welding of Aluminum and Aluminum-Alloys - Classification
AWS D1.1/D1.1M	(2010; Errata 2011) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A1008/A1008M	(2015) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened
ASTM A1011/A1011M	(2014) Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability and Ultra-High Strength
ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2009) 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 A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A424/A424M	(2009a) Standard Specification for Steel Sheet for Porcelain Enameling
ASTM A501	(2007) Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
ASTM A572/A572M	(2015) Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A653/A653M	(2013) Standard Specification for Steel

	Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B108/B108M	(2012; E 2012) Standard Specification for Aluminum-Alloy Permanent Mold Castings
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B211	(2012) Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM B26/B26M	(2012) Standard Specification for Aluminum-Alloy Sand Castings
ASTM B316/B316M	(2010) Standard Specification for Aluminum and Aluminum-Alloy Rivet and Cold-Heading Wire and Rods
ASTM B85/B85M	(2013) Standard Specification for Aluminum-Alloy Die Castings
ASTM C1048	(2012; E 2012) Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass
ASTM C1363	(2011) Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
ASTM C481	(1999; R 2011) Standard Test Method Laboratory Aging of Sandwich Constructions
ASTM C591	(2013) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C612	(2014) Mineral Fiber Block and Board Thermal Insulation
ASTM C665	(2012) Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
ASTM C864	(2005; R 2011) Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers
ASTM C920	(2014a) Standard Specification for Elastomeric Joint Sealants
ASTM D1037	(2012) Evaluating Properties of Wood-Base Fiber and Particle Panel Materials

ASTM D1730	(2009) Standard Practices for Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting
ASTM D2244	(2015) Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D3656/D3656M	(2013) Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns
ASTM D4214	(2007) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
ASTM E119	(2014) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E136	(2012) Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C
ASTM E1425	(2014) Standard Practice for Determining the Acoustical Performance of Windows, Doors, Skylight, and Glazed Wall Systems
ASTM E283	(2004; R 2012) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E330	(2002; R 2010) Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E331	(2000; R 2009) Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E34	(2011) Chemical Analysis of Aluminum and Aluminum-Base Alloys
ASTM E546	(2008) Frost Point of Sealed Insulating Glass Units
ASTM E576	(2008) Frost Point of Sealed Insulating Glass Units in the Vertical Position
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E90	(2009) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

ASTM F2912	(2011) Standard Specification for Glazing and Glazing Systems Subject to Airblast Loadings

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM AMP 500	(2006) Metal Finishes Manual

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC 7/NACE No.4	(2007; E 2004) Brush-Off Blast Cleaning
SSPC SP 1	(2015) Solvent Cleaning
SSPC SP 3	(1982; E 2004) Power Tool Cleaning

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 4-010-01	(2012) DoD Minimum Antiterrorism Standards for Buildings

UNDERWRITERS LABORATORIES (UL)

UL 325	(2013; Reprint May 2015) Door, Drapery, Gate, Louver, and Window Operators and Systems

1.2 ADMINISTRATIVE REQUIREMENTS

1.2.1 Pre-Installation Meetings

Conduct pre-installation meeting to verify 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:

Listing of product installations

Sample warranty

Finish and color samples

Manufacturer's catalog data

Installation drawings

Fabrication drawings for custom fabrications

Concurrently submit certified test reports showing compliance with specified performance characteristics and UL 325 for the following:

a. Air Infiltration ASTM E283

b. Deflection ASTM E330

c. Condensation Resistance and Thermal Transmittance Performance Requirements

d. Water Infiltration ASTM E331

e. Structural Requirements ASTM E330

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Sample Warranty; G

Listing of Product Installations; G

Finish and color samples

Manufacturer's catalog data

Finish and color samples

SD-02 Shop Drawings

Glazed curtain wall system; G

Submit for curtain wall system and accessories. Drawings shall indicate in detail all system parts including elevations, full-size sections, framing, jointing, panels, types and thickness of metal, flashing and coping details, field connections, weep and drainage system, finishes, sealing methods, glazing, glass sizes and details, firestopping insulation materials, and erection details.

Installation Drawings; G

Shop-Painting Aluminum

Shop-Painting Steel

SD-03 Product Data

Glazed curtain wall system; G

Include descriptive literature, detailed specifications, and available performance test data.

Preventive Maintenance and Inspection

Metals For Fabrication

Nonskinning Sealing Compound

Metal Accessories

Curtain-wall Framing Members; G

Aluminum Doors and Frames; G

Curtain Wall Frame; G

Panels; G

Sealants and Caulkings; G

Curtain-Wall Installation Materials

Masonry Anchorage Devices

Thermal Insulation Materials

Sample warranties

SD-05 Design Data

Design Calculations; G, FIO

Finish; G

Exposed-to-View Aluminum Finish; G

SD-07 Certificates

Initial Certification Letter from Contractor's Delegated-Design Professional Engineer; G, FIO

SD-08 Manufacturer's Instructions

Glazed curtain wall system

Insulating glass

SD-11 Closeout Submittals

WARRANTY

Final Certification Letter from Contractor's Delegated-Design Professional Engineer; G, FIO

1.4 REQUIREMENT FOR DESIGN DATA

Submit structural and thermal calculations for complete wall assembly.

1.5 QUALITY ASSURANCE

1.5.1 Design Calculations

Design Curtain Wall 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.

1.5.2 Initial Certification Letter from Contractor's Delegated-Design 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. Initial 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 Curtain Wall.
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 Curtain Wall have been performed in accordance with the Professional Engineer's design.

1.5.3 Final Certification Letter from Contractor's Delegated-Design Professional Engineer

After construction of the Curtain Wall is complete, submit a signed and sealed Certification Letter from the responsible design professional stating that the fabrication and installation of the Curtain Wall have been performed in accordance with the Professional Engineer's design. Final Certification Letter shall be submitted for record only.

1.5.4 Qualifications

1.5.4.1 Installer Qualifications

Provide documentation of installer experience to perform work of this section, who has specialized in the installation of work similar to that required for this project, and who is acceptable to product manufacturer. Provide the name of the curtain wall manufacturer, qualifications of personnel, years of concurrent contracting experience and other information required by the Contracting Officer.

1.5.4.2 Manufacturer Qualifications

Manufacturers are acceptable providing they meet the requirements specified

in this section and project drawings.

Ensure manufacturer is capable of providing field service representation during construction, approving acceptable installer, approving application method and providing the necessary engineering services.

1.5.4.3 Single Source Responsibility

Provide curtain wall, storefront framing, windows, aluminum doors and frames and related products from a single source manufacturer.

Provide design, structural engineering, and custom fabrication for curtain wall and related systems and supply of all components, materials, and products based on a single manufacturer of sole responsibility. Provision of products from numerous sources for site assembly without complete single source design and supply responsibility is not acceptable. Work items and components to be fabricated or supplied by a single source are:

a. Door assemblies to be installed in door portal of curtain wall system as specified in Section 08 11 16 ALUMINUM DOORS AND FRAMES.

b. Glazed exterior wall to be constructed around door portal as specified in this section.

c. Windows within exterior curtain wall as specified in this section.

d. Door operating hardware to be installed on or within door portal as specified in Section 08 71 00 DOOR HARDWARE.

e. Glass specified in Section 08 81 00 GLAZING.

1.5.5 Testing Requirements

The components listed below shall be tested in accordance with the requirements below, and meet performance requirements specified.

a. Joint and Glazing Sealants: Perform tests as required by applicable publications referenced.

b. Preformed Compression Gaskets and Seals: ASTM C864.

c. Spandrel Glass: Fallout resistance test, ASTM C1048.

d. Insulating Glass: ASTM E546 or ASTM E576 at 0 degrees F, no frost or dew point.

1.5.6 Factory Tests

Perform the tests except that where a curtain wall system or component of similar type, size, and design as specified for this project has been previously tested, demonstrating compliance with requirements specified under the conditions specified herein, the resulting test reports may be submitted in lieu of testing the components.

1.5.6.1 Deflection and Structural Tests

No curtain wall framing member shall deflect, in a direction normal to the plane of the wall, more than 1/175 of its clear span or 3/4 inch, whichever is less, when tested in accordance with ASTM E330, except that when a

plastered surface will be affected the deflection shall not exceed 1/360 of the span. No framing member shall have a permanent deformation in excess of 0.2 percent of its clear span when tested in accordance with ASTM E330 for a minimum test period of 10 seconds at 1.5 times the design wind pressures specified.

1.5.6.2 Water Penetration Test

No water penetration shall occur when the wall is tested in accordance with ASTM E331 at a differential static test pressure of 20 percent of the inward acting design wind pressure as specified, but not less than 4 psf. Make provision in the wall construction for adequate drainage to the outside of water leakage or condensation that occurs within the outer face of the wall. Leave drainage and weep openings in members and wall open during test.

1.5.6.3 Air Infiltration Test

Air infiltration through the wall, when tested in accordance with ASTM E283, shall not exceed 0.06 cfm per square foot of fixed wall area, plus the permissible allowance specified for operable windows within the test area.

1.5.6.4 Delamination Test

Adhesively bonded metal-faced panels shall show no evidence of delamination, warpage or other deterioration or damage when subjected to the six "Accelerated Aging Cycles" specified in ASTM D1037.

1.5.6.5 Thermal Conductance Tests

The thermal transmittance of opaque panels shall not exceed specified U-value, when tested in accordance with ASTM C1363. The average calculated thermal transmittance of the complete wall assembly including panels, windows, and all other components shall not exceed a U-value of 0.34. Determine U-values of components in accordance with ASTM C1363.

1.5.6.6 Window Tests

Provide windows that meet the same requirements for deflection and structural adequacy as specified for framing members when tested in accordance with ASTM E330, except permanent deformation shall not exceed 0.4 percent; there shall be no glass breakage, and no permanent damage to fasteners, anchors, hardware, or operating devices. Provide windows that have no water penetration when tested in accordance with ASTM E331.

1.5.6.7 Fire Resistance Tests

Insulation provided in the curtain wall system field applied in conjunction with the curtain wall system shall have a flame spread rating not exceeding 75 and a smoke developed rating not exceeding 150 when tested in accordance with ASTM E84, except as specified otherwise herein.

a. Insulation: Insulation contained entirely within panel assemblies which meets the flame spread and smoke developed ratings of 75 and 150 respectively isolated from the building interior by masonry walls, masonry cavity walls, or encased in masonry cores is not required to comply with the flame spread and smoke developed ratings specified.

b. Curtain Wall Systems: Material for firestopping the opening between

the edge of the floor slab and back of the curtain wall system, shall have not less than the flame spread and smoke developed ratings specified for insulation which is neither isolated from the building interior nor encased in masonry cores.

c. Firestopping Materials and Devices: Firestopping material and attachment devices shall be an effective barrier against the spread of fire, smoke, and gases for a period of 2 hours when exposed to the conditions of the standard ASTM E119time-temperature curve for a period equivalent to the fire rating of the floor system and shall also be rated noncombustible when tested in accordance with ASTM E136.

1.5.6.8 Sound Transmission Class

Sound transmission class (STC) of the wall shall be a minimum of 31 db, when tested in accordance with ASTM E90 and ASTM E1425.

1.6 GLAZED CURTAIN WALL SYSTEM REQUIREMENTS

Provide system complete with framing, mullions, trim, framed pre-assembled units, panels, windows, glass, glazing, sealants, insulation, fasteners, anchors, accessories, concealed auxiliary members, and attachment devices for securing the wall to the structure as specified or indicated.

1.6.1 Design

Unit system with mullions, panels, window units, screens, framed pre-assembled units with integral and nonintegral spandrel panels. Fully coordinate system accessories directly incorporated, and adjacent to contiguous related work and insure materials compatibility, deflection limitations, thermal movements, and clearances and tolerances as indicated or specified.

1.6.2 Performance Requirements

1.6.2.1 Structural Performance

Design curtain-wall system, including framing members, windows, doors and frames, metal accessories, panels, and glazing to withstand the specified design loads. Loads acting normal to the plane of the curtain wall shall act either inward or outward.

Deflection of any metal framing member in a direction normal to the plane of the curtain wall, when subjected to the test of structural performance, using the specified windload in accordance with AAMA/WDMA/CSA 101/I.S.2/A440, shall not exceed 1/175 of the clear span of the member or 3/4 inch, whichever value is less.

1.6.2.2 Allowable Design Stresses

Aluminum-alloy framing member allowable design stresses shall be in accordance with the requirements of AA ADM pertaining to building type structures made of the specified aluminum alloy.

Hot-rolled structural-steel member allowable design stresses and design rules shall be in accordance with the requirements of AISC/AISI 121 pertaining to the specified structural steel.

Cold-formed light-gage steel structural member allowable design stresses

and design rules shall be in accordance with the requirements of AISI SG03-3 SG570 pertaining to structural members formed from the specified structural-steel sheet or strip.

1.6.2.3 Design Loads

Design loads, including gravity wind, seismic, and blast shall be as indicated on Drawings S001 to S003.

1.6.2.4 Minimum Antiterrorism Performance

Curtain wall shall meet the minimum antiterrorism performance required by UFC 4-010-01 and as indicated on Drawing G005 - AT/FP Compliance. Conformance to the performance requirements shall be validated by computational design analysis using dynamic analysis or through testing, in accordance with ASTM F2912 using project specific charge weight and standoff distances. Static design is not permitted.

1.6.2.5 Deflection

No member shall deflect in a direction parallel to the plane of the wall, when carrying its full design load, more than an amount which will reduce the edge cover or glass bite below 75 percent of the design dimension. No member after deflection under full design load, shall have a clearance between itself and the top of the panel, glass, sash, or other part immediately below it less than 1/8 inch; the clearance between the member and an operable window or door shall be minimum 1/16 inch.

1.6.3 Thermal Movement

Fabricate, assemble, and erect system with adequate allowances for expansion and contraction of components and fastenings to prevent buckling damage, joint seal failure, glass breakage, undue stress on fastenings or other detrimental effects. For design purposes, base provisions for thermal movement on assumed ambient temperature range of from 0 degrees F to 120 degrees F, without causing buckling, opening of joints, overstressing of fasteners or other harmful effects.

1.6.4 Tolerances

Design and erect wall system to accommodate tolerances in building frame and other contiguous work as indicated or specified. Provide with the following tolerances:

a. Maximum variation from plane or location shown on approved shop drawings: 1/8 inch per 12 feet of length up to not more than 1/2 inch in any total length.

b. Maximum offset from true alignment between two identical members abutting end to end in line: 1/16 inch.

1.7 QUALIFICATION OF WELDERS

Welding shall be performed by certified welders qualified in accordance with AWS D1.1/D1.1M using procedures, materials, and equipment of the type required for the work.

1.8 DELIVERY AND STORAGE

Inspect materials delivered to the site for damage; unload and store with a minimum of handling in accordance with recommendations contained in AAMA CW-10. Storage spaces shall be dry locations with adequate ventilation, free from heavy dust, not subject to combustion products or sources of water, and shall permit easy access for inspection and handling. Deliver caulking and sealing compounds to the job site in sealed containers labeled to show the designated name, formula or specifications number; lot number; color; date of manufacturer; shelf life; and curing time when applicable.

1.8.1 Protective Covering

Prior to shipment from the factory, place knocked-down lineal members in cardboard containers and cover finished surfaces of aluminum with protective covering of adhesive paper, waterproof tape, or strippable plastic. Covering shall not chip, peel, or flake due to temperature or weather, shall protect against discoloration and surface damage from transportation, and storage, and shall be resistant to alkaline mortar and plaster. Do not cover aluminum surfaces that will be in contact with sealants after installation.

1.8.2 Identification

Prior to delivery, mark wall components to correspond with shop and erection drawings placement location and erection.

1.9 WARRANTY

Guarantee insulating glass units not to develop material obstruction of vision as a result of dust or film formation on the inner glass surface caused by failure of the seal, other than through glass breakage, within a period of 10 years from date of acceptance of work by the Government. Replace units failing to comply with the terms of this guarantee with new units without additional cost to the Government. The Contractor shall require the manufacturer to execute their warranties in writing directly to the Government.

1.9.1 Sample Warranties

Provide curtain wall and glazing assemblies material and workmanship warranties meeting specified requirements. Provide revision or amendment to standard membrane manufacturer warranty to comply with the specified requirements.

a. Project Warranty: Refer to Section 01 11 00 SUMMARY OF WORK and Section 01 33 00 SUBMITTAL PROCEDURES for project warranty provisions.

b. Manufacturer's Warranty: Submit, for Owner's acceptance, Manufacturer's standard warranty document executed by authorized company official manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under the Contract Documents.

c. Assembly Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of the curtain-wall systems that do not comply with requirements or that deteriorate as defined in this Section within specified warranty period.

d. Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.

   Repair damaged areas of paint if fading occurs in excess of 5 units (Hunter Color Difference) as per ASTM D2244, or chalking occurs in excess of a numerical rating of 8 as per ASTM D4214 or color change occurs in excess of 10 units as per ASTM D2244.

e. Beneficiary: Issue warranty in the legal name of the project Owner.

f. Warranty Period: 10 years commencing on Date of Substantial Completion, covering complete curtain wall system for failure to meet specified requirements.

g. Warranty Acceptance: Owner is sole authority who will determine acceptability of manufacturer's warranty documents.

h. Replace window internal barrier which exhibits failure within minimum warranty period.

i. Failures include, but are not limited to, the following:

   1. Structural failures including, but not limited to, excessive deflection.

   2. Noise or vibration caused by thermal movements.

   3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

   4. Water leakage through fixed glazing and framing areas.

   5. Failure of operating components.

1.10 INTERPRETATION OF AWS CODE

AWS code, when referred to herein, shall mean AWS D1.1/D1.1M, "Structural Welding Code - Steel" with the following modification:

Revise AWS code Section 1, "General Provisions," Paragraph 1.1 as follows: References to the need for approval shall mean "Approval by the Contracting Officer" and references to the "Building Commissioner" shall mean the "Contracting Officer."

1.11 DRAWINGS

Installation Drawings shall include the following information for curtain wall assemblies.

Curtain-wall locations in building, layout and elevations, dimensions, shapes and sizes of members, thickness of metals, types and locations of shop and field connections, details of anchorage to building construction, glazing provisions, and other pertinent construction and erection details.

Location and details of anchorage devices that are to be cast-in-place in concrete and masonry construction.

Panel dimensions, thicknesses and kinds of materials, edge details, details of installation in curtain-wall framing, and other pertinent construction and erection details.

1.12 MANUFACTURER'S INFORMATION

Provide manufacturer's catalog data in combination with product data for integrated aluminum entrances and storefront.

Preventive Maintenance and Inspection shall consist of the aluminum manufacturer's recommended cleaning materials and application methods, including detrimental effects to the aluminum finish when improperly applied.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Aluminum

Shall be free from defects impairing strength or durability of surface finish. Provide standard alloys shall conform to standards and designations of AA ASD1. Special alloys, not covered by the following ASTM specifications, shall conform to standards and designations recommended by the manufacturer for the purpose intended.

2.1.1.1 Wrought Aluminum Alloys

Shall be those which include aluminum alloying elements not exceeding the following maximum limits when tested and additional in accordance with ASTM E34. These limits apply to both bare products and the core of clad products. The cladding of clad products shall be within the same limits except that the maximum zinc limit may be 2.5 percent in order to assure that the cladding is anodic to the core. Special wrought alloys with a silicon content not more than 7.0 percent will be acceptable for limited structural uses where special appearance is required:

ALLOY	PERCENT
Silicon	1.5
Magnesium, Manganese, and Chromium combined	6.0
Iron	1.0
Copper	0.4
Zinc	1.0

Within the chemical composition limits set forth above, wrought aluminum alloys shall conform to the following:

a. Extruded bars, rods, shapes and tubes: ASTM B221.

b. Sheet and Plate: ASTM B209.

2.1.1.2 Cast Aluminum Alloys

Provide those in which the alloying elements are silicon, magnesium, manganese, or a combination of these. Other elements shall not exceed the following limits:

ALLOY	PERCENT
Iron	1.2
Copper	0.4
Nickel	0.4
Titanium	0.2
Others (total)	0.5

Within the chemical composition limits set forth above, cast aluminum alloys shall conform to the following:

a. Sand castings: ASTM B26/B26M.

b. Die casting: ASTM B85/B85M.

c. Permanent mold castings: ASTM B108/B108M.

2.1.1.3 Welding Rods and Electrodes

Provide welding rods and bare electrodes shall conform to AWS A5.10/A5.10M as recommended by the manufacturer of the aluminum base metal alloy being used.

2.1.1.4 Finish - Organic Coating

Clean and prime exposed aluminum surfaces. Provide a high performance finish in accordance with AAMA 2604 with total dry film thickness of not less than 1.2 mils. The finish color shall match the architect's sample.

2.1.1.5 Strength

Aluminum extrusions for framing members used in curtain walls and main frame and sash or ventilator members in windows shall have a minimum ultimate tensile strength of 22,000 psi and a minimum yield strength of 16,000 psi.

2.1.2 Carbon Steel

Conform to the following specifications:

a. Rolled shapes, plates, and bars: ASTM A36/A36M.

b. Galvanized sheets: ASTM A653/A653M.

c. Sheets for porcelain enameling: ASTM A424/A424M.

d. Other sheets: ASTM A1011/A1011M or ASTM A1008/A1008M.

2.1.3 Stainless Steel

Conform to ASTM A167, Type 316, and finish in accordance with the NAAMM AMP 500 conform to Metal Finishes Manual as follows:

a. Concealed flashings: Dead soft fully annealed, 2 D finish.

b. Exposed work: No. 4 finish to match approved sample.

2.1.4 High-Strength, Low-Alloy Steel

Conform to ASTM A572/A572M for structural shapes, plates, and bars.

2.1.5 Metal Fasteners

Provide fasteners as specified in paragraph entitled "Fastener Metals for Joining Various Metal Combinations" in "Part 2 - Products" of the AAMA MCWM-1. Use metals for fasteners shall be chemically and galvanically compatible with contiguous materials.

2.1.6 Joint Sealants and Accessories

Provide manufacturer's standard colors as closely matching the adjacent surfaces as possible.

2.1.6.1 Elastomeric, Single or Multiple Component

ASTM C920, Type S, single component or Type M, multiple component. Use Grade NS, nonsag type in joints on vertical surfaces and use Grade P, self-leveling or flow type, in joints on horizontal surfaces.

2.1.6.2 Single Component Silicone Rubber Base

ASTM C920, Type S, Grade NS (Silicone).

2.1.6.3 Solvents and Primers

Provide material which is quick drying, colorless, nonstaining, compatible with compound used, as recommended by sealant manufacturer. Where primer is specified or recommended by sealant manufacturer, tests related to that material shall include primer.

2.1.6.4 Backing Material

Provide material which is nonstaining, nonabsorbent, and compatible with sealing compound. Closed cell resilient urethane, polyvinylchloride or polyethylene foam; closed-cell sponge of vinyl or rubber; closed cell neoprene or butyl rod; or polychloroprene tubes or beads.

2.1.6.5 Bond Preventive Materials

Provide polyethylene tape with pressure-sensitive adhesive; aluminum foil or waxed paper.

2.1.6.6 Preformed Sealing Compound

Provide nonskinning type conforming to AAMA 800. Tapes, beads, ribbons or

other shapes as required.

2.1.7 Glass and Glazing

Materials are specified under Section 08 81 00 GLAZING.

2.1.7.1 Glass Sizes and Clearances

Sizes indicated are nominal. Verify actual sizes required by measuring frames. Coordinate dimensions for glass and glass holding members to meet applicable minimum clearances as recommended by glass manufacturer. Do not nip to remove flares or to reduce oversized dimensions.

2.1.7.2 Glass Setting Materials

a. Sealants and preformed sealing compounds: Shall be as specified under paragraph entitled "Joint Sealant and Accessories."

b. Preformed compression gaskets and seals: ASTM C864, color black.

c. Setting blocks, edge blocks, and spacer shims: Fabricate from neoprene or other materials recommended by glass manufacturer compatible with compounds, sealants, or gaskets used. Unless otherwise recommended by the glass manufacturer, shore "A" Durometer hardness for setting and edge blocks shall be 90 plus or minus 5; for spacer shims, 50 plus or minus 5.

2.1.8 Firestopping Material

Mineral fiber manufactured from asbestos-free materials, and conforming to ASTM C612 or ASTM C665, meeting fire resistance requirements specified.

2.1.9 Tempered Hardboard

AHA A135.4, Class 1, inch thickness as indicated.

2.1.10 Screens

ASTM D3656/D3656M, Class 2, 18 by 14 mesh, color charcoal.

2.1.11 Paint and Finishes

2.1.11.1 Primer

Zinc-molydate, alkyd type.

2.1.12 Panels

Where, in order to meet the requirements specified, the proposed panel assembly is thicker than indicated, make corresponding adjustments in accessories and other work such as door, window and louver frames, flashing, coping, and trim products at no extra cost to the Government. Unless otherwise indicated, design for installation from outside the building. Provide vapor barrier on interior face of insulation. Seal edges of panels with cores of absorptive material to prevent entrance of water and allow venting of the core space to outside air.

2.1.13 Panel Type

Panels shall be metal-faced laminated both sides, consisting of exterior metal facing, facing backing, insulating core, facing backing, and interior metal facing. Facing-panel dimensions shall be as indicated.

2.1.14 Exterior Metal Facing

Facing shall be aluminum and type best suited for the work.

Color of aluminum exposed-to-view surfaces shall match the color of the curtainwall framing and the approved samples.

2.1.15 Core Insulation

Core shall be rigid urethane conforming to ASTM C591, Type 2.

2.1.16 Interior Metal Facing

Facing shall be as specified for exterior metal facing.

2.1.17 Panel Fabrication

Securely bond panel materials together to form a stable and durable composite unit. Panels with core insulation of absorptive material shall have edges sealed and provide venting to the outside air. Provide panels that conform to the following:

Flatness: Provide exterior surfaces of such flatness that, when measured at room temperature, the maximum slope of the surface at any point, measured from the nominal plane of the surface, that do not exceed the following:

1.0 percent for surfaces having a finish of high reflectivity

1.25 percent for surfaces having a finish of medium reflectivity

1.5 percent for surfaces having a finish of low reflectivity

Structural requirements: Panels of the maximum size required by the work, when supported in the manner intended, shall withstand the windload specified without permanent deformation or damage.

Accelerated aging: Panels shall show no evidence of delamination, warpage, or other deterioration or damage after completion of six accelerated aging cycles in accordance with ASTM C481, Cycle A.

Thermal transmittance: U-factor of a panel, when a panel not less than 10 square feet in area and of identical construction is tested in accordance with ASTM C1363, shall be as follows:

Not more than 0.50 Btu/hr-square foot-degree F.

2.1.18 Metal Windows

Fixed and operating. Comply with requirements of Aluminum Windows AAMA/WDMA/CSA 101/I.S.2/A440 as modified herein. Provide inside glazing with removable metal glazing beads. Comply with glass clearance dimensions and sealant dimensions recommended by glass manufacturer.

2.1.18.1 Frames

Frames for fixed glazed panels and window units shall be aluminum.

2.1.18.2 Operating Windows

Operating windows shall be projected type. Operating windows shall be complete with hardware, weatherstripping, and accessories. Hardware shall comply with AAMA/WDMA/CSA 101/I.S.2/A440 modified as follows:

a. Metal and finish for hardware shall be brushed finish stainless steel.

2.1.18.3 Window Construction

Weld or mechanically join and seal corners of frames and ventilators for water-tight construction. Remove excess metal from welded joints and dress smooth on exposed and contact surfaces so that no objectionable discoloration or roughness will be visible after finishing. Apply sealing compound in interior surfaces of corners and frame intersections.

2.1.19 Insect Screens

Provide insect screens for ventilators of projected windows in accordance with Aluminum Windows AAMA/WDMA/CSA 101/I.S.2/A440. Screens for projected windows shall be full sash opening interior type. Mount screens on inside of windows. Screens shall be rewirable, easily removable from inside the building, and interchangeable for same size ventilators of similar type windows. Provide hardware, guides, stops, clips, bolts, and screws as necessary for a secure and tight attachment to window. Where sliding or hinged wickets are required in screens to permit operation of window hardware, the frame around the wicket opening shall be of similar material and strengths as the screen frames.

a. Frames: Construct screen frames of similar material and finish as specified for the windows to which attached. Screen frame construction shall consist of closed tubular shapes standard with the manufacturer, either extruded or roll formed. Frames must be mitered, electrically flash welded, then dressed smooth; or have internal reinforcing or blocks at corners and mechanically connected corners. Screen frames shall have removable splines of aluminum, stainless steel, or vinyl.

b. Screening: Weave of screening shall be parallel with frames and sufficiently tight to present a smooth appearance. Conceal edges of screening in spline channel of frames.

c. Hardware: Screen hardware shall be manufacturer's standard type and finish, unless otherwise indicated.

2.1.20 Metal Accessories

Flashings, Metal sills, and Closures. Fabricate accessories of sizes and shapes indicated from similar materials and finish as specified for wall system.

2.2 METALS FOR FABRICATION

2.2.1 Aluminum-Alloy Extrusions

Extrusions shall conform to ASTM B221.

Extrusions to receive an integral-color anodic coating shall be the alloy and temper recommended by the aluminum producer for the specified finish with integral-color anodic coating and have mechanical properties equal to or exceeding those of 6063-T5.

2.2.2 Aluminum-Alloy Sheets and Plates

Unless otherwise specified, sheets and plates shall conform to ASTM B209, Alloy 3003-H16.

Sheets and plates to receive a clear anodic coating shall conform to ASTM B209, Alloy 5005-H16.

2.2.3 Structural Steel

Hot-rolled shapes, plates, and bars shall conform to ASTM A36/A36M.

Hot-formed tubing shall conform to ASTM A501.

Sheet and strip for cold-formed, light-gage, structural members shall conform to ASTM A1011/A1011M.

2.2.4 Metals for Fasteners

Provide aluminum-alloy bolts and screws made from rod conforming to ASTM B211, Alloy 2024-T351.

Provide aluminum-alloy nuts made from rod conforming to ASTM B211, Alloy 6061-T6.

Provide aluminum-alloy washers made from sheet conforming to ASTM B209, Alloy 2024-T4.

Provide aluminum-alloy rivets made from rod or wire conforming to ASTM B316/B316M, Alloy 6053-T61.

Provide steel fasteners made from corrosion-resistant chromium-nickel Type 302, 303, 304, 305, or 316 with the form and condition best suited for the work.

2.3 NONSKINNING SEALING COMPOUND

Sealing compound shall be nonskinning, gun-grade type conforming to AAMA 800.

2.4 FABRICATION

2.4.1 Workmanship

Metal Accessories shall be accurately formed; joints, except those designed to accommodate movement, accurately fitted and rigidly assembled.

Insofar as practical, fitting and assembly of the work shall be done in the manufacturer's plant. Mark work that cannot be permanently

factory-assembled before shipment to ensure proper assembly at the site.

2.4.2 Shop-Painting Aluminum

Shop prime aluminum surfaces that will come in contact with dissimilar metals, masonry, concrete, or wood.

Prepare aluminum surfaces for painting in accordance with ASTM D1730, Type B, Method 2 or 3.

Give aluminum surfaces one shop coat of paint applied to dry, clean, surfaces to provide a continuous minimum dry-film thickness of 1.5 mils.

2.4.3 Shop-Painting Steel

Shop prime surfaces of concealed steel.

Remove scale, rust, and other deleterious materials. Remove heavy rust and loose mill scale in accordance with SSPC SP 3 or SSPC 7/NACE No.4. Remove oil, grease, and similar contaminants in accordance with SSPC SP 1.

Give steel surfaces two coats of paint; the second coat shall have a color different from the first coat. Apply paint to dry, clean, surfaces to provide a continuous minimum dry-film thickness of 1.5 mils for the first coat and 1 mil for the second coat.

2.4.4 Depth of Glazing Rabbets

Comply with anti-terrorism force protection (ATFP) requirements for exterior glazing.

Depth of glazing rabbets for openings to receive glass materials or panels shall be as follows:

MATERIAL	NOMINAL THICKNESS	MAXIMUM SIZE	MINIMUM RABBET DEPTH
Single-glass lights	Double strength	Up to 5 square feet	3/8 inch
	Double strength	Over 5 square feet	1/2 inch
	1/8 inch	Up to 5 square feet	3/8 inch
	1/8 inch	5 to 25 square feet	1/2 inch
	1/8 inch	25 to 70 square feet	5/8 inch
	3/16 inch	Up to 25 square feet	1/2 inch
	3/16 inch	Over 25 square feet	5/8 inch
	7/32 inch	All sizes	5/8 inch
	1/4 inch	Up to 100 square feet	5/8 inch
	1/4 inch	Over 100 square feet	3/4 inch
	5/16 inch	All sizes	3/4 inch
	3/8 inch	All sizes	7/8 inch
	1/2 inch	All sizes	7/8 inch
	3/4 inch	All sizes	7/8 inch
Double-glazing units	All thicknesses	Up to 25 square feet	5/8 inch
	All thicknesses	25 to 70 square feet	3/4 inch
Panels	Up to 1 inch	All sizes	5/8 inch
	1 to 1-1/2 inches	All sizes	3/4 inch

2.4.5 Finish

Exposed-to-View Aluminum Finish of surfaces must be: AAMA 2605, Fluoropolymer Coating.

Match aluminum finish and color appearance to that of the finish and color samples approved for use in the project within the aluminum producer's standard color range.

2.5 CURTAIN-WALL FRAMING MEMBERS

2.5.1 General

Framing members shall be the section dimensions and arrangement indicated and designed to accommodate windows, panels, and other materials to be incorporated into the curtain-wall system.

Curtain-wall framing shall be the grid type with both the vertical and horizontal mullions extending the indicated distance beyond the exterior face of the curtain wall.

2.5.2 Construction

Framing members shall be aluminum-alloy extrusions with a wall thickness not less than 0.125 inch. Glazing rabbet legs shall be an integral part of the frame with the leg depth not less than the minimum depth specified for the thickness and size of the glass material or panel to be installed in the curtain-wall frame. Design and construct frames to receive window sash and louvers of the type specified when required.

Prepare vertical mullions for anchorage to the building construction at the bottom, at each intermediate floor elevation, and at the top.

Corners of frames shall be coped and welded construction. Welds shall be on the unexposed surfaces. Corner joints shall be accurately fitted and flush, with watertight hairline joints not exceeding 1/64 inch in width.

2.6 ALUMINUM DOORS AND FRAMES

Aluminum doors and frames are specified in Section 08 11 16 ALUMINUM DOORS AND FRAMES.

2.7 METAL ACCESSORIES

2.7.1 Sills

Sills shall be the shapes and dimensions indicated and fabricated of aluminum-alloy extrusions having a wall thickness not less than 0.125 inch.

Sills shall run continuously under the curtain wall and permit the lower curtain wall frame member to interlock without fastenings.

2.7.2 Exterior Architectural Louvers

Exterior architectural louvers are specified in Section 05 72 00 DECORATIVE METAL SPECIALTIES.

2.8 THERMAL INSULATION MATERIALS-FIELD APPLIED

Thermal insulation materials are specified in Section 07 21 16 MINERAL FIBER BLANKET INSULATION.

2.9 SEALANTS AND CAULKINGS

Sealants and caulkings are specified in Section 07 92 00 JOINT SEALANTS.

2.10 CURTAIN-WALL INSTALLATION MATERIALS

2.10.1 Masonry Anchorage Devices

2.10.2 Toggle Bolts

Toggle bolts shall be the tumble-wing type.

2.10.3 Steel Bolts, Nuts, and Washers

Bolts shall be regular hexagon head, low-carbon steel.

Nuts shall be hexagon, regular style, carbon steel.

Plain washers shall be round, general-assembly purpose, carbon steel.

Lockwashers shall be helical spring, carbon steel.

2.10.4 Machine Screws

Provide screws for concealed work that are corrosion-resistant steel, slotted or cross-recessed type, roundhead.

Provide screws for exposed-to-view work that are corrosion-resistant steel, cross-recessed, flathead.

2.10.5 Electrodes for Welding Steel

Electrodes for welding steel by the manual shielded metal arc welding process shall meet the requirements of AWS D1.1/D1.1M and be covered mild-steel electrodes conforming to AWS A5.1/A5.1M, E60 series.

PART 3 EXECUTION

3.1 GENERAL

Install curtain walls and accessories in accordance with the approved drawings and as specified.

3.2 FABRICATION

Provide curtain wall components of the materials and thickness indicated or specified. The details indicated are representative of the required design and profiles. Acceptable designs may differ from that shown if the proposed system components conform to the limiting dimensions indicated and the requirements specified herein. Unless specifically indicated or specified otherwise, the methods of fabrication and assembly shall be at the discretion of the curtain wall manufacturer. Perform fitting and assembling of components in the shop to the maximum extent practicable. Provide anchorage devices shall permit adjustment in three directions. Exposed fastenings used on finished surfaces shall be truss head, flat head, or oval head screws or bolts.

3.2.1 Joints

Provide welded or mechanical fasteners as indicated or specified. Match joints in exposed work to produce continuity of line and design. Bed-joints or rabbets receiving caulking or sealing material shall be minimum 3/4 inch deep and 3/8 inch wide at mid ambient temperature range.

3.2.2 Welding

Conform to AWS D1.1/D1.1M. Use methods and electrodes recommended by manufacturers of base metal alloys. Provide welding rods of an alloy that matches the color of the metal being welded. Protect glass and other finish from exposure to welding spatter. Ground and finish weld beads on exposed metal surfaces to minimize mismatch and to blend with finish on

adjacent parent metal. If flux is used in welding aluminum, completely remove it immediately upon completion of welding operations. Do not use exposed welds on aluminum surfaces.

3.2.3 Soldering and Brazing

Provide as recommended by suppliers. Solder only for filling or sealing joints.

3.2.4 Ventilation and Drainage

Provide internal ventilation drainage system of weeps or based on principles of pressure equalization to ventilate the wall internally and to discharge condensation and water leakage to exterior as inconspicuously as possible. Flashings and other materials used internally shall be nonstaining, noncorrosive, and nonbleeding.

3.2.5 Protection and Treatment of Metals

3.2.5.1 General

Remove from metal surfaces lubricants used in fabrication and clean off other extraneous material before leaving the shop.

3.2.5.2 Galvanic Action

Provide protection against galvanic action wherever dissimilar metals are in contact, except in the case of aluminum in permanent contact with galvanized steel, zinc, stainless steel, or relatively small areas of white bronze. Paint contact surfaces with one coat bituminous paint or apply appropriate caulking material or nonabsorptive, noncorrosive, and nonstaining tape or gasket between contact surfaces.

3.2.5.3 Protection for Aluminum

Protect aluminum which is placed in contact with, built into, or which will receive drainage from masonry, lime mortar, concrete, or plaster with one coat of alkali-resistant bituminous paint. Where aluminum is contacted by absorptive materials subject to repeated wetting or treated with preservative noncompatible with aluminum, apply two coats of aluminum paint, to such materials and seal joints with approved caulking compound.

3.3 INSTALLATION

Installation and erection of glazed wall system and all components shall be performed under direct supervision of and in accordance with approved recommendations and instructions of wall system manufacturer or fabricator.

3.3.1 Bench Marks and Reference Points

Establish and permanently mark bench marks for elevations and building line offsets for alignment at convenient points on each floor level. Should any error or discrepancy be discovered in location of the marks, stop erection work in that area until discrepancies have been corrected.

3.3.2 Verifying Conditions and Adjacent Surfaces

After establishment of lines and grades and prior to system installation examine supporting structural elements. Verify governing dimensions,

including floor elevations, floor to floor heights, minimum clearances between curtain wall and structural frames, and other permissible dimensional tolerances in the building frame.

3.3.3 Panels

Install panels into framed pre-assembled units using gaskets and sealants as indicated or specified.

3.3.4 Windows

Install windows in accordance with details indicated and approved detail drawings.

3.3.4.1 Sealing

Seal exterior metal to metal joints between members of windows, frames, mullions, and mullion covers. Remove excess sealant.

3.3.4.2 Ventilators and Hardware

After installing and glazing windows, adjust ventilators and hardware to operate smoothly and to be weathertight when ventilators are closed and locked. Lubricate hardware and moving parts.

3.3.4.3 Weatherstripping

Install to make weathertight contact with frames when ventilators are closed and locked. Do not cause binding of sash or prevent closing and locking of ventilator.

Provide for ventilating sections of all windows to insure a weather-tight seal meeting the infiltration tests specified. Use easily replaceable factory-applied weatherstripping of manufacturer's stock type. Use molded vinyl, molded or molded-expanded neoprene for weatherstripping for compression contact surfaces. For sliding surfaces, use treated woven pile or wool, polypropylene or nylon pile with nylon fabric and metal or plastic backing strip weatherstripping. Do not use neoprene or polyvinyl chloride weatherstripping where they will be exposed to direct sun light.

3.3.5 Joint Sealants

3.3.5.1 Surface Preparation

Surfaces to be primed and sealed shall be clean, dry to the touch, free from frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter. Enclose joints on three sides. Clean out grooves to proper depth. Joint dimensions shall conform to approved detail drawings with a tolerance of plus 1/8 inch. Do not apply compound unless ambient temperature is between 40 and 90 degrees F. Clean out loose particles and mortar just before sealing. Remove protective coatings or coverings from surfaces in contact with sealants before applying sealants or tapes. Solvents used to remove coatings shall be of type that leave no residue on metals.

3.3.5.2 Applications

Match approved sample. Force compound into grooves with sufficient pressure to fill grooves solidly. Sealing compound shall be uniformly smooth and free of wrinkles and, unless indicated otherwise, tooled and

left sufficiently convex to result in a flush joint when dry. Do not trim edges of sealing material after joints are tooled. Mix only amount of multi-component sealant which can be installed within four hours, but at no time shall this amount exceed 5 gallons.

3.3.5.3 Primer

Apply to masonry, concrete, wood, and other surfaces as recommended by sealant manufacturer. Do not apply primer to surfaces which will be exposed after caulking is completed.

3.3.5.4 Backing

Tightly pack in bottom of joints which are over 1/2 inch in depth with specified backing material to depth indicated or specified. Roll backing material of hose or rod stock into joints to prevent lengthwise stretching.

3.3.5.5 Bond Prevention

Install bond preventive material at back or bottom of joint cavities in which no backstop material is required, covering full width and length of joint cavities.

3.3.5.6 Protection and Cleaning

Remove compound smears from surfaces of materials adjacent to sealed joints as the work progresses. Use masking tape on each side of joint where texture of adjacent material will be difficult to clean. Remove masking tape immediately after filling joint. Scrape off fresh compound from adjacent surfaces immediately and rub clean with approved solvent. Upon completion of caulking and sealing, remove remaining smears, stains, and other soiling, and leave the work in clean neat condition.

3.3.6 Glass

Install in accordance with manufacturer's recommendations as modified herein. Install insulating glass units made with heat absorbing glass with heat absorbing pane on exterior side.

3.3.6.1 Inspection of Sash and Frames

Before installing glass, inspect sash and frames to receive glass for defects such as dimensional variations, glass clearances, open joints, or other conditions that will prevent satisfactory glass installation. Do not proceed with installation until defects have been corrected.

3.3.6.2 Preparation of Glass and Rabbets

Clean sealing surfaces at perimeter of glass and sealing surfaces of rabbets and stop beads before applying glazing compound, sealing compound, glazing tape, or gaskets. Use only approved solvents and cleaning agents recommended by compound or gasket manufacturer.

3.3.6.3 Positioning Glass

Set glass from inside the building unless otherwise indicated or specified. Maintain specified edge clearances and glass bite at perimeter. Maintain position of glass in rabbet and provide required sealant thickness on both sides of glass. For glass dimensions larger than 50 united inches, provide

setting blocks at sill and spacer shims on all four sides; locate setting blocks one quarter way in from each jamb edge of glass. Where setting blocks and spacer shims are set into glazing compound or sealant, butter with compound or sealant, place in position, and allow to firmly set prior to installation of glass.

3.3.6.4 Setting Methods

Outside glazed and held in place with extruded aluminum pressure plates anchored to mullion with stainless steel fasteners at 9 inches on center maximum.

Apply glazing compound, glazing sealant, glazing tape, and gaskets uniformly with accurately formed corners and bevels. Remove excess compound from glass and sash. Use only recommended thinners, cleaners, and solvents. Strip surplus compound from both sides of glass and tool at slight angle to shed water and provide clean sight lines. Secure stop beads in place with suitable fastenings. Do not apply compound or sealant at temperatures lower than 40 degrees F, or on damp, dirty, or dusty surfaces. After glazing, fix ventilators in sash so they cannot be operated until compound or sealant has set.

3.3.6.5 Void Space

Heat absorbing, insulating, spandrel, and tempered glass, and glass of other types that exceed 100 united inches in size: Provide void space at head and jamb to allow glass to expand or move without exuding the sealant.

3.3.6.6 Insulating Glass

Provide adequate means to weep incidental water and condensation away from the sealed edges of insulated glass units and out of the wall system. The weeping of lock-strip gaskets should be in accordance with the recommendation of the glass manufacturer.

3.3.6.7 Insulating Glass With Edge Bands

Insulating glass with flared metal edge bands set in lock-strip type gaskets: Follow glass manufacturer's recommendations and add supplementary wet seal as required; when used with glazing tape, use tapered tape.

3.3.7 Firestopping

Provide firestopping, where indicated, in openings between wall system and floor at each story to prevent passage of flame and hot gases from floor to floor under extended fire exposure. Installed fire stopping shall remain in place under extended fire exposure despite distortions that may occur in wall system components. Securely attach anchoring or containment devices to building structure and not to wall system. Place mineral fiber on impaling chips embedded in edge of floor slab.

3.4 FINISHES

3.4.1 Galvanizing

Conform to ASTM A123/A123M, ASTM A153/A153M, and ASTM A653/A653M, as applicable.

3.4.1.1 Repair of Zinc-Coated Surfaces

Repair zinc coated surfaces damaged by welding or other means with galvanizing repair paint or by application of stick or thick paste material specifically designed for repair of galvanizing, as approved.

3.4.2 Shop Cleaning and Painting

3.4.2.1 Cleaning

Clean steel and iron work by power wire brushing or other approved manual or mechanical means, for removal of rust, loose paint, scale, and deleterious substances. Wash cleaned surfaces which become contaminated with rust, dirt, oil, grease, or other foreign matter, with solvents until thoroughly clean. Cleaning steel embedded in concrete is not required.

3.4.2.2 Painting Steel or Iron Surfaces

Apply primer to a minimum dry film thickness of 1.0 mil. Apply additional shop coat of specified paint, to which a small amount of tinting material has been added, on surfaces that will be concealed in the finished construction or that will not be accessible for finish painting. Accomplish painting in dry weather or under cover, and on steel or iron surfaces that are free from moisture and frost. Do not paint surfaces of items to be embedded in concrete. Recoat damaged surfaces upon completion of work. Prime coat steel immediately after cleaning. Do not apply bituminous protective coatings to items to be finish painted.

3.5 FIELD TESTS

Conduct field check test for water leakage on designated wall areas after erection. Conduct test on two wall areas, two bays wide by two stories high where directed. Conduct test and take necessary remedial action as described in AAMA 501.1.

3.6 CLEANING AND PROTECTION

3.6.1 General

At the completion of the installation, clean the work to remove mastic smears and other foreign materials.

3.6.2 Glass

Upon completion of wall system installation, thoroughly wash glass surfaces on both sides and remove labels, paint spots, putty, compounds, and other defacements. Replace cracked, broken, and defective glass with new glass at no additional cost to the Government.

3.6.3 Aluminum Surfaces

Protection methods, cleaning, and maintenance shall be in accordance with AAMA 609 & 610.

3.6.4 Other Metal Surfaces

After installation, protect windows, panels, and other exposed surfaces from disfiguration, contamination, contact with harmful materials, and from other construction hazards that will interfere with their operation, or

damage their appearance or finish. Protection methods must be in accordance with recommendations of product manufacturers or of the respective trade association. Remove paper or tape factory applied protection immediately after installation. Clean surfaces of mortar, plaster, paint, smears of sealants, and other foreign matter to present neat appearance and prevent fouling of operation. In addition, wash with a stiff fiber brush, soap and water, and thoroughly rinse. Where surfaces become stained or discolored, clean or restore finish in accordance with recommendations of product manufacturer or the respective trade association.

3.7 MATERIALS EMBEDDED IN OTHER CONSTRUCTION

Install materials to be embedded in cast-in-place concrete and masonry prior to the installation of the curtain wall. Provide setting drawings, templates, and instructions for installation.

3.8 FASTENING TO CONSTRUCTION-IN-PLACE

Provide anchorage devices and fasteners for fastening work to construction-in-place. Provide fasteners as specified.

3.9 SETTING MASONRY ANCHORAGE DEVICES

Set devices in masonry or concrete-in-place construction in accordance with the manufacturer's printed instructions. Leave drilled holes rough and free of drill dust.

3.10 FIELD-WELDING STEEL AND TOUCHUP PAINTING

Procedures of manual shielded metal arc welding, the appearance and quality of the welds made, and the methods used in correcting welding work shall conform to AWS D1.1/D1.1M.

After completion of welding, clean and paint field welds and scarred surfaces on steel work and on adjacent ferrous-metal surfaces. Paint shall be the same as that used for shop painting.

3.11 INSTALLATION TOLERANCES

Install curtain walls within the following tolerances:

Deviation in location from that indicated on the drawings	Plus or minus 1/4 inch
Deviation from the plumb or horizontal	
n 12 feet of length	Not more than 1/8 inch
In any total length	Not more than 1/2 inch
Offset from true alignment at joints between abutting members in line	Not more than 1/16 inch

3.12 PLACING CURTAIN-WALL FRAMING MEMBERS

Install members plumb, level, and within the limits of the installation tolerances specified.

Connect members to building framing. Provide supporting brackets adjustments for the accurate location of curtain-wall components. Adjustable connections shall be rigidly fixed after members have been positioned.

3.13 PANEL INSTALLATION

Panels shall be set with a glazing-tape back bed, two-component elastomeric sealing-compound heel bead, glazing-tape bedding of the stop, and two-component elastomeric sealing-compound topping bead on both sides of the panel. Face and edge clearances shall not be less than 1/8 inch. Remove excess sealing compound on both sides of the curtain wall opening with a glazing knife at a slight angle over the rabbet leg or applied stop. Install applied stops on the exterior side of the curtain wall and secured with screws.

3.14 INSPECTION AND ACCEPTANCE PROVISIONS

3.14.1 Finished Curtain-Wall System Requirements

Curtain-wall work shall be rejected for any of the following deficiencies:

Finish of exposed-to-view aluminum having color and appearance that are outside the color and appearance range of the approved samples.

Installed curtain-wall components having stained, discolored, abraded, or otherwise damaged exposed-to-view surfaces that cannot be cleaned or repaired.

Aluminum surfaces in contact with dissimilar materials that are not protected as specified.

3.14.2 Repair of Defective Work

Remove and replace defective work with curtain-wall materials that meet the specifications at no expense to the Government.

-- End of Section --

SECTION 08 71 00

DOOR HARDWARE
08/08

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM E283	(2004; R 2012) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM F883	(2013) Padlocks

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.1	(2013) Butts and Hinges
ANSI/BHMA A156.13	(2012) Mortise Locks & Latches Series 1000
ANSI/BHMA A156.16	(2013) Auxiliary Hardware
ANSI/BHMA A156.17	(2004; R 2010) Self Closing Hinges & Pivots
ANSI/BHMA A156.18	(2012) Materials and Finishes
ANSI/BHMA A156.21	(2009) Thresholds
ANSI/BHMA A156.26	(2012) Continuous Hinges
ANSI/BHMA A156.3	(2008) Exit Devices
ANSI/BHMA A156.4	(2013) Door Controls - Closers
ANSI/BHMA A156.5	(2014) Auxiliary Locks and Associated Products
ANSI/BHMA A156.6	(2010) Architectural Door Trim
ANSI/BHMA A156.7	(2003; R 2009) Template Hinge Dimensions
ANSI/BHMA A156.8	(2010) Door Controls - Overhead Stops and Holders
BHMA A156.15	(2011) Release Devices Closer Holder, Electromagnetic and Electromechanical
BHMA A156.22	(2012) Door Gasketing and Edge Seal Systems

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2015; ERTA 2015) Life Safety Code
NFPA 80	(2013) Standard for Fire Doors and Other Opening Protectives

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR A250.8	(2003; R2008) Recommended Specifications for Standard Steel Doors and Frames

UNDERWRITERS LABORATORIES (UL)

UL Bld Mat Dir	(2012) Building Materials Directory

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

SD-02 Shop Drawings

Hardware schedule; G

Keying system

SD-03 Product Data

Hardware items; G

SD-08 Manufacturer's Instructions

Installation

SD-10 Operation and Maintenance Data

Hardware Schedule items, Data Package 1; G

Submit data package in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

SD-11 Closeout Submittals

Key Bitting

1.3 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

1.4 KEY BITTING CHART REQUIREMENTS

Submit key bitting charts to the Contracting Officer prior to completion of the work. Include:

a. Complete listing of all keys (AA1, AA2, etc.).

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.

1.5 QUALITY ASSURANCE

1.5.1 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.

1.5.2 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 shall meet to discuss key requirements for the facility.

1.6 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 in hardware schedule. Deliver permanent keys and removable cores to the Contracting Officer, either directly or by certified mail. Deliver construction master keys with the locks.

PART 2 PRODUCTS

2.1 TEMPLATE HARDWARE

Provide hardware to be applied to metal or to prefinished doors manufactured to template. Promptly furnish template information or templates to door and frame manufacturers. Conform to 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 80 for fire doors and NFPA 101 for exit doors, as well as to other requirements indicated, even if such hardware is not specifically mentioned under paragraph entitled "Hardware Schedule." Provide the label of Underwriters Laboratories, Inc. for such hardware listed in UL Bld Mat Dir or labeled and listed by another testing laboratory acceptable to 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 will be visible after the item is installed. For closers with covers, the name or trademark may be beneath the cover.

2.3.1 Hinges

ANSI/BHMA A156.1, 4-1/2 by 4-1/2 inch unless otherwise indicated. Construct loose pin hinges for exterior doors and reverse-bevel interior doors so that pins will be nonremovable when door is closed. Other antifriction bearing hinges may be provided in lieu of ball-bearing hinges. Continuous hinges: ANSI/BHMA A156.26 Grade 1 aluminum geared continuous hinges constructed from 6063-T6 aluminum designated heavy duty (HD) with minimum 32 bearings for a standard 83-inch hinge.

2.3.2 Pivots

ANSI/BHMA A156.4.

2.3.3 Spring Hinges

ANSI/BHMA A156.17.

2.3.4 Locks and Latches

2.3.4.1 Mortise Locks and Latches

ANSI/BHMA A156.13, Series 1000, Operational Grade 1, Security Grade 2. Provide mortise locks with escutcheons not less than 7 by 2-1/4 inch with a bushing at least 1/4 inch long. Cut escutcheons to suit cylinders and provide trim items with straight, beveled, or smoothly rounded sides, corners, and edges. Install levers and roses of mortise locks with screwless shanks and no exposed screws. Provide interior lock status indicators to indicate locked/unlocked status of exterior lever trim on all classroom doors and where specified.

2.3.5 Exit Devices

ANSI/BHMA A156.3, Grade 1. Provide adjustable strikes for rim type and vertical rod devices. Provide touch bars in lieu of conventional crossbars and arms. Provide escutcheons, not less than 7 by 2-1/4 inch. Provide interior visual indicators to indicate locked/unlocked status of exterior lever trim or status or dogged latchbolt on all classroom doors and where specified.

2.3.6 Cylinders and Cores

Provide cylinders and cores for ew locks, including locks provided under other sections of this specification. Provide cylinders and cores with six pin tumblers. Provide cylinders from products of one manufacturer, and provide cores from the products of one manufacturer. Rim cylinders, mortise cylinders, and knobs of bored locksets have interchangeable cores which are removable by special control keys. Stamp each interchangeable core with a key control symbol in a concealed place on the core.

2.3.7 Keying System

Provide a grand master keying system. Provide construction interchangeable cores. Provide key cabinet as specified.

Provide a new great grand masterkey system with patented restricted keys to year 2029. System should incorporate high security dual locking cylinders on perimeter and administration areas where indicated. High security cylinders shall feature anti pick proof design dual locking pins with interlocking finger pins to check for patented features on keys.

2.3.8 Lock Trim

Cast, forged, or heavy wrought construction and commercial plain design.

2.3.8.1 Lever Handles

Provide lever handles in lieu of knobs where indicated in paragraph entitled "Hardware Schedule". Conform to the minimum requirements of ANSI/BHMA A156.13 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.

2.3.8.2 Texture

Provide knurled or abrasive coated knobs or lever handles where specified in paragraph entitled "Hardware Schedule".

2.3.9 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 2 grand master keys, 12 construction master keys, and 4 control keys for removable cores. 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.

2.3.10 Door Bolts

ANSI/BHMA A156.16. Provide dustproof strikes for bottom bolts, except for doors having metal thresholds. Automatic latching flush bolts: ANSI/BHMA A156.3, Type 25.

2.3.11 Closers

ANSI/BHMA A156.4, Series C02000, Grade 1, with PT 4C. Provide with brackets, arms, mounting devices, fasteners, full size covers, except at storefront mounting, and other features necessary for the particular application. Size closers in accordance with manufacturer's recommendations, or provide multi-size closers, Sizes 1 through 6, and list sizes in the Hardware Schedule. Provide manufacturer's 10 year warranty.

2.3.11.1 Identification Marking

Engrave each closer with manufacturer's name or trademark, date of manufacture, and manufacturer's size designation located to be visible after installation.

2.3.12 Overhead Holders

ANSI/BHMA A156.8.

2.3.13 Closer Holder-Release Devices

BHMA A156.15.

2.3.14 Door Protection Plates

ANSI/BHMA A156.6.

2.3.14.1 Sizes of Mop and Kick Plates

2 inch less than door width for single doors; one inch less than door width for pairs of doors. Provide 8 inch kick plates for flush doors and 1 inch less than height of bottom rail for panel doors. Provide 4 inch mop plates.

2.3.15 Door Stops and Silencers

ANSI/BHMA A156.16. Silencers Type L03011. Provide three silencers for each single door, two for each pair.

2.3.16 Padlocks

ASTM F883.

2.3.17 Thresholds

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 Weather Stripping Gasketing

BHMA A156.22. Provide the type and function designation where specified in paragraph entitled "Hardware Schedule". Provide a set to include head and jamb seals, sweep strips, and, for pairs of doors, astragals. Air leakage of weather stripped doors not to exceed 0.5 cubic feet per minute of air per square foot of door area when tested in accordance with ASTM E283. Provide weather stripping with one of the following:

2.3.18.1 Extruded Aluminum Retainers

Extruded aluminum retainers not less than 0.050 inch wall thickness with vinyl, neoprene, silicone rubber, or polyurethane inserts. Provide clear (natural) anodized aluminum.

2.3.19 Soundproofing Gasketing

BHMA A156.22. Include adjustable doorstops at head and jambs and an automatic door bottom per set, both of extruded aluminum, clear (natural) anodized, surface applied, with vinyl fin seals between plunger and housing. Provide doorstops with solid neoprene tube, silicone rubber, or closed-cell sponge gasket. Furnish door bottoms with adjustable operating rod and silicone rubber or closed-cell sponge neoprene gasket. Doorstops mitered at corners. Provide the type and function designation where specified in paragraph entitled "Hardware Sets".

2.3.20 Rain Drips

Extruded aluminum, not less than 0.08 inch thick, clear anodized. 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, with length equal to overall width of door frame. Align bottom with door frame rabbet.

2.3.21 Special Tools

Provide special tools, such as spanner and socket wrenches and dogging keys, required to service and adjust hardware items.

2.4 FASTENERS

Provide fasteners of proper type, quality, size, quantity, and finish with hardware. Provide stainless steel or nonferrous metal fasteners that are exposed to weather. Provide fasteners of type necessary to accomplish a permanent installation.

2.5 FINISHES

ANSI/BHMA A156.18. Provide hardware in BHMA 630 finish (satin stainless steel), unless specified otherwise. Provide items not manufactured in stainless steel in BHMA 626 finish (satin chromium plated) over brass or bronze, except aluminum paint finish for surface door closers, and except BHMA 652 finish (satin chromium plated) for steel hinges. Provide hinges for exterior doors in stainless steel with BHMA 630 finish or chromium plated brass or bronze with BHMA 626 finish. Furnish exit devices in BHMA 626 finish in lieu of BHMA 630 finish except where BHMA 630 is specified under paragraph entitled "Hardware Sets". Match exposed parts of concealed closers to lock and door trim. Match hardware finish for aluminum doors to the doors.

2.6 KEY CABINET AND CONTROL SYSTEM

ANSI/BHMA A156.5, Type required to yield a capacity (number of hooks) 50 percent greater than the number of key changes used for door locks.

PART 3 EXECUTION

3.1 INSTALLATION

Install 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 Weather Stripping Installation

Handle and install weather stripping to prevent damage. Provide full contact, weather-tight seals. Operate doors without binding.

3.1.1.1 Stop-Applied Weather Stripping

Fasten in place with color-matched sheet metal screws not more than 9 inch on center after doors and frames have been finish painted.

3.1.2 Soundproofing Installation

Install as specified for stop-applied weather stripping.

3.1.3 Threshold Installation

Extend thresholds the full width of the opening and notch end for jamb stops. Set thresholds in a full bed of sealant and anchor to floor with cadmium-plated, countersunk, steel screws in expansion sleeves.

3.2 FIRE DOORS AND EXIT DOORS

Install hardware in accordance with NFPA 80 for fire doors, NFPA 101 for exit doors.

3.3 HARDWARE LOCATIONS

SDI/DOOR A250.8, unless indicated or specified otherwise.

a. Kick and Armor Plates: Push side of single-acting doors. Both sides of double-acting doors.

b. Mop Plates: Bottom flush with bottom of door.

3.4 KEY CABINET AND CONTROL SYSTEM

Locate where directed. Tag one set of file keys and one set of duplicate keys. Place other keys in appropriately marked envelopes, or tag each key. Furnish 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, as directed, errors in cutting and fitting and damage to adjoining work.

3.6 HARDWARE SETS

Provide hardware for aluminum doors under this section. Deliver Hardware templates and hardware, except field-applied hardware to the aluminum door and frame manufacturer for use in fabricating the doors and frames.

-- End of Section --

Door/Hardware Index

Door #	HWSet #
1A00.1	100
1A00.2	101
1A00.3	102
1A00.4	103
1A01.1	116
1A01.2	117
1A02.1	309
1A03.1	300
1A04.1	333
1A05.1	302
1A06.1	333
1A07.1	302
1A09.1	302
1A10.3	310
1A11.1	301
1A12.1	303
1A14.1	308
1A16.1	308
1A20.1	305
1A22.1	304
1A23.1	303
1A25.1	333
1A26.1	311
1A27.1	307
1A28.1	302
1A29.1	302
1A30.1	302
1A31.1	302
1A32.1	302
1A33.1	302
1A34.1	303
1A35.1	302
1B01.1	315
1B02.1	346
1B02.2	348
1B03.1	315
1B04.1	315
1B05.1	112
1B06.1	347
1B07.1	305

Door #	HWSet #
1B08.1	312
1B10.1	312
1B12.1	312
1B14.1	312
1C00.1	101
1C00.2	104
1C00.3	308
1C00.4	204
1C00.6	115
1C00.7	107
1C00.8	204
1C02.1	119
1C02.2	109
1C02.3	113
1C02.4	207
1C03.1	366
1C03.2	366
1C03.3	107
1C03.4	107
1C03.5	358
1C04.1	365
1C04.2	365
1C05.1	334
1C07.1	334
1C09.1	324
1C10.1	114
1C10.2	311
1C11.1	108
1C12.1	324
1C13.1	349
1C14.1	330
1C15.1	330
1C16.1	303
1C17.1	108
1C17.2	359
1C18.1	350
1C18.2	350
1C19.1	351
1C19.2	356
1C19.3	110

Door #	HWSet #
1C20.1	330
1C20.2	331
1C20.3	330
1C20.4	324
1C21.1	352
1C21.2	111
1C22.1	303
1C23.1	301
1C23.2	355
1C25.1	354
1C26.1	303
1C27.1	353
1C27.2	112
1C28.1	330
1C28.2	331
1C28.3	330
1C28.4	329
1C29.1	311
1C30.1	370
1C31.1	303
1C32.1	370
1C32.2	106
1C33.1	311
1C35.1	311
1C37.1	308
1C38.1	324
1C39.1	313
1C39.2	106
1C40.1	329
1C41.1	367
1C41.2	106
1C41.3	306
1C43.1	328
1C44.1	330
1C45.1	330
1C47.1	327
1C47.2	327
1C47.3	105
1C47.4	105
1C47.5	326
1C47.6	368
1C49.1	317
1C49.2	317

Door #	HWSet #
1C50.1	325
1C51.1	324
1C52.1	323
1C53.1	318
1C55.1	322
1C57.1	322
1C59.1	321
1D01.1	205
1D01.2	205
1D01.3	205
1D02.1	315
1D03.1	343
1D03.2	343
1D04.1	369
1D04.2	314
1D05.1	345
1D05.2	344
1D06.1	369
1D06.2	314
1D07.1	315
1D08.1	312
1D09.1	315
1D10.1	312
1D11.1	315
1D12.1	312
1D13.1	319
1D14.1	312
1D16.1	312
1D18.1	312
1E00.1	342
1E00.2	342
1E00.3	342
1E00.4	342
1E02.1	357
1E03.1	333
1E07.1	334
1F03.1	363
1F04.1	303
1F05.1	361
1F06.1	333
1F07.1	324
1F08.1	360
1F09.1	362

Door #	HWSet #
1G02.1	118
1G03.1	118
1G05.1	112
1G05.2	340
1G05.3	365
1S02.1	201
1S03.1	202
1S03.2	107
1S04.1	202
1S04.2	107
1S05.1	200
1S05.2	107
2B01.1	315
2B02.1	315
2B02.2	320
2B03.1	315
2B04.1	314
2B04.2	314
2B05.1	308
2B06.1	322
2B08.1	315
2B10.1	312
2B12.1	312
2B14.1	312
2B16.1	312
2C00.1	208
2C00.2	206
2C00.3	206
2C00.4	208
2C01.1	315
2C01.2	315
2C02.1	316
2C04.1	336
2C04.2	337
2C06.1	335
2C08.1	334
2C09.1	320
2C09.2	314
2C09.3	314
2C10.1	330
2C11.1	330

Door #	HWSet #
2C12.1	339
2C13.1	338
2C14.1	316
2C17.1	340
2C18.1	204
2D00.1	204
2D01.1	205
2D01.2	205
2D01.3	205
2D02.1	316
2D02.2	332
2D02.3	332
2D02.4	315
2D02.5	364
2D03.1	315
2D04.1	315
2D05.1	315
2D06.1	315
2D07.1	315
2D08.1	312
2D09.1	308
2D10.1	312
2D12.1	312
2D14.1	312
2D16.1	312
2D18.1	312
2E00.1	316
2E00.2	316
2E00.3	320
2E00.4	320
2E02.1	333
2E03.1	333
2E06.1	335
2E07.1	334
2S02.2	203
2S03.3	202
2S04.1	202
2S05.3	202
E05.1	341

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Hardware Set No. 100

For use on door #(s):
1A00.1

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONT. HINGE	224HD EPT (A31031G)	628	ANSI
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	KEYED REMOVABLE MULLION	KR4954-STAB (Type 22,)	689	ANSI
1	EA	ELEC PANIC HARDWARE	QEL+-35A-EO (Grade 1, Type 4, Function 01)	626	ANSI
1	EA	ELEC PANIC HARDWARE	QEL+-35A-NL-OP-388 (Grade 1, Type 4, Function 03)	626	ANSI
1	EA	RELAY	RELAY KIT-R6		VON
1	EA	RIM CYLINDER	20-057-ICX (E09222)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	PRIMUS CORE	20-740-XP (E09241L)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
2	EA	90 DEG OFFSET PULL	8190HD 10" O	630	IVE
1	EA	SURF. AUTO OPERATOR	9553 REG2 MS (C0Unknown)	ANCLR	ANSI
2	EA	MOUNTING PLATE	4050-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4050-30	689	LCN
2	EA	BLADE STOP SPACER	4050-61	689	LCN
2	EA	ACTUATOR, WALL MOUNT	8310-853T	630	LCN
1	EA	PROG. REMOTE CONTROL	8310-859	689	LCN
1	EA	SAFETY SENSOR	8310-877		LCN
1	EA	THRESHOLD	566A-MSLA-10	A	ZER
1	EA	POWER SUPPLY	PS914 900-2RS KL900	LGR	VON
1	EA	CARD READER	BY SECURITY VENDOR		

DOOR OPERATION:
1. Door normally closed and secure.
2. Entry from secure side by valid credential or key override which will unlock electrified door.
2. Valid credential will also allow ADA wall actuator to be used and signal ADA door opener to open door.
3. Safety Sensor prevents door from opening or closing when swing path is not clear.
4. Free egress from inside at all times.

Hardware Set No. 101

For use on door #(s):
1A00.2 1C00.1

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONT. HINGE	224HD EPT (A31031G)	628	ANSI

2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	KEYED REMOVABLE MULLION	KR4954-STAB (Type 22,)	689	ANSI
2	EA	ELEC PANIC HARDWARE	QEL+-35A-EO (Grade 1, Type 4, Function 01)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
2	EA	90 DEG OFFSET PULL	8190HD 10" O	630	IVE
2	EA	OH STOP	100S (C01541)	630	ANSI
2	EA	SURFACE CLOSER	4050 EDA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
2	EA	MOUNTING PLATE	4050-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4050-30	689	LCN
2	EA	BLADE STOP SPACER	4050-61	689	LCN
1	EA	THRESHOLD	566A-MSLA-10	A	ZER
1	EA	POWER SUPPLY	PS914 900-2RS KL900	LGR	VON

DOOR OPERATION:
1. Door normally closed and secure.
2. Remote release by access control system will retract latches during student drop off or as desired.
3. Free egress from inside at all times.

Hardware Set No. 102

For use on door #(s):
1A00.3

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONT. HINGE	224HD EPT (A31031G)	628	ANSI
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	KEYED REMOVABLE MULLION	KR4954-STAB (Type 22,)	689	ANSI
1	EA	ELEC PANIC HARDWARE	QEL+-35A-EO (Grade 1, Type 4, Function 01)	626	ANSI
1	EA	ELEC PANIC HARDWARE	QEL+-35A-NL-OP-388 (Grade 1, Type 4, Function 03)	626	ANSI
1	EA	RELAY	RELAY KIT-R6		VON
1	EA	RIM CYLINDER	20-057-ICX (E09222)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	PRIMUS CORE	20-740-XP (E09241L)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
2	EA	90 DEG OFFSET PULL	8190HD 10" O	630	IVE
1	EA	SURF. AUTO OPERATOR	9553 STD2 MS (C0Unknown)	ANCLR	ANSI
2	EA	CUSH SHOE SUPPORT	4050-30	689	LCN
2	EA	BLADE STOP SPACER	4050-61	689	LCN
2	EA	ACTUATOR, WALL MOUNT	8310-853T	630	LCN
1	EA	SAFETY SENSOR	8310-877		LCN
1	EA	POWER SUPPLY	PS914 900-2RS KL900	LGR	VON
1	EA	CARD READER	BY SECURITY VENDOR		

DOOR OPERATION:
1. Door normally closed and secure.
2. Entry from secure side by valid credential or key override which will unlock electrified door.
2. Valid credential will also allow ADA wall actuator to be used and signal ADA door opener to open door.
3. Safety Sensor prevents door from opening or closing when swing path is not clear.
4. Free egress from inside at all times.

Hardware Set No. 103

For use on door #(s):
1A00.4

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONT. HINGE	224HD EPT (A31031G)	628	ANSI
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	KEYED REMOVABLE MULLION	KR4954-STAB (Type 22,)	689	ANSI
2	EA	ELEC PANIC HARDWARE	QEL+-35A-EO (Grade 1, Type 4, Function 01)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
2	EA	90 DEG OFFSET PULL	8190HD 10" O	630	IVE
2	EA	OH STOP	100S (C01541)	630	ANSI
2	EA	SURFACE CLOSER	4050 EDA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
2	EA	MOUNTING PLATE	4050-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4050-30	689	LCN
2	EA	BLADE STOP SPACER	4050-61	689	LCN
1	EA	POWER SUPPLY	PS914 900-2RS KL900	LGR	VON

DOOR OPERATION:
1. Door normally closed and secure.
2. Remote release by access control system will retract latches during student drop off or as desired.
3. Free egress from inside at all times.

Hardware Set No. 104

For use on door #(s):
1C00.2

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONT. HINGE	224HD EPT (A31031G)	628	ANSI
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	KEYED REMOVABLE MULLION	KR4954-STAB (Type 22,)	689	ANSI
1	EA	ELEC PANIC HARDWARE	QEL+-35A-EO (Grade 1, Type 4, Function 01)	626	ANSI

1	EA	ELEC PANIC HARDWARE	QEL+-35A-NL-OP-388 (Grade 1, Type 4, Function 03)	626	ANSI
1	EA	RIM CYLINDER	20-057-ICX (E09222)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	PRIMUS CORE	20-740-XP (E09241L)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
2	EA	90 DEG OFFSET PULL	8190HD 10" O	630	IVE
2	EA	OH STOP	100S (C01541)	630	ANSI
2	EA	SURFACE CLOSER	4050 EDA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
2	EA	MOUNTING PLATE	4050-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4050-30	689	LCN
2	EA	BLADE STOP SPACER	4050-61	689	LCN
1	EA	THRESHOLD	566A-MSLA-10	A	ZER
1	EA	POWER SUPPLY	PS914 900-2RS KL900	LGR	VON

DOOR OPERATION:
1. Door normally closed and secure.
2. Remote release by access control system will retract latches during student drop off or as desired.
3. Free egress from inside at all times.

Hardware Set No. 105

For use on door #(s):
1C47.3 1C47.4

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD EPT (A31031G)	628	ANSI
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	QEL+-98-EO (Grade 1, Type 1, Function 01)	626	ANSI
1	EA	RIM CYLINDER	20-057-ICX (E09222)	626	ANSI
1	EA	PRIMUS CORE	20-740-XP (E09241L)	626	ANSI
1	EA	DOOR PULL	VR810 NL	630	IVE
1	EA	GASKETING	188S-BK	S-Bk	ZER
1	EA	THRESHOLD	566A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
1	EA	POWER SUPPLY	PS914 900-2RS KL900	LGR	VON
1	EA	CARD READER	BY SECURITY VENDOR		
1	SET	POINT TO POINT	WIRING DIAGRAMS		

DOOR OPERATION:
1. Door normally closed and secure.
2. Entry from secure side by valid credential or key override which will unlock electrified door.
3. Free egress from inside at all times.

Hardware Set No. 106

For use on door #(s):
1C32.2 1C39.2 1C41.2

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD EPT (A31031G)	628	ANSI
1	EA	ELEC PANIC HARDWARE	QEL+-35A-NL-OP-388 (Grade 1, Type 4, Function 03)	626	ANSI
1	EA	RIM CYLINDER	20-057-ICX (E09222)	626	ANSI
1	EA	PRIMUS CORE	20-740-XP (E09241L)	626	ANSI
1	EA	90 DEG OFFSET PULL	8190HD 10" O	630	IVE
1	EA	OH STOP	100S (C01541)	630	ANSI
1	EA	SURFACE CLOSER	4050 EDA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
1	EA	MOUNTING PLATE	4050-18PA	689	LCN
1	EA	CUSH SHOE SUPPORT	4050-30	689	LCN
1	EA	BLADE STOP SPACER	4050-61	689	LCN
1	EA	THRESHOLD	566A-MSLA-10	A	ZER
1	EA	POWER SUPPLY	PS914 900-2RS KL900	LGR	VON
1	EA	CARD READER	FURNISHED BY SECURITY VENDOR		
1	SET	POINT TO POINT	WIRING DIAGRAMS		

DOOR OPERATION:
1. Door normally closed and secure.
2. Entry from secure side by valid credential or key override which will unlock electrified door.
3. Free egress from inside at all times.

Hardware Set No. 107

For use on door #(s):
1C00.7 1C03.3 1C03.4 1S03.2 1S04.2 1S05.2

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
1	EA	CONT. HINGE	224HD EPT (A31031G)	628	ANSI
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	KEYED REMOVABLE MULLION	KR4954-STAB (Type 22,)	689	ANSI
1	EA	PANIC HARDWARE	CD-35A-EO (Grade 1, Type 4, Function 01)	626	ANSI
1	EA	ELEC PANIC HARDWARE	QEL+-35A-NL-OP-388 (Grade 1, Type 4, Function 03)	626	ANSI
1	EA	RIM CYLINDER	20-057-ICX (E09222)	626	ANSI
2	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	PRIMUS CORE	20-740-XP (E09241L)	626	ANSI
2	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
2	EA	90 DEG OFFSET PULL	8190HD 10" O	630	IVE
2	EA	OH STOP	100S (C01541)	630	ANSI
2	EA	SURFACE CLOSER	4050 EDA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
2	EA	MOUNTING PLATE	4050-18PA	689	LCN

2	EA	CUSH SHOE SUPPORT	4050-30	689	LCN
2	EA	BLADE STOP SPACER	4050-61	689	LCN
1	EA	THRESHOLD	566A-MSLA-10	A	ZER
1	EA	POWER SUPPLY	PS914 900-2RS KL900	LGR	VON
	EA	CARD READER	FURNISHED BY SECURITY VENDOR		

DOOR OPERATION:
1. Door normally closed and secure.
2. Entry from secure side by valid credential or key override which will unlock electrified door.
3. Free egress from inside at all times.

Hardware Set No. 108

For use on door #(s):
1C11.1 1C17.1

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
1	EA	CONT. HINGE	224HD EPT (A31031G)	628	ANSI
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	SET	AUTO FLUSH BOLT	FB31P (Type 25)	630	ANSI
1	EA	EU STOREROOM LOCK	MA881L QN	626	FAL
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	PRIMUS CORE	20-740-XP (E09241L)	626	ANSI
1	EA	COORDINATOR	COR X FL (Type 21A)	628	ANSI
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	OH STOP & HOLDER	90H (C02511)	630	ANSI
2	EA	SURFACE CLOSER	4050 EDAW/62G (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
2	EA	KICK PLATE	8400 16" X 1" LDW B4E (J102)	630	ANSI
1	EA	GASKETING	188S-BK	S-Bk	ZER
1	EA	MEETING STILE	555AA X 55AA	AA	ZER
1	EA	THRESHOLD	566A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
1	EA	POWER SUPPLY	PS902	LGR	SCE
	EA	CARD READER	FURNISHED BY SECURITY VENDOR		
	SET	POINT TO POINT	WIRING DIAGRAMS		

DOOR OPERATION:
1. Door normally closed and secure.
2. Entry from secure side by valid credential or key override which will unlock electrified door.
3. Free egress from inside at all times.

Hardware Set No. 109

For use on door #(s):
1C02.2

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
1	EA	CONT. HINGE	224HD EPT (A31031G)	628	ANSI
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	KEYED REMOVABLE MULLION	KR4954-STAB (Type 22,)	689	ANSI
1	EA	PANIC HARDWARE	CD-98-EO (Grade 1, Type 1, Function 01)	626	ANSI
1	EA	ELEC PANIC HARDWARE	QEL+-98-L-NL-17 (Grade 1, Type 1, Function 09)	626	ANSI
1	EA	RIM CYLINDER	20-057-ICX (E09222)	626	ANSI
2	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
3	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
2	EA	OH STOP & HOLDER	90H (C02511)	630	ANSI
2	EA	SURFACE CLOSER	4050 EDAW/62G (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
2	EA	KICK PLATE	8400 16" X 1" LDW B4E (J102)	630	ANSI
1	EA	GASKETING	188S-BK	S-Bk	ZER
1	EA	MEETING STILE	555AA X 55AA	AA	ZER
1	EA	THRESHOLD	566A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
1	EA	POWER SUPPLY	PS914 900-2RS KL900	LGR	VON
	SET	POINT TO POINT	WIRING DIAGRAMS		

DOOR OPERATION:
1. Door normally closed and secure.
2. Entry from secure side by valid credential or key override which will unlock electrified door.
3. Free egress from inside at all times.

Hardware Set No. 110

For use on door #(s):
1C19.3

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD EPT (A31031G)	628	ANSI
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	EU STOREROOM LOCK	MA881L QN	626	FAL
1	EA	PRIMUS CORE	20-740-XP (E09241L)	626	ANSI
1	EA	OH STOP & HOLDER	90H (C02511)	630	ANSI
1	EA	SURFACE CLOSER	4050 EDAW/62G (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
1	EA	GASKETING	188S-BK	S-Bk	ZER
1	EA	THRESHOLD	566A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
1	EA	POWER SUPPLY	PS902	LGR	SCE
	EA	CARD READER	BY SECURITY VENDOR		
	SET	POINT TO POINT	WIRING DIAGRAMS		

DOOR OPERATION:
1. Door normally closed and secure.
2. Entry from secure side by valid credential or key override which will unlock electrified door.
3. Free egress from inside at all times.

Hardware Set No. 111

For use on door #(s):
1C21.2

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
1	EA	PANIC HARDWARE	98-EO (Grade 1, Type 1, Function 01)	626	ANSI
1	EA	PRIMUS CORE	20-740-XP (E09241L)	626	ANSI
1	EA	DOOR PULL	VR810 NL	630	IVE
1	EA	SURFACE CLOSER	4050 SCUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
1	EA	GASKETING	188S-BK	S-Bk	ZER
1	EA	THRESHOLD	566A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER

Hardware Set No. 112

For use on door #(s):
1B05.1 1C27.2 1G05.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	PRIMUS CORE	20-740-XP (E09241L)	626	ANSI
1	EA	SURFACE CLOSER	4050 SCUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
1	EA	GASKETING	188S-BK	S-Bk	ZER
1	EA	THRESHOLD	566A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER

Hardware Set No. 113

For use on door #(s):
1C02.3

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD EPT (A31031G)	628	ANSI
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	ELEC PANIC HARDWARE	QEL+-98-NL-OP-110MD (Grade 1, Type 1, Function 03)	626	ANSI
1	EA	RIM CYLINDER	20-057-ICX (E09222)	626	ANSI
1	EA	PRIMUS CORE	20-740-XP (E09241L)	626	ANSI
1	EA	SURFACE CLOSER	4050 EDA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
1	EA	GASKETING	188S-BK	S-Bk	ZER
1	EA	THRESHOLD	566A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
1	EA	POWER SUPPLY	PS914 900-2RS KL900	LGR	VON
1	EA	CARD READER	FURNISHED BY SECURITY VENDOR		
1	SET	POINT TO POINT	WIRING DIAGRAMS		

DOOR OPERATION:
1. Door normally closed and secure.
2. Entry from secure side by valid credential or key override which will unlock electrified door.
3. Free egress from inside at all times.

Hardware Set No. 114

For use on door #(s):
1C10.1

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
1	EA	CONT. HINGE	224HD EPT (A31031G)	628	ANSI
1	EA	POWER TRANSFER	EPT10 CON	689	VON
1	SET	AUTO FLUSH BOLT	FB31P (Type 25)	630	ANSI
1	EA	EU STOREROOM LOCK	MA881L QN	626	FAL
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	PRIMUS CORE	20-740-XP (E09241L)	626	ANSI
1	EA	COORDINATOR	COR X FL (Type 21A)	628	ANSI
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	OH STOP & HOLDER	90H (C02511)	630	ANSI
2	EA	SURFACE CLOSER	4050 EDAW/62G (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
2	EA	KICK PLATE	8400 8" X 1" LDW B4E (J102)	630	ANSI
1	EA	GASKETING	188S-BK	S-Bk	ZER
1	EA	MEETING STILE	555AA X 55AA	AA	ZER
1	EA	THRESHOLD	566A-MSLA-10	A	ZER
1	EA	RAIN DRIP	142A	A	ZER
1	EA	POWER SUPPLY	PS902	LGR	SCE
	EA	CARD READER	BY SECURITY VENDOR		
	SET	POINT TO POINT	WIRING DIAGRAMS		

DOOR OPERATION:
1. Door normally closed and secure.
2. Entry from secure side by valid credential or key override which will unlock electrified door.
3. Free egress from inside at all times.

Hardware Set No. 115

For use on door #(s):
1C00.6

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
1	EA	DUMMY PUSH BAR	350	626	VON
2	EA	90 DEG OFFSET PULL	8190HD 10" O	630	IVE
2	EA	OH STOP	100S (C01541)	630	ANSI
2	EA	SURFACE CLOSER	4050 EDA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
2	EA	MOUNTING PLATE	4050-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4050-30	689	LCN
2	EA	BLADE STOP SPACER	4050-61	689	LCN

Hardware Set No. 116

For use on door #(s):
1A01.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	PRIMUS CORE	20-740-XP (E09241L)	626	ANSI
1	EA	ELECTRIC STRIKE	6211 FSE CON (E59321)	630	ANSI
1	EA	OH STOP	100S (C01541)	630	ANSI
1	EA	SURFACE CLOSER	4050 EDA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
1	EA	MOUNTING PLATE	4050-18PA	689	LCN
1	EA	CUSH SHOE SUPPORT	4050-30	689	LCN
1	EA	BLADE STOP SPACER	4050-61	689	LCN
1	EA	POWER SUPPLY	PS902	LGR	SCE

DOOR OPERATION:
1. Door normally closed and secure.
2. Entry from secure side by remote release from reception desk. or key override.
3. Free egress from inside at all times.

Hardware Set No. 117

For use on door #(s):
1A01.2

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
1	EA	ASYLUM LOCK	MA411L QN (F30)	626	ANSI
2	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
2	EA	PRIMUS CORE	20-740-XP (E09241L)	626	ANSI
1	EA	ELECTRIC STRIKE	6211 FSE CON (E59321)	630	ANSI
1	EA	OH STOP	100S (C01541)	630	ANSI
1	EA	SURFACE CLOSER	4050 EDA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
1	EA	MOUNTING PLATE	4050-18PA	689	LCN
1	EA	CUSH SHOE SUPPORT	4050-30	689	LCN
1	EA	BLADE STOP SPACER	4050-61	689	LCN
1	EA	POWER SUPPLY	PS902	LGR	SCE
2	EA	CARD READER	FURNISHED BY SECURITY VENDOR		
1	SET	POINT TO POINT	WIRING DIAGRAMS		

DOOR OPERATION:
1. Door normally closed and secure.
2. Entry from either side by valid credential, remote release from reception desk or key override.

Hardware Set No. 118

For use on door #(s):
1G02.1 1G03.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
1	EA	CLASSROOM DEADLOCK	MA911L (F29)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	PRIMUS CORE	20-740-XP (E09241L)	626	ANSI
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4050 RW/PA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
1	EA	GASKETING	188S-BK	S-Bk	ZER
1	EA	THRESHOLD	566A-MSLA-10	A	ZER

Hardware Set No. 119

For use on door #(s):
1C02.1

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
2	EA	DUMMY PUSH BAR	350	626	VON
2	EA	90 DEG OFFSET PULL	8190HD 10" O	630	IVE
2	EA	SURFACE CLOSER	4050 EDA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
2	EA	KICK PLATE	8400 8" X 1" LDW B4E (J102)	630	ANSI
2	EA	WALL STOP/HOLDER	FS495 (L11291)	626	ANSI
2	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 200

For use on door #(s):
1S05.1

Provide each PR door(s) with the following:

Hardware Set No. 201

For use on door #(s):
1S02.1

Provide each SGL door(s) with the following:

Hardware Set No. 202

For use on door #(s):
1S03.1 1S04.1 2S03.3 2S04.1 2S05.3

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
2	EA	FIRE EXIT HARDWARE	9827-L-BE-F-LBR-17-499F (Grade 1, Type 2LBR, Function 14)	626	ANSI
2	EA	SURFACE CLOSER	4050 RW/PA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
2	EA	KICK PLATE	8400 8" X 1" LDW B4E (J102)	630	ANSI
2	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
2	EA	GASKETING	8042S-BK	S-Bk	ZER
1	EA	MEETING STILE	8217S-BK	S-Bk	ZER

Hardware Set No. 203

For use on door #(s):
2S02.2

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
1	EA	FIRE EXIT HARDWARE	98-L-BE-F-17 (Grade 1, Type 1, Function 14)	626	ANSI
1	EA	SURFACE CLOSER	4050 RW/PA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
2	EA	GASKETING	8042S-BK	S-Bk	ZER

Hardware Set No. 204

For use on door #(s):
1C00.4 1C00.8 2C18.1 2D00.1

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONT. HINGE	224HD EPT (A31031G)	628	ANSI
2	EA	POWER TRANSFER	EPT10 CON	689	VON
2	EA	ELEC PANIC HARDWARE	9827-L-E996-17-FSE-299F (Grade 1, Type 2, Function 08)	626	ANSI
2	EA	RIM CYLINDER	20-057-ICX (E09222)	626	ANSI
2	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
2	EA	SURFACE CLOSER	4050 EDA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
2	EA	FIRE/LIFE WALL MAG	SEM7850 (EXTENSION RODS AS REQ) (C0)	689	ANSI
2	EA	SILENCER	SR64 (L03011)	GRY	ANSI
1	EA	POWER SUPPLY	PS902	LGR	SCE

DOOR OPERATION:
1. Doors are part of security lock down.
2. Door normally held open on wall magnets.
3. During lock down doors will be released from magnets and electrified lever trim will be locked.
4. Lever trims can be unlocked electrically as desired and doors closed to section off area.
5. Free egress from push side at all times.

Hardware Set No. 205

For use on door #(s):
1D01.1 1D01.2 1D01.3 2D01.1 2D01.2 2D01.3

Provide each DE door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
2	EA	DUMMY PUSH BAR	350	626	VON
2	EA	SURFACE CLOSER	4050 CUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI
2	EA	KICK PLATE	8400 8" X 1" LDW B4E (J102)	630	ANSI
2	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 206

For use on door #(s):

2C00.2 2C00.3

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
2	EA	FIRE EXIT HARDWARE	9827-L-BE-F-LBR-17-499F (Grade 1, Type 2LBR, Function 14)	626	ANSI
2	EA	SURFACE CLOSER	4050 EDA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
2	EA	KICK PLATE	8400 8" X 1" LDW B4E (J102)	630	ANSI
2	EA	FIRE/LIFE WALL MAG	SEM7850 (EXTENSION RODS AS REQ) (C0)	689	ANSI
2	EA	GASKETING	8042S-BK	S-Bk	ZER
1	EA	MEETING STILE	8217S-BK	S-Bk	ZER

Hardware Set No. 207

For use on door #(s):

1C02.4

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
2	EA	FIRE EXIT HARDWARE	9847-L-BE-F-LBR-17 (Grade 1, Type 2LBR, Function 14)	626	ANSI
2	EA	SURFACE CLOSER	4050 EDA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
2	EA	KICK PLATE	8400 8" X 1" LDW B4E (J102)	630	ANSI
2	EA	FIRE/LIFE WALL MAG	SEM7850 (EXTENSION RODS AS REQ) (C0)	689	ANSI
2	EA	GASKETING	8042S-BK	S-Bk	ZER
1	EA	MEETING STILE	8217S-BK	S-Bk	ZER

DOOR OPERATION:

1. Door held open by wall magnets connected to fire alarm system.

Hardware Set No. 208

For use on door #(s):
2C00.1 2C00.4

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
2	SET	PUSH/PULL BAR	9190HD-10"-NO (J503)	630	ANSI
2	EA	SURFACE CLOSER	4050 CUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI
2	EA	MOUNTING PLATE	4050-18PA	689	LCN
2	EA	CUSH SHOE SUPPORT	4050-30	689	LCN
2	EA	BLADE STOP SPACER	4050-61	689	LCN

Hardware Set No. 300

For use on door #(s):
1A03.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 (A8111)	652	ANSI
1	EA	OFFICE LOCK	MA571L QN (F13)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	SURFACE CLOSER	4050 RW/PA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 301

For use on door #(s):
1A11.1 1C23.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 (A8112)	652	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	PRIMUS CORE	20-740-XP (E09241L)	626	ANSI
1	EA	ELECTRIC STRIKE	6400 FSE	630	VON
1	EA	SURFACE CLOSER	4050 RW/PA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI

1	EA	POWER SUPPLY	PS902	LGR	SCE
	EA	CARD READER	FURNISHED BY SECURITY VENDOR		
	SET	POINT TO POINT	WIRING DIAGRAMS		

DOOR OPERATION:
1. Door normally closed and secure.
2. Entry from secure side by valid credential or key override which will unlock electrified door.
3. Free egress from inside at all times.

Hardware Set No. 302

For use on door #(s):

1A05.1	1A07.1	1A09.1	1A28.1	1A29.1	1A30.1
1A31.1	1A32.1	1A33.1	1A35.1		

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 (A8112)	652	ANSI
1	EA	OFFICE LOCK	MA571L QN (F13)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	PRIMUS CORE	20-740-XP (E09241L)	626	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 303

For use on door #(s):

1A12.1	1A23.1	1A34.1	1C16.1	1C22.1	1C26.1
1C31.1	1F04.1				

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 (A8112)	652	ANSI
1	EA	OFFICE LOCK	MA571L QN (F13)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 304

For use on door #(s):

1A22.1

Provide each SGL door(s) with the following:

Qty	Description	Catalog Number	Finish	Mfr

3	EA	HINGE	5BB1 4.5 X 4.5 NRP (A8112)	652	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	PRIMUS CORE	20-740-XP (E09241L)	626	ANSI
1	EA	ELECTRIC STRIKE	6211 FSE CON (E59321)	630	ANSI
1	EA	OH STOP	450S (C05541)	630	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI
1	EA	POWER SUPPLY	PS902	LGR	SCE
1	EA	CARD READER	FURNISHED BY SECURITY VENDOR		
1	SET	POINT TO POINT	WIRING DIAGRAMS		

DOOR OPERATION:
1. Door normally closed and secure.
2. Entry from secure side by valid credential or key override which will unlock electrified door.
3. Free egress from inside at all times.

Hardware Set No. 305

For use on door #(s):
1A20.1 1B07.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP (A8112)	652	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	SURFACE CLOSER	4050 CUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
1	EA	GASKETING	8042S-BK	S-Bk	ZER

Hardware Set No. 306

For use on door #(s):
1C41.3

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 (A8111)	652	ANSI
1	EA	OFFICE LOCK	MA571L QN (F13)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	SURFACE CLOSER	4050 RW/PA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
1	EA	WALL STOP/HOLDER	FS495 (L11291)	626	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 307

For use on door #(s):
1A27.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP (A8111)	652	ANSI
1	EA	OFFICE LOCK	MA571L QN (F13)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	SURFACE CLOSER	4050 HCUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI
1	EA	FLUSH PANEL ADAPTER	4050-419	689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 308

For use on door #(s):
1A14.1 1A16.1 1C00.3 1C37.1 2B05.1 2D09.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP (A8112)	652	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	SURFACE CLOSER	4050 CUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI
1	EA	FLUSH PANEL ADAPTER	4050-419	689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 309

For use on door #(s):
1A02.1

Provide each DD door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
8	EA	HINGE	5BB1 4.5 X 4.5 NRP (A8112)	652	ANSI
2	EA	DUTCH DOOR BOLT	054	626	IVE

2	EA	MANUAL FLUSH BOLT	FB458 (L04251)	626	ANSI
1	EA	CLASSRM SEC LOCK	MA431L QN-SI w/ DEADBOLT (F32)	626	ANSI
1	EA	CYLINDER TURN	09-904NH-L583-639	626	SCH
2	EA	OH STOP	450S (C05541)	630	ANSI
4	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 310

For use on door #(s):
1A10.3

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 (A8111)	652	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	PRIMUS CORE	20-740-XP (E09241L)	626	ANSI
1	EA	ELECTRIC STRIKE	6400 FSE	630	VON
1	EA	SURFACE CLOSER	4050 RW/PA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
1	EA	POWER SUPPLY	PS902	LGR	SCE
1	EA	CARD READER	FURNISHED BY SECURITY VENDOR		
1	SET	POINT TO POINT	WIRING DIAGRAMS		

DOOR OPERATION:
1. Door normally closed and secure.
2. Entry from secure side by valid credential or key override which will unlock electrified door.
3. Free egress from inside at all times.

Hardware Set No. 311

For use on door #(s):
1A26.1 1C10.2 1C29.1 1C33.1 1C35.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 (A8112)	652	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 312

For use on door #(s):

1B08.1	1B10.1	1B12.1	1B14.1	1D08.1	1D10.1
1D12.1	1D14.1	1D16.1	1D18.1	2B10.1	2B12.1
2B14.1	2B16.1	2D08.1	2D10.1	2D12.1	2D14.1
2D16.1	2D18.1				

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP (A8111)	652	ANSI
1	EA	PANIC HARDWARE	98-L-2SI-17 (Grade 1, Type 1, Function 08)	626	ANSI
1	EA	RIM CYLINDER	20-057-ICX (E09222)	626	ANSI
1	EA	RIM CYL THUMBTURN	XB11-979	626	SCH
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	SURFACE CLOSER	4050 HCUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI
1	EA	FLUSH PANEL ADAPTER	4050-419	689	LCN
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 313

For use on door #(s):

1C39.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
2	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
2	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	ELECTRIC STRIKE	6400 FSE	630	VON
1	EA	SURFACE CLOSER	4050 HCUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI
1	EA	FLUSH PANEL ADAPTER	4050-419	689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI
1	EA	KEY SWITCH	653-15 L2	630	SCE
1	EA	POWER SUPPLY	PS902 FA900 KL900	LGR	SCE
	SET	POINT TO POINT	WIRING DIAGRAMS		

DOOR OPERATION:
1. Door is part of electronic security lock down.
2. Door is locked and unlocked via electric strike on frame by keyswitch on wall.
3. During a lock down electric strike is released and will secure door.
4. Free egress at all times from inside.

Hardware Set No. 314

For use on door #(s):

1D04.2	1D06.2	2B04.1	2B04.2	2C09.2	2C09.3

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP (A8111)	652	ANSI
1	EA	CLASSRM SEC LOCK	MA431L QN-SI w/ DEADBOLT (F32)	626	ANSI
1	EA	CYLINDER TURN	09-904NH-L583-639	626	SCH
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 315

For use on door #(s):

1B01.1	1B03.1	1B04.1	1D02.1	1D07.1	1D09.1
1D11.1	2B01.1	2B02.1	2B03.1	2B08.1	2C01.1
2C01.2	2D02.4	2D03.1	2D04.1	2D05.1	2D06.1
2D07.1					

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 (A8111)	652	ANSI
1	EA	CLASSRM SEC LOCK	MA431L QN-SI w/ DEADBOLT (F32)	626	ANSI
1	EA	CYLINDER TURN	09-904NH-L583-639	626	SCH
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 316

For use on door #(s):

2C02.1	2C14.1	2D02.1	2E00.1	2E00.2

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 (A8111)	652	ANSI
1	EA	CLASSRM SEC LOCK	MA431L QN-SI w/ DEADBOLT (F32)	626	ANSI
1	EA	CYLINDER TURN	09-904NH-L583-639	626	SCH
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	OH STOP	90S J (C02541)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 317

For use on door #(s):
1C49.1 1C49.2

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
1	EA	PANIC HARDWARE	CDSI-98-L-NL-17 (Grade 1, Type 1, Function 09)	626	ANSI
1	EA	RIM CYLINDER	20-057-ICX (E09222)	626	ANSI
2	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
3	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	ELECTRIC STRIKE	6111 FSE (E59311)	630	ANSI
1	EA	SURFACE CLOSER	4050 EDA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
1	EA	FLUSH PANEL ADAPTER	4050-419	689	LCN
1	EA	WALL STOP/HOLDER	FS495 (L11291)	626	ANSI
1	EA	GASKETING	188S-BK	S-Bk	ZER
1	EA	MEETING STILE	8217S-BK	S-Bk	ZER
1	EA	DOOR BOTTOM	364AA6	AA	ZER
1	EA	THRESHOLD	544A-MSLA-10	A	ZER
1	EA	KEY SWITCH	653-15 L2	630	SCE
1	EA	POWER SUPPLY	PS902 FA900 KL900	LGR	SCE
	SET	POINT TO POINT	WIRING DIAGRAMS		

DOOR OPERATION:
1. Door is part of electronic security lock down.
2. Door is locked and unlocked via electric strike on frame.
3. During a lock down electric strike is released and will secure door.
4. Free egress at all times from inside.

Hardware Set No. 318

For use on door #(s):
1C53.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 (A8112)	652	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	SURFACE CLOSER	4050 RW/PA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 319

For use on door #(s):
1D13.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP (A8112)	652	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	SURFACE CLOSER	4050 CUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 320

For use on door #(s):
2B02.2 2C09.1 2E00.3 2E00.4

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP (A8111)	652	ANSI
1	EA	CLASSRM SEC LOCK	MA431L QN-SI w/ DEADBOLT (F32)	626	ANSI
1	EA	CYLINDER TURN	09-904NH-L583-639	626	SCH
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	OH STOP	90S J (C02541)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 321

For use on door #(s):
1C59.1

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1 4.5 X 4.5 (A8112)	652	ANSI
2	EA	MANUAL FLUSH BOLT	FB458 (L04251)	626	ANSI
1	EA	DUST PROOF STRIKE	DP2 (L14011)	626	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	OH STOP	90S J (C02541)	630	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
2	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 322

For use on door #(s):
1C55.1 1C57.1 2B06.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 (A8111)	652	ANSI
1	EA	OFFICE LOCK	MA571L QN (F13)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 323

For use on door #(s):
1C52.1

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1 4.5 X 4.5 (A8112)	652	ANSI
2	EA	MANUAL FLUSH BOLT	FB458 (L04251)	626	ANSI
1	EA	DUST PROOF STRIKE	DP2 (L14011)	626	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
2	EA	OH STOP	90S J (C02541)	630	ANSI
2	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 324

For use on door #(s):
1C09.1 1C12.1 1C20.4 1C38.1 1C51.1 1F07.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 (A8112)	652	ANSI
1	EA	CLASSROOM LOCK	MA561L QN (F05)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 325

For use on door #(s):
1C50.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 (A8112)	652	ANSI
1	EA	CLASSROOM LOCK	MA561L QN (F05)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
1	EA	GASKETING	870AA	AA	ZER
1	EA	DOOR BOTTOM	364AA6	AA	ZER
1	EA	THRESHOLD	544A-MSLA-10	A	ZER
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 326

For use on door #(s):
1C47.5

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
1	EA	DUMMY PUSH BAR	350	626	VON
1	EA	90 DEG OFFSET PULL	8190HD 10" O	630	IVE
1	EA	SURFACE CLOSER	4050 RW/PA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 327

For use on door #(s):
1C47.1 1C47.2

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
1	EA	PANIC HARDWARE	CDSI-9875-EO (Grade 1, Type 3, Function 01)	626	ANSI
1	EA	CYLINDER TURN	09-904NH-L583-639	626	SCH
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	90 DEG OFFSET PULL	8190HD 10" O	630	IVE
1	EA	SURFACE CLOSER	4050 HCUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI

1	EA	FLUSH PANEL ADAPTER	4050-419	689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
1	EA	GASKETING	188S-BK	S-Bk	ZER
1	EA	MEETING STILE	8217S-BK	S-Bk	ZER
1	EA	DOOR BOTTOM	364AA6	AA	ZER
1	EA	THRESHOLD	544A-MSLA-10	A	ZER

Hardware Set No. 328

For use on door #(s):

1C43.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 (A8112)	652	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 329

For use on door #(s):

1C28.4 1C40.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP (A8112)	652	ANSI
1	EA	CLASSROOM LOCK	MA561L QN (F05)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	OH STOP	90S (C02541)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 330

For use on door #(s):

1C14.1 1C15.1 1C20.1 1C20.3 1C28.1 1C28.3
1C44.1 1C45.1 2C10.1 2C11.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 (A8111)	652	ANSI

1	EA	CLASSROOM DEADLOCK	MA911L (F29)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4050 RW/PA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 331

For use on door #(s):

1C20.2 1C28.2

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 (A8111)	652	ANSI
1	EA	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4050 EDA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 332

For use on door #(s):

2D02.2 2D02.3

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 (A8111)	652	ANSI
1	EA	PASSAGE SET	MA101 QN (F01)	626	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 333

For use on door #(s):

1A04.1 1A06.1 1A25.1 1E03.1 1F06.1 2E02.1
2E03.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 (A8111)	652	ANSI
1	EA	PRIVACY LOCK	MA321 QN (F22)	626	ANSI
1	EA	SURFACE CLOSER	4050 RW/PA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 334

For use on door #(s):

1C05.1 1C07.1 1E07.1 2C08.1 2E07.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP (A8112)	652	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	OH STOP	450S (C05541)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 335

For use on door #(s):

2C06.1 2E06.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP (A8112)	652	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	PRIMUS CORE	20-740-XP (E09241L)	626	ANSI
1	EA	ELECTRIC STRIKE	6211 FSE CON (E59321)	630	ANSI
1	EA	SURFACE CLOSER	4050 CUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI
1	EA	POWER SUPPLY	PS902	LGR	SCE
1	EA	CARD READER	FURNISHED BY SECURITY VENDOR		
1	SET	POINT TO POINT	WIRING DIAGRAMS		

DOOR OPERATION:

1. Door normally closed and secure.
2. Entry from secure side by valid credential or key override which will unlock electrified door.
3. Free egress from inside at all times.

Hardware Set No. 336

For use on door #(s):
2C04.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 (A8111)	652	ANSI
1	EA	CLASSRM SEC LOCK	MA431L QN-SI w/ DEADBOLT (F32)	626	ANSI
1	EA	CYLINDER TURN	09-904NH-L583-639	626	SCH
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
1	EA	GASKETING	188S-BK	S-Bk	ZER
1	EA	MEETING STILE	8217S-BK	S-Bk	ZER
1	EA	DOOR BOTTOM	364AA6	AA	ZER
1	EA	THRESHOLD	544A-MSLA-10	A	ZER

Hardware Set No. 337

For use on door #(s):
2C04.2

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 (A8111)	652	ANSI
1	EA	PASSAGE SET	MA101 QN (F01)	626	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
1	EA	GASKETING	188S-BK	S-Bk	ZER
1	EA	MEETING STILE	8217S-BK	S-Bk	ZER
1	EA	DOOR BOTTOM	364AA6	AA	ZER
1	EA	THRESHOLD	544A-MSLA-10	A	ZER

Hardware Set No. 338

For use on door #(s):
2C13.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 (A8112)	652	ANSI
1	EA	CLASSROOM LOCK	MA561L QN (F05)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 339

For use on door #(s):
2C12.1

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1 4.5 X 4.5 NRP (A8112)	652	ANSI
2	EA	MANUAL FLUSH BOLT	FB458 (L04251)	626	ANSI
1	EA	DUST PROOF STRIKE	DP2 (L14011)	626	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	SURFACE CLOSER	4050 EDA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H) (Active leaf only)	689	ANSI
2	EA	KICK PLATE	8400 8" X 1" LDW B4E (J102)	630	ANSI
2	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
2	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 340

For use on door #(s):
1G05.2 2C17.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP (A5112)	630	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 341

For use on door #(s):
E05.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 (A8112)	652	ANSI
1	EA	OFFICE LOCK	MA571L QN (F13)	626	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI

1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	ELECTRIC STRIKE	6400 FSE	630	VON
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI
1	EA	POWER SUPPLY	PS902	LGR	SCE
	SET	POINT TO POINT	WIRING DIAGRAMS		

DOOR OPERATION:
1. Door normally closed and secure.
2. Entry from secure side by valid credential or key override which will unlock electrified door.
3. Free egress from inside at all times.

Hardware Set No. 342

For use on door #(s):
1E00.1 1E00.2 1E00.3 1E00.4

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP (A8111)	652	ANSI
1	EA	OFFICE LOCK	MA571L QN (F13)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	SURFACE CLOSER	4050 CUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 343

For use on door #(s):
1D03.1 1D03.2

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 (A8112)	652	ANSI
1	EA	CLASSROOM LOCK	MA561L QN (F05)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	OH STOP	90S J (C02541)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 344

For use on door #(s):
1D05.2

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP (A8112)	652	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	SURFACE CLOSER	4050 CUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 345

For use on door #(s):
1D05.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP (A8112)	652	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	SURFACE CLOSER	4050 CUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI
1	EA	FLUSH PANEL ADAPTER	4050-419	689	LCN
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
2	EA	GASKETING	8042S-BK	S-Bk	ZER

Hardware Set No. 346

For use on door #(s):
1B02.1

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP (A8111)	652	ANSI
2	EA	MANUAL FLUSH BOLT	FB458 (L04251)	626	ANSI
1	EA	DUST PROOF STRIKE	DP2 (L14011)	626	ANSI
1	EA	CLASSRM SEC LOCK	MA431L QN-SI w/ DEADBOLT (F32)	626	ANSI
1	EA	CYLINDER TURN	09-904NH-L583-639	626	SCH
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
2	EA	OH STOP	90S J (C02541)	630	ANSI
2	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 347

For use on door #(s):
1B06.1

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP (A8111)	652	ANSI
2	EA	MANUAL FLUSH BOLT	FB458 (L04251)	626	ANSI
1	EA	DUST PROOF STRIKE	DP2 (L14011)	626	ANSI
2	EA	CLASSRM SEC LOCK	MA431L QN-SI w/ DEADBOLT (F32)	626	ANSI
1	EA	CYLINDER TURN	09-904NH-L583-639	626	SCH
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
2	EA	OH STOP	90S (C02541)	630	ANSI
2	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 348

For use on door #(s):
1B02.2

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP (A8111)	652	ANSI
2	EA	MANUAL FLUSH BOLT	FB458 (L04251)	626	ANSI
1	EA	DUST PROOF STRIKE	DP2 (L14011)	626	ANSI
1	EA	PASSAGE SET	MA101 QN (F01)	626	ANSI
2	EA	OH STOP	90S (C02541)	630	ANSI
2	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 349

For use on door #(s):
1C13.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP (A8112)	652	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	OH STOP	90S (C02541)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 350

For use on door #(s):
1C18.1 1C18.2

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
1	EA	PANIC HARDWARE	CD-98-NL-OP-110MD (Grade 1, Type 1, Function 03)	626	ANSI
1	EA	RIM CYLINDER	20-057-ICX (E09222)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
2	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	90 DEG OFFSET PULL	8190HD 10" O	630	IVE
1	EA	SURFACE CLOSER	4050 HCUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 351

For use on door #(s):
1C19.1

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1 4.5 X 4.5 (A8112)	652	ANSI
2	EA	MANUAL FLUSH BOLT	FB458 (L04251)	626	ANSI
1	EA	DUST PROOF STRIKE	DP2 (L14011)	626	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	OH STOP	90S J (C02541) (Inactive Leaf Only)	630	ANSI
1	EA	SURFACE CLOSER	4050 RW/PA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H) (Active Leaf Only)	689	ANSI
2	EA	KICK PLATE	8400 8" X 1" LDW B4E (J102)	630	ANSI
1	EA	WALL STOP/HOLDER	FS495 (L11291)	626	ANSI
2	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 352

For use on door #(s):
1C21.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP (A8111)	652	ANSI
1	EA	FIRE EXIT HARDWARE	98-L-NL-F-17 (Grade 1, Type 1, Function 09)	626	ANSI
1	EA	RIM CYLINDER	20-057-ICX (E09222)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI

1	EA	SURFACE CLOSER	4050 CUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
1	EA	GASKETING	188S-BK	S-Bk	ZER

Hardware Set No. 353

For use on door #(s):
1C27.1

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1 4.5 X 4.5 NRP (A8112)	652	ANSI
2	EA	MANUAL FLUSH BOLT	FB458 (L04251)	626	ANSI
1	EA	DUST PROOF STRIKE	DP2 (L14011)	626	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	OH STOP	90S (C02541) (Inactive Leaf Only)	630	ANSI
1	EA	SURFACE CLOSER	4050 CUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H) (Closer on Active Leaf Only)	689	ANSI
2	EA	KICK PLATE	8400 8" X 1" LDW B4E (J102)	630	ANSI
2	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 354

For use on door #(s):
1C25.1

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1 4.5 X 4.5 NRP (A8112)	652	ANSI
2	EA	POWER TRANSFER	EPT10 CON	689	VON
2	EA	MANUAL FLUSH BOLT	FB458 (L04251)	626	ANSI
1	EA	DUST PROOF STRIKE	DP2 (L14011)	626	ANSI
1	EA	EU STOREROOM LOCK	MA881L QN	626	FAL
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	PRIMUS CORE	20-740-XP (E09241L)	626	ANSI
2	EA	OH STOP & HOLDER	90H (C02511)	630	ANSI
2	EA	SURFACE CLOSER	4050 CUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI
2	EA	KICK PLATE	8400 8" X 1" LDW B4E (J102)	630	ANSI
1	EA	POWER SUPPLY	PS902	LGR	SCE
1	EA	CARD READER	FURNISHED BY SECURITY VENDOR		

DOOR OPERATION:
1. Door normally closed and secure.
2. Entry from secure side by valid credential or key override which will unlock electrified door.

3. Free egress from inside at all times.
4. Door position switch and request to exit connected to access control system for monitoring.

Hardware Set No. 355

For use on door #(s):
1C23.2

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 (A8112)	652	ANSI
1	EA	PASSAGE SET	MA101 QN (F01)	626	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 356

For use on door #(s):
1C19.2

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1 4.5 X 4.5 NRP (A8112)	652	ANSI
2	EA	MANUAL FLUSH BOLT	FB458 (L04251)	626	ANSI
1	EA	DUST PROOF STRIKE	DP2 (L14011)	626	ANSI
1	EA	CLASSROOM LOCK	MA561L QN (F05)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
2	EA	OH STOP	90S (C02541)	630	ANSI
2	EA	KICK PLATE	8400 8" X 1" LDW B4E (J102)	630	ANSI
2	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 357

For use on door #(s):
1E02.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 (A8111)	652	ANSI
1	EA	PRIVACY LOCK	MA321 QN (F22)	626	ANSI
1	EA	SURFACE CLOSER	4050 CUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 358

For use on door #(s):
1C03.5

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HW HINGE	5BB1HW 4.5 X 4.5 (A8111)	652	ANSI
2	EA	MANUAL FLUSH BOLT	FB458 (L04251)	626	ANSI
1	EA	DUST PROOF STRIKE	DP2 (L14011)	626	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
2	EA	KICK PLATE	8400 8" X 1" LDW B4E (J102)	630	ANSI
2	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
2	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 359

For use on door #(s):
1C17.2

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1 4.5 X 4.5 NRP (A8112)	652	ANSI
2	EA	MANUAL FLUSH BOLT	FB458 (L04251)	626	ANSI
1	EA	DUST PROOF STRIKE	DP2 (L14011)	626	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
2	EA	OH STOP & HOLDER	90H (C02511)	630	ANSI
2	EA	KICK PLATE	8400 16" X 1" LDW B4E (J102)	630	ANSI
2	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 360

For use on door #(s):
1F08.1

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1 4.5 X 4.5 (A8112)	652	ANSI
2	EA	MANUAL FLUSH BOLT	FB458 (L04251)	626	ANSI
1	EA	DUST PROOF STRIKE	DP2 (L14011)	626	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
2	EA	KICK PLATE	8400 8" X 1" LDW B4E (J102)	630	ANSI
2	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
2	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 361

For use on door #(s):
1F05.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 (A8112)	652	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 362

For use on door #(s):
1F09.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP (A8112)	652	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	OH STOP	90S (C02541)	630	ANSI
1	EA	KICK PLATE	8400 16" X 1" LDW B4E (J102)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 363

For use on door #(s):
1F03.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 (A8111)	652	ANSI
1	EA	CLASSRM SEC LOCK	MA431L QN-SI w/ DEADBOLT (F32)	626	ANSI
1	EA	CYLINDER TURN	09-904NH-L583-639	626	SCH
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
1	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	SURFACE CLOSER	4050 HCUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 16" X 2" LDW B4E (J102)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 364

For use on door #(s):
2D02.5

Provide each BF door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	SET	BIFOLD TRACK	200FS SERIES		JOH
2	EA	DOOR PULL, 3/4" RND	8102HD 8" STD	630	IVE

Hardware Set No. 365

For use on door #(s):
1C04.1 1C04.2 1G05.3

Provide each RU door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
	EA	ALL HARDWARE BY	DOOR MANUFACTURER		

Hardware Set No. 366

For use on door #(s):
1C03.1 1C03.2

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONT. HINGE	224HD EPT (A31031G)	628	ANSI
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	KEYED REMOVABLE MULLION	KR4954-STAB (Type 22,)	689	ANSI
1	EA	ELEC PANIC HARDWARE	QEL+-98-EO (Grade 1, Type 1, Function 01)	626	ANSI
1	EA	ELEC PANIC HARDWARE	QEL+-98-NL-OP-110MD (Grade 1, Type 1, Function 03)	626	ANSI
1	EA	RIM CYLINDER	20-057-ICX (E09222)	626	ANSI
2	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
3	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
2	EA	90 DEG OFFSET PULL	8190HD 10" O	630	IVE
2	EA	OH STOP	100SE ADJ (C01541)	630	ANSI
2	EA	FIRE/LIFE CLOSER	4040SE WMS (C0Unknown PT-4D, PT-4N, PT-4P)	689	ANSI
2	EA	MOUNTING PLATE	4050-18PA	689	LCN
1	EA	KEY SWITCH	653-15 L2	630	SCE
1	EA	POWER SUPPLY	PS914 900-2RS FA900 KL900	LGR	VON
	SET	POINT TO POINT	WIRING DIAGRAMS		

DOOR OPERATION:
1. This opening is part of a security lock down.
2. Exit device latches can be electrically retracted for push pull operation by keyswitch on wall.
3. Doors can also be held open by electronic hold-open closers.
4. During lock down doors will be released from hold open position and exit device latches will release for locked condition.
5. Free egress from push side at all times.

Hardware Set No. 367

For use on door #(s):
1C41.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP (A8111)	652	ANSI
1	EA	PANIC HARDWARE	LD-98-L-NL-17 (Grade 1, Type 1, Function 09)	626	ANSI
1	EA	RIM CYLINDER	20-057-ICX (E09222)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
2	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	ELECTRIC STRIKE	6300 FSE (E09731)	630	ANSI
1	EA	SURFACE CLOSER	4050 HCUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI
1	EA	FLUSH PANEL ADAPTER	4050-419	689	LCN
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI
1	EA	KEY SWITCH	653-15 L2	630	SCE
1	EA	POWER SUPPLY	PS902 FA900 KL900	LGR	SCE
	SET	POINT TO POINT	WIRING DIAGRAMS		

DOOR OPERATION:
1. Door is part of electronic security lock down.
2. Door is locked and unlocked via electric strike on frame by keyswitch on wall.
3. During a lock down electric strike is released and will secure door.
4. Free egress at all times from inside.

Hardware Set No. 368

For use on door #(s):
1C47.6

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	CONT. HINGE	224HD (A31031G)	628	ANSI
1	EA	PANIC HARDWARE	CD-9847-L-NL-LBR-17 (Grade 1, Type 8, Function 09)	626	ANSI
1	EA	PANIC HARDWARE	LD-9847-EO-LBR (Grade 1, Type 8, Function 01)	626	ANSI

1	EA	RIM CYLINDER	20-057-ICX (E09222)	626	ANSI
1	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
2	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
2	EA	SURFACE CLOSER	4050 EDA (C0Unknown PT-4A, PT-4C, PT-4D, PT-4H)	689	ANSI
2	EA	WALL STOP/HOLDER	FS495 (L11291)	626	ANSI
1	EA	GASKETING	188S-BK	S-Bk	ZER
1	EA	GASKETING	429A	A	ZER
1	EA	GASKETING	770AA	AA	ZER
1	EA	MEETING STILE	555AA X 55AA	AA	ZER
1	EA	MEETING STILE	8217S-BK	S-Bk	ZER
2	EA	DOOR BOTTOM	355A6	A	ZER
2	EA	SILENCER	SR64 (L03011)	GRY	ANSI

Hardware Set No. 369

For use on door #(s):
1D04.1 1D06.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP (A8111)	652	ANSI
1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
2	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
2	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	ELECTRIC STRIKE	6400 FSE	630	VON
1	EA	SURFACE CLOSER	4050 CUSH (C0Unknown PT-4A, PT-4C, PT-4D, PT-4G, PT-4H)	689	ANSI
1	EA	KICK PLATE	8400 8" X 2" LDW B4E (J102)	630	ANSI
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI
1	EA	KEY SWITCH	653-15 L2	630	SCE
1	EA	POWER SUPPLY	PS902 FA900 KL900	LGR	SCE
	SET	POINT TO POINT	WIRING DIAGRAMS		

DOOR OPERATION:
1. Door is part of electronic security lock down.
2. Door is locked and unlocked via electric strike on frame by keyswitch on wall.
3. During a lock down electric strike is released and will secure door.
4. Free egress at all times from inside.

Hardware Set No. 370

For use on door #(s):
1C30.1 1C32.1

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HW HINGE	5BB1HW 4.5 X 4.5 (A8111)	652	ANSI

1	EA	STOREROOM LOCK	MA581L QN (F07)	626	ANSI
2	EA	MORTISE CYLINDER	20-061-ICX (E09211)	626	ANSI
2	EA	FSIC CORE	23-030 (E09241L)	626	ANSI
1	EA	ELECTRIC STRIKE	6400 FSE	630	VON
1	EA	WALL STOP	WS406/407CCV (L52251)	630	ANSI
3	EA	SILENCER	SR64 (L03011)	GRY	ANSI
1	EA	KEY SWITCH	653-15 L2	630	SCE
1	EA	POWER SUPPLY	PS902 FA900 KL900	LGR	SCE
	SET	POINT TO POINT	WIRING DIAGRAMS		

DOOR OPERATION:
1. Door is part of electronic security lock down.
2. Door is locked and unlocked via electric strike on frame by keyswitch on wall.
3. During a lock down electric strike is released and will secure door.
4. Free egress at all times from inside.

Miscellaneous Items

Qty		Description	Catalog Number	Finish	Mfr	Handing
1	EA	PUSHBUTTON CONSOLE	8204		SCE	

SECTION 08 81 00

GLAZING
08/11

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 NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1	(2009; Errata 2010) Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

ASTM INTERNATIONAL (ASTM)

ASTM C1036	(2010; E 2012) Standard Specification for Flat Glass
ASTM C1048	(2012; E 2012) Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass
ASTM C1172	(2009; E 2011) Standard Specification for Laminated Architectural Flat Glass
ASTM C509	(2006; R 2011) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM C864	(2005; R 2011) Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers
ASTM C920	(2014a) Standard Specification for Elastomeric Joint Sealants
ASTM D2287	(2012) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
ASTM D395	(2014) Standard Test Methods for Rubber Property - Compression Set
ASTM E1300	(2012a; E 2012) Determining Load Resistance of Glass in Buildings
ASTM E2129	(2010) Standard Practice for Data Collection for Sustainability Assessment of Building Products
ASTM E413	(2010) Rating Sound Insulation
ASTM E90	(2009) Standard Test Method for Laboratory

	Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
ASTM F1233	(2008; R 2013) Security Glazing Materials and Systems

GLASS ASSOCIATION OF NORTH AMERICA (GANA)

GANA Glazing Manual	(2004) Glazing Manual
GANA Sealant Manual	(2008) Sealant Manual

INSULATING GLASS MANUFACTURERS ALLIANCE (IGMA)

IGMA TB-3001	(2001) Guidelines for Sloped Glazing
IGMA TM-3000	(1990; R 2004) North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use
IGMA TR-1200	(1983; R 2007) Guidelines for Commercial Insulating Glass Dimensional Tolerances

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

NFRC 100	(2010) Procedure for Determining Fenestration Product U-Factors
NFRC 200	(2010) Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC	(2009) Leadership in Energy and Environmental Design(tm) New Construction Rating System

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 Contractor Quality Control approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation; G

Drawings showing complete details of the proposed setting methods, mullion details, edge blocking, size of openings, frame details, materials, and types and thickness of glass.

SD-03 Product Data

Insulating Glass; G

Documentation for Energy Star qualifications.

Glazing Accessories

Manufacturer's descriptive product data, handling and storage recommendations, installation instructions, and cleaning instructions.

Tapes

Local/Regional Materials; (LEED NC)

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.

Environmental Data

SD-04 Samples

Insulating Glass; G

Sealant; G

Two 8 by 10 inch samples of each of the following: insulating glass units.

Three samples of each indicated material.

SD-07 Certificates

Insulating Glass; G

Certificates stating that the glass meets the specified requirements. Labels or manufacturers marking affixed to the glass will be accepted in lieu of certificates.

Glazing Accessories

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

Local/Regional Materials; LEED NC

LEED (tm) documentation relative to local/regional materials credit in accordance with LEED Reference Guide. Include in LEED Documentation Notebook.

1.3 SYSTEM DESCRIPTION

Glazing systems shall be fabricated and installed watertight and airtight to withstand thermal movement and wind loading without glass breakage, gasket failure, deterioration of glazing accessories, and defects in the work. Glazed panels shall comply with the safety standards, as indicated in accordance with ANSI Z97.1. Glazed panels shall comply with indicated wind/snow/blast 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 SUSTAINABLE DESIGN REQUIREMENTS

1.6.1 Local/Regional Materials

See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total local material requirements. Glazing materials may be locally available.

1.6.2 Environmental Data

Submit Table 1 of ASTM E2129 for the following products: insulating glass.

1.7 WARRANTY

1.7.1 Warranty for Insulating Glass Units

Warranty insulating glass units against development of material obstruction to vision (such as dust, fogging, or film formation on the inner glass surfaces) caused by failure of the hermetic seal, other than through glass breakage, for a 10-year period following acceptance of the work. Provide new units for any units failing to comply with terms of this warranty within 45 working days after receipt of notice from the Government.

1.7.2 Monolithic Opacified Spandrel

Manufacturer shall warrant the opacifier film on the spandrel to be free of peeling for a period of five years after Date of Substantial Completion. Warranty shall be signed by manufacturer.

PART 2 PRODUCTS

2.1 GLASS

ASTM C1036, unless specified otherwise. In doors and sidelights, provide safety glazing material conforming to 16 CFR 1201.

2.1.1 Clear Glass

For interior glazing (i.e., pass and observation windows), 1/4 inch thick glass should be used. Interior window glazing, framing, connections, and supporting structural elements at the neighborhoods and primary gathering locations shall provide a one (1) minute time of delay against blunt tool and sharp tool impacts. The standards for interior window glazing as outlined in ASTM F1233, Standard Test Method for Security Glazing Materials and Systems will be applied.

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.

2.1.2 Annealed Glass

Annealed glass shall be Type I transparent flat type, Class 1 - clear and tinted, Quality q3 - glazing select, 22 percent light transmittance, 0.20 Solar Heat Gain Coefficient (SHGC), conforming to ASTM C1036. Color shall be gray.

2.1.3 Laminated Glass

ASTM C1172, Kind LA fabricated from two nominal 1/8 inch pieces of Type I, Class 1, Quality q3, flat annealed transparent glass conforming to ASTM C1036. Flat glass shall be laminated together with a minimum of 0.030 inchthick, clear polyvinyl butyral interlayer. The total thickness shall be nominally 1/4 inch. Color shall be gray.

2.1.4 Mirrors

2.1.4.1 Glass Mirrors

Glass for mirrors shall be Type I transparent flat tempered type, Class 1-clear, Glazing Quality q1 1/4 inch thick conforming to ASTM C1036. Glass shall be coated on one surface with silver coating, copper protective coating, and mirror backing paint. Silver coating shall be highly adhesive pure silver coating of a thickness which shall provide reflectivity of 83 percent or more of incident light when viewed through 1/4 inch thick glass, and shall be free of pinholes or other defects. Copper protective coating shall be pure bright reflective copper, homogeneous without sludge, pinholes or other defects, and shall be of proper thickness to prevent "adhesion pull" by mirror backing paint. Mirror backing paint shall

consist of two coats of special scratch and abrasion-resistant paint , and shall be baked in uniform thickness to provide a protection for silver and copper coatings which will permit normal cutting and edge fabrication.

2.1.5 Tempered Glass

ASTM C1048, Kind FT (fully tempered), Condition A (uncoated), Type I, Class 1 (transparent), Quality q3, thickness as recommended by manufacturer. Color shall be clear. Provide and wherever safety glazing material is indicated or specified.

2.1.6 Heat-Strengthened Glass

ASTM C1048, Kind HS (heat strengthened), Condition A (uncoated), Type I, Class 2 (tinted heat absorbing), Quality q3, 1/4 inch thick. Provide for outer light of insulating glass units.

2.1.7 Spandrel Glass

2.1.7.1 Ceramic-Opacified Spandrel Glass

Insulated glass unit with spandrel glass as interior lite. Ceramic-opacified spandrel glass shall be Kind HS heat-strengthened transparent flat type, Condition B, coated with a colored ceramic material on No. 4 surface, Quality q3 - glazing select, 1/4 inchthick, conforming to ASTM C1048. Glass performance shall be U-Value and shading coefficient matching insulating glass unit. Color shall be dark gray.

2.2 INSULATING GLASS UNITS

Two panes of glass separated by a dehydrated 1/2 inch airspace, filled with argon gas. Non-residential glazed systems (including frames and glass) shall be certified by the National Fenestration Rating Council with a whole-window SHGC maximum of 0.20 determined according to NFRC 200 procedures and a U-factor maximum of 0.29 Btu/hr-ft2-F in accordance with NFRC 100. Glazing shall meet or exceed a luminous efficacy of 1.0. Glazed panels shall be rated for not less than 31 Sound Transmission Class (STC) when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E413. Dimensional tolerances shall be as specified in IGMA TR-1200. Spacer shall be black, roll-formed, thermally broken aluminum, with bent or tightly welded or keyed and sealed joints to completely seal the spacer periphery and eliminate moisture and hydrocarbon vapor transmission into airspace through the corners. Primary seal shall be compressed polyisobutylene and the secondary seal shall be a specially formulated silicone.

Two panes of glass separated by a dehydrated airspace and hermetically sealed. Dimensional tolerances shall be as specified in IGMA TR-1200. Spacer shall be roll-formed, 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 shall be compressed polyisobutylene and the secondary seal shall be a specially formulated silicone.

2.2.1 Buildings

Two panes of glass separated by a dehydrated airspace, filled with argon gas and hermetically sealed.

Insulated glass units shall have a SHCGC maximum of 0.20 and a U-factor maximum of 0.29 Btu per square foot by hr by degree F summer and 0.26 winter.

Glazing shall meet or exceed a luminous efficacy of 1.0, see Section 08 44 00 for glazing and frames. Glazed panels shall be rated for not less than 31 Sound Transmission Class (STC) when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E413.

Dimensional tolerances shall be as specified in IGMA TR-1200. Spacer shall be black, roll-formed, thermally broken aluminum with bent or tightly welded or keyed and sealed joints to completely seal the spacer periphery and eliminate moisture and hydrocarbon vapor transmission into airspace through the corners. Primary seal shall be compressed polyisobutylene and the secondary seal shall be specially formulated silicone.

The inner light shall be laminated glass as indicated in paragraph 2.1.3 of this specification section. The outer light shall be tinted, heat-strengthened glass as indicated in paragraph 2.1.6 of this specification section.

2.3 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 shall be gray or neutral color.

2.3.1 Sealants

Provide elastomeric sealants.

2.3.1.1 Elastomeric Sealant

ASTM C920, Type S, Grade NS, Class 12.5, Use G. Use for channel or stop glazing and metal sash. Sealant shall be chemically compatible with setting blocks, edge blocks, and sealing tapes, with sealants used in manufacture of insulating glass units. Color of sealant shall be white.

2.3.2 Joint Backer

Joint backer shall have a diameter size at least 25 percent larger than joint width; type and material as recommended in writing by glass and sealant manufacturer.

2.3.3 Sealing Tapes

Preformed, semisolid, PVC-based material of proper size and compressibility for the particular condition, complying with ASTM D2287. Use only where glazing rabbet is designed for tape and tape is recommended by the glass or sealant manufacturer. Provide spacer shims for use with compressible tapes. Tapes shall be chemically compatible with the product being set.

2.3.4 Setting Blocks and Edge Blocks

Closed-cell neoprene setting blocks shall be dense extruded type conforming to ASTM C509 and ASTM D395, Method B, Shore A durometer between 70 and 90. Edge blocking shall be Shore A durometer of 50 (plus or minus 5). Silicone

setting blocks shall be required when blocks are in contact with silicone sealant. Profiles, lengths and locations shall be as required and recommended in writing by glass manufacturer. Block color shall be black.

2.3.5 Glazing Gaskets

Glazing gaskets shall 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 shall be continuous one-piece units with factory-fabricated injection-molded corners free of flashing and burrs. Glazing gaskets shall be in lengths or units recommended by manufacturer to ensure against pull-back at corners. Glazing gasket profiles shall be as recommended by the manufacturer for the intended application.

2.3.5.1 Fixed Glazing Gaskets

Fixed glazing gaskets shall be closed-cell (sponge) smooth extruded compression gaskets of cured elastomeric virgin neoprene compounds conforming to ASTM C509, Type 2, Option 1.

2.3.5.2 Wedge Glazing Gaskets

Wedge glazing gaskets shall 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.

2.3.5.3 Aluminum Framing Glazing Gaskets

Glazing gaskets for aluminum framing shall be permanent, elastic, non-shrinking, non-migrating, watertight and weathertight.

2.3.6 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.

2.4 MIRROR ACCESSORIES

2.4.1 Mastic

Mastic for setting mirrors shall be a polymer type mirror mastic resistant to water, shock, cracking, vibration and thermal expansion. Mastic shall be compatible with mirror backing paint, and shall be approved by mirror manufacturer.

2.4.2 Mirror Frames

Mirrors shall be provided 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 shall 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 shall be provided with mirror frames.

PART 3 EXECUTION

3.1 PREPARATION

Preparation, unless otherwise specified or approved, shall 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-INSTALLATION

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, shall 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 shall 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 shall 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 shall be clean at the time the work is accepted.

3.4 PROTECTION

Glass work shall be protected immediately after installation. Glazed openings shall be identified with suitable warning tapes, cloth or paper flags, attached with non-staining adhesives. Reflective glass shall be protected with a protective material to eliminate any contamination of the reflective coating. Protective material shall be placed 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. Glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities shall be removed and replaced with new units.

3.5 WASTE MANAGEMENT

Disposal and recycling of waste materials, including corrugated cardboard recycling, shall be in accordance with the Waste Management Plan. Separate float glass and reuse or recycle. Upon removal, separate protective materials and reuse or recycle. Close and seal tightly all partly used sealant containers and store protected in well-ventilated, fire-safe area at moderate temperature.

-- End of Section --

SECTION 08 91 00

METAL WALL AND DOOR LOUVERS
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.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)

AMCA 500-D	(2012) Laboratory Methods of Testing Dampers for Rating
AMCA 511	(2010) Certified Ratings Program for Air Control Devices

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 2605	(2011) Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels

ASTM INTERNATIONAL (ASTM)

ASTM A1008/A1008M	(2015) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened
ASTM A653/A653M	(2013) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
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 Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Wall louvers; G

SD-03 Product Data

Metal Wall Louvers; G

SD-04 Samples

Wall louvers; G

Door louvers; G

1.3 DELIVERY, STORAGE, AND PROTECTION

Deliver materials to the site in an undamaged condition. Carefully store materials off the ground to provide proper ventilation, drainage, and protection against dampness. Louvers shall 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 louvers and door louvers shall 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 Galvanized Steel Sheet

ASTM A653/A653M, coating designation G90.

2.1.2 Aluminum Sheet

ASTM B209, alloy 3003 or 5005 with temper as required for forming.

2.1.3 Extruded Aluminum

ASTM B221, alloy 6063-T5 or -T52.

2.1.4 Cold Rolled Steel Sheet

ASTM A1008/A1008M, Class 1, with matte finish. Use for interior louvers only.

2.2 METAL WALL LOUVERS

Weather resistant type, with bird screens and made to withstand a wind load of not less than what is indicated on Drawing Number S002. Wall louvers shall bear the AMCA certified ratings program seal for air performance and water penetration in accordance with AMCA 500-D and AMCA 511. The rating shall 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.

2.2.2 Formed Metal Louvers

Formed of zinc-coated steel sheet not thinner than 16 U.S. gage, or aluminum sheet not less than 0.08 inch thick.

2.2.3 Mullions and Mullion Covers

Same material and finish as louvers. Provide mullions where indicated for all louvers more than 5 feet in width at not more than 5 feet on centers. Provide mullions covers on both faces of joints between louvers.

2.2.4 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. For steel louvers, provide 1/2 inch square mesh, 12 or 16 gage zinc-coated steel; 1/2 inch square mesh, 16 gage copper; or 1/4 inch square mesh, 16 gage zinc-coated steel or copper bird screening. Mount screens in removable, rewirable frames of same material and finish as the louvers.

2.3 DOOR LOUVERS

Inverted "Y" or Inverted "V" sightproof type not less than one inch thick with matching metal trim. Louvers for exterior doors shall be weather resistant type.

2.3.1 Extruded Aluminum Door Louvers

Fabricate of 6063-T5 or -T52 aluminum alloy with a wall thickness of not less than 0.050 inch thick. Frames and trim shall be clamp-in "L" type.

2.3.2 Formed Metal Door Louvers

Fabricate of 20 U.S. gage steel sheet. Trim shall be beveled "Z" molding both sides.

2.3.3 Screens and Frames

For exterior doors, provide aluminum insect screens, 18 by 16 or 18 by 14 mesh. Mount screens in removable, rewirable frames of same material and finish as the louvers.

2.4 FASTENERS AND ACCESSORIES

Provide stainless steel screws and fasteners for aluminum louvers and zinc-coated or stainless steel screws and fasteners for steel louvers. Provide other accessories as required for complete and proper installation.

2.5 FINISHES

2.5.1 Aluminum

Exposed aluminum surfaces shall be factory finished with an organic coating. Color shall be as indicated. Louvers for each location shall have the same

finish.

2.5.1.1 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: wall louvers to match curtain wall finish.

2.5.2 Steel

Provide factory-applied coating. Clean and phosphate treat exposed surfaces and apply rust-inhibitive primer, color: door louvers are to be field painted with the door.

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 Door Louvers

Install louvers in wood doors by using metal "Z" or "L" moldings. Fasten moldings to door with screws.

3.1.3 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.

3.2.3 Metal

Paint metal in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.

3.2.4 Wood

Paint wood or other absorptive materials that may become repeatedly wet and in contact with metal with two coats of aluminum paint or a coat of heavy-bodied bituminous paint.

-- 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.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 341	(2010) Seismic Provisions for Structural Steel Buildings

ASTM INTERNATIONAL (ASTM)

ASTM A641/A641M	(2009a; R 2014) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM A653/A653M	(2013) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM C1007	(2011a) Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories
ASTM C645	(2014) Nonstructural Steel Framing Members
ASTM C754	(2015) Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
ASTM E1190	(2011) Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members
ASTM E488/E488M	(2010) Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements

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. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Metal support systems; G

Submit for the erection of metal framing, furring, and ceiling suspension systems. Indicate materials, sizes, thicknesses, and fastenings.

1.3 QUALITY ASSURANCE

1.3.1 Design Responsibility

Metal studs designated on the drawings as "CFMF" require design by the delegated design professional. Members and their connections shall be designed to meet the requirements of this specification and the requirements of specification Section 05 04 00

1.3.2 Deflection Limits

Limit deflection of partitions to the following limits based on 5 PSF uniform design load typically and 10 PSF for partitions enclosing elevator shafts.

a. Partitions to Receive Tile Finish: L/360.

b. Other Partitions: L/240.

c. Limit deflection of ceilings to L/360.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the job site and store in ventilated dry locations. Storage area shall permit 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 FRAMING MEMBERS, GENERAL

Comply with ASTM C754 and ASTM C1007 for conditions indicated.

2.2 MATERIALS

Steel sheet components shall comply with ASTM C645ASTM C955 requirements for metal unless otherwise noted.

Provide steel materials for metal support systems with galvanized coating ASTM A653/A653M, G-60. Provide support systems and attachments per AISC 341 and UFC 3-310-04, "Seismic Design for Buildings" in seismic zones.

2.2.1 Materials for Attachment of Gypsum Wallboard

2.2.1.1 Suspended and Furred Ceiling Systems

ASTM C645. Minimum G60 hot-dipped galvanized coating and .0179 steel thickness before application of protective coating.

2.2.1.1.1 Hanger Attachments to Concrete

Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E488/E488M by an independent testing agency. Type: Cast-in-place anchor, designed for attachment to concrete forms or post-installed, expansion anchor.

Powder-Actuated Fasteners: Suitable fastener for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E1190 by an independent testing agency.

2.2.1.1.2 Wire Hangers

ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

2.2.1.2 Nonload-Bearing Wall Framing and Furring

ASTM C645, but not thinner than 0.0329 inch thickness. The ASTM certified third party testing statement for equivalent thicknesses shall not apply.

The minimum stud size is 3-5/8 inches deep with a minimum flange width of 1.375 inches and a stiffening lip length of 0.375 inches.

2.2.1.3 Runners

Slip-Type Head Joints: Provide the following:

a. Single Long-Leg Runner System: Top runner with minimum 2-1/2 inch-deep flanges in thickness as scheduled below, installed with studs, friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.

    1. Stud length up to 12'-0": Minimum top runner base metal thickness; .033 inch.
    2. Stud length 12'-0" to 22'-0": Minimum top runner base metal thickness; .043 inch.
    3. Stud length up to 24'-0": Minimum top runner base metal thickness; .054 inch.

Partition top runner which does not extend to structure: 1-1/4 inches leg of thickness and size to match studs.

Bottom Runner: 1-1/4 inches leg of thickness and size to match studs, typical.

2.2.1.4 Cold-Rolled Channel Bridging

Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.

a. Depth: 1-1/2 inches.
b. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.

2.2.1.5 Blocking and Strapping

Permitted only where interferences prevent the installation of Cold Rolled Channel Bridging noted above.

a. Blocking: 0.033 inch track sections clipped to studs.
b. Strapping: 2-1/2 inches wide steel strap bracing, 0.33 inch by 10 feet.

2.2.1.6 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.

2.2.1.7 Z-Furring Channels with Wall Insulation

Galvanized steel, Z-shaped, with 1-1/4 inch and 7/8 inch flanges and depth as indicated, minimum uncoated-metal thickness of 0.018 inch, and depth required to fit insulation thickness indicated.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Systems for Attachment of Gypsum Wallboard

3.1.1.1 Suspended and Furred Ceiling Systems

ASTM C754, except provide framing members 16 inches o.c. unless indicated otherwise.

3.1.1.2 Non-loadbearing Wall Framing and Furring

ASTM C754, except as indicated otherwise.

3.1.1.3 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) indicated.

3.1.1.4 Z-Furring Channels

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 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 --

SECTION 09 29 00

GYPSUM BOARD
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 NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108.11	(1992; Reaffirmed 2005) Specifications for Interior Installation of Cementitious Backer Units

ASTM INTERNATIONAL (ASTM)

ASTM C1002	(2007) 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	(2010a) Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base
ASTM C1396/C1396M	(2013) Standard Specification for Gypsum Board
ASTM C1629/C1629M	(2006; R 2011) Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels
ASTM C475/C475M	(2012) Joint Compound and Joint Tape for Finishing Gypsum Board
ASTM C514	(2004; E 2009; R 2009) Standard Specification for Nails for the Application of Gypsum Board
ASTM C840	(2011) Application and Finishing of Gypsum Board
ASTM C954	(2011) 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 D1037	(2012) Evaluating Properties of Wood-Base Fiber and Particle Panel Materials

ASTM D2394	(2005; R 2011) Simulated Service Testing of Wood and Wood-Base Finish Flooring
ASTM D5420	(2010) Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Strike Impacted by a Falling Weight (Gardner Impact)
ASTM E2129	(2010) Standard Practice for Data Collection for Sustainability Assessment of Building Products
ASTM E695	(2003; R 2009) Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials

GYPSUM ASSOCIATION (GA)

GA 214	(2010) Recommended Levels of Gypsum Board Finish
GA 216	(2010) Application and Finishing of Gypsum Panel Products

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC	(2009) Leadership in Energy and Environmental Design(tm) New Construction Rating System

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. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Cementitious backer units

Water-Resistant Gypsum Backing Board

Impact Resistant Gypsum Board

Accessories

Submit for each type of gypsum board and for cementitious backer units.

Gypsum Board; (LEED NC)

Submit documentation indicating percentage of post-industrial and post-consumer recycled content per unit of product. Indicate relative dollar value of recycled content products to total dollar value of products included in project.

Adhesives; (LEED NC)
Joint Treatment Materials

Submit manufacturer's product data, indicating VOC content.

Local/Regional Materials; (LEED NC)

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.

Environmental Data

SD-07 Certificates

Asbestos Free Materials; G

Certify that gypsum board types, gypsum backing board types, cementitious backer units, and joint treating materials do not contain asbestos.

SD-08 Manufacturer's Instructions

Material Safety Data Sheets

SD-10 Operation and Maintenance Data

Manufacturer maintenance instructions

Waste Management

SD-11 Closeout Submittals

Local/Regional Materials; (LEED)

LEED documentation relative to local/regional materials credit in accordance with LEED Reference Guide. Include in LEED Documentation Notebook.

Gypsum Board; (LEED)

LEED documentation relative to recycled content credit in accordance with LEED Reference Guide. Include in LEED Documentation Notebook.

Adhesives; (LEED)

LEED documentation relative to low emitting materials credit in accordance with LEED Reference Guide. Include in LEED Documentation Notebook.

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 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.

1.3.2 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. Gypsum wallboard shall not be stored 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.

1.3.3 Handling

Neatly stack gypsum board and cementitious backer units flat to prevent sagging or damage to the edges, ends, and surfaces.

1.4 ENVIRONMENTAL CONDITIONS

1.4.1 Temperature

Maintain a uniform temperature of not less than 50 degrees F in the structure for at least 48 hours prior to, during, and following the application of gypsum board, cementitious backer units, and joint treatment materials, or the bonding of adhesives.

1.4.2 Exposure to Weather

Protect gypsum board and cementitious backer unit products from direct exposure to rain, snow, sunlight, and other extreme weather conditions.

1.4.3 Temporary Ventilation

Provide temporary ventilation for work of this section.

1.5 SUSTAINABLE DESIGN REQUIREMENTS

1.5.1 Local/Regional Materials

See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total local material requirements. Gypsum board materials may be locally available.

1.5.2 Environmental Data

Submit Table 1 of ASTM E2129 for the following products: adhesives.

1.6 QUALIFICATIONS

Furnish type of gypsum board work specialized by the installer with a minimum of 3 years of documented successful experience.

1.7 SCHEDULING

The gypsum wallboard shall be taped, spackled and primed before the installation of the highly-emitting materials, including carpet and flooring adhesives.

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 Material Safety Data Sheets and manufacturer maintenance instructions for gypsum materials including adhesives.

2.1.1 Gypsum Board

ASTM C1396/C1396M. Gypsum board shall contain a minimum of 5 percent post-consumer recycled content, or a minimum of 20 percent post-industrial recycled content. Paper facings shall contain 100 percent post-consumer recycled paper content. Gypsum cores shall contain a minimum of 95 percent post-industrial recycled gypsum content. See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total recycled content requirements. Gypsum board may contain post-consumer or post-industrial recycled content.

2.1.1.1 Regular

48 inch wide, 5/8 inch thick, tapered edges.

2.1.1.2 Type X (Special Fire-Resistant)

48 inch wide, 1/2 inch thick, tapered edges.

2.1.2 Gypsum Backing Board

ASTM C1396/C1396M, gypsum backing board shall be used as a base in a multilayer system.

2.1.2.1 Regular

48 inch wide, 5/8 inch thick, square edges.

2.1.2.2 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, square edges.

2.1.3 Regular Water-Resistant Gypsum Backing Board

ASTM C1396/C1396M

2.1.3.1 Regular

48 inch wide, 5/8 inch thick, tapered edges.

2.1.3.2 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, tapered edges.

2.1.4 Impact Resistant Gypsum Board

48 inchwide, 5/8 inch thick, tapered edges.
Reinforced gypsum panel with imbedded fiber mesh or lexan backing testing in accordance with the following tests. Hard body impact test must attain a Level 2 performance in accordance with ASTM C1629/C1629M. Provide fasteners that meet manufacturer requirements and specifications stated within this section. Impact resistant gypsum board, when tested in accordance with ASTM E84, have a flame spread rating of 25 or less and a smoke developed rating of 50 or less.

2.1.4.1 Structural Failure Test

ASTM E695 or ASTM D2394 for structural failure (drop penetration). ASTM E695 using a 60 lb sand filled leather bag, resisting no less than 300 ft. lb. cumulative impact energy before failure or ASTM D2394 using 5.5 inch hemispherical projectile resisting no less than 264 ft. lb. before failure. Provide test specimen stud spacing a minimum 16 inch on center.

2.1.4.2 Indentation Test

ASTM D5420 or ASTM D1037 for indentation resistance. ASTM D5420 using a 32 oz weight with a 5/8 inch hemispherical impacting head dropped once 3 feet creating not more than 0.137 inch indentation or ASTM D1037 using no less than 470 lb weight applied to the 0.438 inch diameter ball to create not more than a 0.0197 inch indentation depth.

2.1.5 Cementitious Backer Units

In accordance with the Tile Council of America (TCA) Handbook.

2.1.6 Joint Treatment Materials

ASTM C475/C475M. Use all purpose joint and texturing compound containing inert fillers and natural binders, including lime compound. Pre-mixed compounds shall be free of antifreeze, vinyl adhesives, preservatives, biocides and other slow releasing compounds.

2.1.6.1 Embedding Compound

Specifically formulated and manufactured for use in embedding tape at gypsum board joints and compatible with tape, substrate and fasteners.

2.1.6.2 Finishing or Topping Compound

Specifically formulated and manufactured for use as a finishing compound.

2.1.6.3 All-Purpose Compound

Specifically formulated and manufactured to serve as both a taping and a finishing compound and compatible with tape, substrate and fasteners.

2.1.6.4 Setting or Hardening Type Compound

Specifically formulated and manufactured for use with fiber glass mesh tape.

2.1.6.5 Joint Tape

Use cross-laminated, tapered edge, reinforced paper, or fiber glass mesh tape recommended by the manufacturer.

2.1.7 Fasteners

2.1.7.1 Nails

ASTM C514.

2.1.7.2 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. At ICF panels, use type of screw recommended by ICF manufacturer.

2.1.7.3 Staples

No. 16 USS gageflattened galvanized wire staples with 7/16 inch wide crown outside measurement and divergent point for base ply of two-ply gypsum board application. Use as follows:

Length of Legs	Thickness of Gypsum Board
1-1/8 inches	1/2 inch
1-1/4 inches	5/8 inch

2.1.8 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" thick, by 24" wide.

2.1.9 Accessories

ASTM C1047. Fabricate from corrosion protected steel or plastic designed for intended use. Accessories manufactured with paper flanges are not acceptable. Flanges shall be free of dirt, grease, and other materials that may adversely affect bond of joint treatment. Provide prefinished or job decorated materials.

2.1.10 Sound Attenuation Blankets

Include the use of either mineral wool or fiberglass batts. Fire resistive blankets are required in rated assemblies and include only the mineral wool products approved in the UL assembly.

2.1.11 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.

3.2 APPLICATION OF GYPSUM BOARD

Apply gypsum board to framing and furring members in accordance with ASTM C840 or GA 216 and the requirements specified. Apply gypsum board with separate panels in moderate contact; do not force in place. Stagger end joints of adjoining panels. Neatly fit abutting end and edge joints. Use gypsum board of maximum practical length; select panel sizes to minimize waste. Cut out gypsum board to make neat, close, and tight joints around openings. In vertical application of gypsum board, provide panels in lengths required to reach full height of vertical surfaces in one continuous piece. Lay out panels to minimize waste; reuse cutoffs whenever feasible. Surfaces of gypsum board and substrate members may not be bonded together with an adhesive. 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. Install 5/8 inch gypsum or 1/2 inch ceiling board over framing at 24 inches on center. Provide type of gypsum board for use in each system specified herein as indicated.

3.2.1 Application of Gypsum Board to Steel Framing and Furring

Apply in accordance with ASTM C840, System VIII or GA 216.

3.2.2 Arches and Bending Radii

Apply gypsum board in accordance with ASTM C840, System IX or GA 216.

3.2.3 Interior of ICF Walls

Application of gypsum board to ICF system - apply gypsum board as per ICF manufacturer's recommendations.

3.2.4 Exterior Application

Apply exterior gypsum board (such as at soffits) in accordance with ASTM C840, System XI or GA 216.

3.2.5 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.

3.2.6 Control Joints

Install expansion and contraction joints in ceilings and walls in accordance with ASTM C840, System XIII or GA 216. Fill control joints between studs in fire-rated construction with firesafing insulation to match the fire-rating of construction.

3.2.7 Application of Impact Resistant Gypsum Board

Apply in accordance with applicable system of ASTM C840 as specified or GA 216. Follow manufacturers written instructions on how to cut, drill and attach board.

3.3 APPLICATION OF CEMENTITIOUS BACKER UNITS

3.3.1 Application

In wet areas 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 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 shall 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 PATCHING

Patch surface defects in gypsum board to a smooth, uniform appearance, ready to receive finishes.

3.8 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 WASTE MANAGEMENT

As specified in Waste Management Plan and as follows. Separate clean waste gypsum products from contaminants. Do not include wood, plastic, metal, asphalt-impregnated gypsum board, or any gypsum board coated with glass fiber, vinyl, decorative paper, or other finish. Place in designated area and protect from moisture and contamination. Coordinate with Section 32 05 33 LANDSCAPE ESTABLISHMENT to identify requirements for gypsum soil amendment and to prepare scrap gypsum board for use as soil amendment.

Identify manufacturer's policy for collection or return of remaining construction scrap, unused material, demolition scrap, and packaging material. Institute demolition and construction recycling to take advantage of manufacturer's programs. When such a service is not available, seek local recyclers to reclaim the materials.

-- End of Section --

SECTION 09 30 13

CERAMIC TILING
11/13

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 A118.1	(2013) American National Specifications for the Installation of Ceramic Tile - Version 2013.1
ANSI A118.3	(2013) American National Specifications for the Installation of Ceramic Tile - Version 2013.1
ANSI A137.1	(2012) American National Standards Specifications for Ceramic Tile

ASTM INTERNATIONAL (ASTM)

ASTM C150/C150M	(2012) Standard Specification for Portland Cement
ASTM C373	(2014) Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products
ASTM C648	(2004; R 2009) Breaking Strength of Ceramic Tile
ASTM D2103	(2015) Standard Specification for Polyethylene Film and Sheeting
ASTM D226/D226M	(2009) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM E2129	(2010) Standard Practice for Data Collection for Sustainability Assessment of Building Products

BAY AREA AIR QUALITY MANAGEMENT DISTRICT (Bay Area AQMD)

Bay Area AQMD Rule 8-51	(1992; R 2001) Adhesive and Sealant Products

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

40 CFR 59	National volatile organic compound

emission standards for consumer and commercial products.

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(1989; R 2005) Adhesive and Sealant Applications

TILE COUNCIL OF NORTH AMERICA (TCNA)

TCNA Hdbk	(2013) Handbook for Ceramic, Glass, and Stone Tile Installation

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 GBDC Ref Guide	(2009; R 2010) LEED Reference Guide for Green Building Design, Construction and Major Renovations of Commercial and Institutional Buildings including Core & Shell and K-12 Projects

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 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 local/regional materials, low-emitting materials, recycled content, rapidly renewable materials requirements.

1.3 SUBMITTALS

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

SD-02 Shop Drawings

Detail Drawings; G

SD-03 Product Data

Local/Regional Materials; (LEED BD+C)
Environmental Data
Tile; G
Setting-Bed; G

Mortar, Grout, and Adhesive; (LEED); G
Tile; (LEED BD+C)

SD-04 Samples

Tile; G
Accessories; G
Transition Strips; G
Grout; G

SD-07 Certificates

Tile
Mortar, Grout, and Adhesive

SD-08 Manufacturer's Instructions

Maintenance Instructions

SD-10 Operation and Maintenance Data

Installation; G

SD-11 Closeout Submittals

Local/Regional Materials; (LEED)
LEED Documentation
Tile; (LEED)
Adhesives; (LEED)

1.4 OTHER SUBMITTAL REQUIREMENTS

1.4.1 LEED Documentation

Regarding Local/Regional Materials submit documentation indicating distance between manufacturing facility and the project site and also the distance of raw material origin from the project site. For Tile and Reinforcing Wire Fabric indicate percentage of post-industrial and post-consumer recycled content per unit of product. Indicate relative dollar value of recycled content products to total dollar value of products included in project.

1.4.2 Environmental Data

Submit Table 1 of ASTM E2129 for the following products: tile and adhesive.

1.5 QUALITY ASSURANCE

Installers to be from a company specializing in performing this type of work and have a minimum of two years experience. 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.

1.6 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.

1.7 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.

1.8 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a 1-year period.

1.9 EXTRA MATERIALS

Supply an extra 2 percent of each type tile used in clean and marked cartons.

PART 2 PRODUCTS

2.1 TILE

Furnish 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 wet dynamic coefficient of friction (DCOF) value of 0.42 or greater when tested in accordance with ANSI A137.1 requirements. Indicate VOC content. For materials like tile, accessories, and transition strips submit samples of sufficient size to show color range, pattern, type and joints. Submit manufacturer's catalog data.

2.1.1 Porcelain Tile

Furnish unglazed rectified porcelain tile, with color extending uniformly through the body of the tile. Blend tiles in factory and in a packages to have same color range and continuous blend for installation. Provide nominal tile sizes as indicated on drawings. Provide a 0.50 percent maximum water absorption in accordance with ASTM C373. Provide base and trim pieces as indicated on drawings.

2.1.2 Mosaic Tile

Furnish unglazed mosaic tile, base and trim units composed of porcelain. Blend tiles in factory and in a packages to have same color range and continuous blend for installation. Provide nominal tile sizes as indicated on drawings. Provide porcelain mosaics with a water absorption up to 0.50 percent.

2.1.3 Glazed Wall Tile

Furnish glazed wall tile that has cushioned edges and trim with lead-free finishas indicated on drawings. Provide nominal tile sizes as indicated on drawings.

2.2 SETTING-BED

Submit manufacturer's catalog data. Compose the setting-bed of the following materials:

2.2.1 Portland Cement

Conform to ASTM C150/C150M for cement, Type I, white for wall mortar and gray for other uses.

2.3 WATER

Provide potable water.

2.4 MORTAR, GROUT, AND ADHESIVE

Submit certificates indicating conformance with specified requirements. Submit LEED documentation relative to low-emitting materials credit in accordance with LEED GBDC Ref Guide. Include in LEED Documentation Notebook. Interior adhesives, sealants, primers and sealants used as filler must meet the requirements of LEED low emitting materials credit. Submit manufacturer's catalog data. Conform to SCAQMD Rule 1168 and Bay Area AQMD Rule 8-51, and to the following for mortar, grout, adhesive, and sealant:

2.4.1 Latex-Portland Cement Mortar (Thin set for small format tiles)

TCNA Hdbk.

2.4.1.1 Latex-Portland Cement Mortar (Medium bed thin set-large format tiles)

TCNA Hdbk.

2.4.1.2 Polymer-Modified Tile Grout

Complies with ANSI A118.1 for use on walls and floors in non-wet areas.

2.4.1.3 Water Cleanable Epoxy Grout

Complies with ANSI A118.3 specifications for chemical resistance, water cleanable-tile-setting and grouting epoxy, with VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D.

2.4.2 Sealants

Comply with applicable regulations regarding toxic and hazardous materials and as specified. Grout sealant must not change the color or alter the appearance of the grout.

2.4.3 Cementitious Backer Board

Provide cementitious backer units, in accordance with TCNA Hdbk. Thickness as indicated on drawings.

2.5 TRANSITION STRIPS

Provide clear anodized aluminum or stainless steel transitions between tile and carpet or resilient flooring. Provide types as recommended by flooring

manufacturer for both edges and transitions of flooring materials specified. Provide transition strips that comply with 36 CFR 1191requirements.

2.6 MEMBRANE MATERIALS

Conform to ASTM D226/D226M, Type 1 for 15 pound waterproofing membrane, asphalt-saturated building felt. Conform to ASTM D2103 4 mil for polyethylene film.

2.7 COLOR, TEXTURE, AND PATTERN

Provide color, pattern and texture as indicated on drawings. Color listed is not intended to limit the selection of equal colors from other manufacturers. Provide floor patterns as specified on the drawings.

PART 3 EXECUTION

3.1 PREPARATORY WORK AND WORKMANSHIP

Inspect surface to receive tile in conformance to the requirements of TCNA Hdbk for surface conditions for the type setting bed specified and for workmanship. Provide variations of tiled surfaces that fall within maximum values shown below:

TYPE	WALLS	FLOORS
Latex Portland Cement Mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.
Epoxy	1/8 inch in 8 ft.	1/8 inch in 10 ft.

3.2 GENERAL INSTALLATION REQUIREMENTS

Do not start tile work until roughing in for mechanical and electrical work has been completed and tested, and built-in items requiring membrane waterproofing have been installed and tested. Close space, in which tile is being set, to traffic and other work. Keep closed until tile is firmly set. Do not start floor tile installation in spaces requiring wall tile until after wall tile has been installed. Apply tile in colors and patterns indicated in the area shown on the drawings. Install tile with the respective surfaces in true even planes to the elevations and grades shown. Provide special shapes as required for sills, jambs, recesses, offsets, external corners, and other conditions to provide a complete and neatly finished installation. Solidly back tile bases and coves with mortar. Do not walk or work on newly tiled floors without using kneeling boards or equivalent protection of the tiled surface. Keep traffic off horizontal portland cement mortar installations for at least 72 hours. Keep all traffic off epoxy installed floors for at least 40 hours after grouting, and heavy traffic off for at least 7 days, unless otherwise specifically authorized by manufacturer. Dimension and draw detail drawings at a minimum scale of 1/4 inch = 1 foot. Include drawings of pattern at inside corners, outside corners, termination points and location of all equipment items such as thermostats, switch plates, mirrors and toilet accessories mounted on surface. Submit drawings showing ceramic tile pattern elevations and floor plans. Submit manufacturer's preprinted installation instructions.

3.3 INSTALLATION OF WALL TILE

Install wall tile in accordance with the TCNA Hdbk, and with grout joints as recommended by the manufacturer for the type of tile.

3.3.1 Latex-Portland Cement Mortar

Use Latex-Portland Cement to install tile in accordance with TCNA Hdbk. Use Latex Portland Cement when installing porcelain ceramic tile.

3.3.2 Ceramic Tile Grout

Prepare and install ceramic tile grout in accordance with TCNA Hdbk. Provide and apply manufacturer's standardproduct for sealing grout joints in accordance with manufacturer's recommendations.

3.4 INSTALLATION OF FLOOR TILE

Install floor tile in accordance with TCNA Hdbk and with grout joints as recommended by the manufacturer for the type of tile.

3.4.1 Latex-Portland Cement

Use Latex-Portland cement mortar to install tile directly over properly cured, plane, clean concrete slabs in accordance with TCNA Hdbk. Use Latex Portland cement when installing porcelain ceramic tile.

3.4.2 Resinous Grout

When resinous grout is indicated, grout tile with epoxy resin grout. 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. Provide a coating of wax applied from the manufacturer on all tile installed. 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.

3.4.3 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.

3.4.4 Waterproofing

Shower units are specified in Section 22 00 00 PLUMBING, GENERAL PURPOSE. .

3.5 INSTALLATION OF 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.

3.6 EXPANSION JOINTS

Form and seal joints as specified in Section 07 92 00 JOINT SEALANTS.

3.6.1 Walls

Provide expansion joints at control joints in backing material. Wherever backing material changes, install an expansion joint to separate the different materials.

3.7 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. Submit copy of manufacturer's printed maintenance instructions.

-- End of Section --

SECTION 09 51 00

ACOUSTICAL CEILINGS
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 A489	(2012) Standard Specification for Carbon Steel Lifting Eyes
ASTM A580/A580M	(2015) Standard Specification for Stainless Steel Wire
ASTM A641/A641M	(2009a; R 2014) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM C423	(2009a) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
ASTM C635/C635M	(2012) 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	(2014) Latex Sealants
ASTM E1264	(2008; E 2010) Acoustical Ceiling Products
ASTM E1414/E1414M	(2011a) Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
ASTM E1477	(1998a; R 2008) Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers
ASTM E795	(2005; R 2012) Mounting Test Specimens During Sound Absorption Tests
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials

UNDERWRITERS LABORATORIES (UL)

UL Fire Resistance	(2014) Fire Resistance Directory

1.2 ACOUSTICAL CEILING SYSTEMS DESCRIPTION

Provide sound controlling units mechanically mounted on a ceiling suspension system for acoustical treatment. The unit size, texture, finish, and color must be as specified. The location and extent of acoustical treatment shall be as shown on the approved detail drawings. Submit drawings showing suspension system, method of anchoring and fastening, details, and reflected ceiling plan. Coordinate with paragraph RECLAMATION PROCEDURES for reclamation of mineral fiber acoustical ceiling panels to be removed from the job site.

1.2.1 Ceiling Attenuation Class and Test

Provide a ceiling system with an attenuation class (CAC) as indicated when determined in accordance with ASTM E1414/E1414M. Provide fixture attenuators over light fixtures and other ceiling penetrations, and provide acoustical blanket insulation adjacent to partitions, as required to achieve the specified CAC. 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.

1.2.2 Ceiling Sound Absorption

Determine the Noise Reduction Coefficient (NRC) in accordance with ASTM C423 Test Method.

1.2.3 Light Reflectance

Determine light reflectance factor in accordance with ASTM E1477 Test Method.

1.2.4 Other Submittals Requirements

The following shall be submitted:

a. Manufacturer's data indicating percentage of recycle material in acoustic ceiling tiles to verify affirmative procurement compliance.

b. Total weight and volume quantities of acoustic ceiling tiles with recycle material.

c. Manufacturer's catalog showing UL classification of fire-rated ceilings giving materials, construction details, types of floor and roof constructions to be protected, and UL design number and fire protection time rating for each required floor or roof construction and acoustic ceiling assembly.

d. Reports by an independent testing laboratory attesting that acoustical ceiling systems meet specified fire endurance and sound transmission requirements. Data attesting to conformance of the proposed system to Underwriters Laboratories requirements for the fire endurance rating listed in UL Fire Resistance may be submitted in lieu of test reports.

e. Certificate attesting that the mineral based acoustical units furnished for the project contain recycled material and showing an estimated percent of such material.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Approved Detail Drawings

SD-03 Product Data

Acoustical Ceiling Systems

SD-04 Samples

Acoustical Units
Acoustic Ceiling Tiles

SD-06 Test Reports

Ceiling Attenuation Class and Test

SD-07 Certificates

Acoustical Units
Acoustic Ceiling Tiles

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 standard performance guarantees or warranties that extend beyond a one year period. Include an agreement to repair or replace acoustical panels that fail within the warranty period in the standard performance guarantee or warranty. Failures include, but are not limited to, sagging and warping of panels; rusting and manufacturers defects of

grid system.

1.8 EXTRA MATERIALS

Furnish spare tiles, from the same lot as those installed, of each color at the rate of 5 tiles for each 1000 tiles installed.

PART 2 PRODUCTS

2.1 ACOUSTICAL UNITS

Submit two 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:

2.1.1 Affirmative Procurement

Mineral Wool, Cellulose, and Laminated Paperboard used in acoustic ceiling tiles are materials listed in the EPA's Comprehensive Procurement Guidelines (CPG) (http://www.epa.gov/cpg/). EPA's recommended Recovered Materials Content Levels for Mineral Wool, Cellulose, Structural Fiberboard and Laminated Paperboard are:

Product	Material	Percent of Post Consumer Materials	Percent of Total Recovered Materials
Laminate Paperboard	Post Consumer Paper	100	100
Rock Wool	Slag	75	
Cellulose	Post Consumer Paper	75	75

a. The recommended recovered materials content levels are based on the weight (not volume) of materials in the insulating core only.

b. Submit recycled material content data for acoustic ceiling tiles indicating compliance with affirmative procurement.

c. Submit total weight and volume quantities of acoustic ceiling tiles with recycle material.

2.1.2 Units for Exposed-Grid System AT1

a. Type: III (non-asbestos mineral fiber with painted finish).

b. Flame Spread: Class A, 25 or less

c. Minimum NRC: 0.65 in open office areas; tested on mounting Type E-400 of ASTM E795.

d. Minimum Light Reflectance Coefficient: LR-1, 0.75 or greater.

e. Nominal size: 24 by 48 inch.

f. Edge detail: Beveled tegular.

g. Finish: Factory-applied standard finish.

h. Minimum CAC: 35.

2.1.2.1 Units for Exposed Grid System-AT2

Type: III (non-asbestos) mineral fiber with painted finish.

b. Flame Spread: Class A, 25 or less.

c. Minimum NRC: 0.50 in open office areas.

d. Minimum Light Reflectance: LR-1, 0.75 or greater.

e. Nominal Size: 24 by 24 inch.

f. Edge Detail: Beveled tegular.

g. Minimum CAC: 35.

2.1.3 Humidity Resistant Composition Units-AT3

a. Type: Non-asbestos mineral or glass fibers bonded with ceramic, moisture resistant thermo-setting resin, or other moisture resistant material and having a factory applied white paint finish. Provide panels that do not sag or warp under conditions of heat, high humidity or chemical fumes. Provide a scrubbable factory finish.

b. Flame Spread: Class: A, 25 or less.

c. Minimum NRC: Minimum 0.55 when tested on Mounting Type E-400 of ASTM E795.

d. Minimum Light Reflectance Coefficient: LR-1, 0.75 or greater.

e. Nominal Size: 24 by 24 inch.

f. Edge Detail: Square.

g. Minimum CAC: 38.

2.1.4 Units for Exposed Grid System-AT4 (CLean Room Ceiling)

a. Type: III (non-asbestos) mineral fiber with vinyl faced membrane - unperforated.

b. Flame Spread: Class A, 25 or less.

c. Minimum NRC: N/A.

d. Minimum Light Reflectance: LR-1, 0.75 or greater.

e. Nominal Size: 24 by 24 inch.

f. Edge Detail: Square.

g. Minimum CAC: 40.

2.1.5 Perforated Acoustical Wood Panels

a. Wood veneer panel system on a 3/4 inch back panel with manufacturer

standard perforations and acoustical batting.

b. Wood Veneer Species: Red oak; finish: satin clear.

c. Panel Sizes: As indicated on drawings.

d. Flame Spread: Conforms to meet ASTM E84 Class 1 or A fire retardancy.

e. Edge Detail: Square.

f. Provide hangers for heavy duty T-bar suspension grid.

g. Coordinate cut-outs for all electrical, mechanical and plumbing fixtures/equipment as required.

2.2 SUSPENSION SYSTEM

Provide standardexposed-grid suspension system conforming to ASTM C635/C635M for intermediate-duty systems and for heavy-duty systems, XC1 only. Provide surfaces exposed to view of aluminum or steel with a factory-applied white and black, XC1 only, baked-enamel finish. Provide wall molding having a flange of not less than 15/16 inch. Provide standard corners. Suspended ceiling framing system must have the capability to support the finished ceiling, light fixtures, air diffusers, and accessories, as shown. Provide a suspension system with a maximum deflection of 1/360 of the span length. Conform seismic details to the contract drawings.

2.3 HANGERS

Provide hangers and attachment capable of supporting a minimum 300 pound ultimate vertical load without failure of supporting material or attachment.

2.3.1 Wires

Conform wires to ASTM A641/A641M, Class 1, 0.08 inch (12 gauge) in diameter. ASTM A580/A580M, composition 302 or 304, condition annealed stainless steel.

2.3.2 Eyebolts

Provide eyebolts of weldless, forged-carbon-steel, with a straight-shank in accordance with ASTM A489. Eyebolt size must be a minimum 1/4 inch, zinc coated.

2.3.3 Masonry Anchorage Devices

Comply with ASTM C636/C636M for anchorage devices for eyebolts, machine screws and wood screws.

2.4 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

8 Program entertainment

9 Telephone junction boxes

2.5 FINISHES

Use manufacturer's standard textures, patterns and finishes as specified for acoustical units and suspension system members. Treat ceiling suspension system components to inhibit corrosion.

2.6 COLORS AND PATTERNS

Use colors and patterns for acoustical units and suspension system components as indicated on Finish Schedule.

2.7 ACOUSTICAL SEALANT

Conform acoustical sealant to ASTM C834, nonstaining.

PART 3 EXECUTION

3.1 INSTALLATION

Examine surfaces to receive directly attached acoustical units for unevenness, irregularities, and dampness that would affect quality and execution of the work. Complete and dry interior finish work such as plastering and concrete 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

Where hangers must be splayed (sloped or slanted) around obstructions, offset 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 Caulking

Seal all joints around pipes, ducts or electrical outlets penetrating the ceiling. Apply a continuous ribbon of acoustical sealant on vertical web of wall or edge moldings.

3.2 CEILING ACCESS PANELS

Locate ceiling access panels directly under the items which require access.

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.

3.4 RECLAMATION PROCEDURES

Neatly stack ceiling tile, designated for recycling by the Contracting Officer, on 4 by 4 foot pallets not higher than 4 foot. Panels must be completely dry. Shrink wrap and symmetrically stack pallets on top of each other without falling over.

-- End of Section --

SECTION 09 64 66

WOOD ATHLETIC 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.

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA M4	(2011) Standard for the Care of Preservative-Treated Wood Products

ASTM INTERNATIONAL (ASTM)

ASTM D1622/D1622M	(2014) Apparent Density of Rigid Cellular Plastics
ASTM D2103	(2015) Standard Specification for Polyethylene Film and Sheeting
ASTM E96/E96M	(2014) Standard Test Methods for Water Vapor Transmission of Materials

MAPLE FLOORING MANUFACTURERS ASSOCIATION (MFMA)

MFMA AFSFSCL	(2003) Athletic Floor Sealer and Finish Specifications and Conformance List #22
MFMA GRHM	(2000) Grading Rules for MFMA Northern Hardwood Maple

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	Scientific Certification Systems (SCS)Indoor Advantage

UL ENVIRONMENT (ULE)

ULE Greenguard	UL Greenguard Certification Program

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Hardwood strip flooring system

Clearly delineate components of the system. Show layout of sleepers, steel channels; location of anchor plate assemblies, floor outlets, and underfloor conduit or raceway location; flooring system details; and flooring abutting other construction. Accessories shall be approved by the flooring manufacturer.

SD-03 Product Data

Hardwood strip flooring components

Certification

SD-04 Samples

Strip flooring; G

Steel channels and clips

Flexible foam underlayment

Sleepers and nailers

SD-06 Test Reports

Preservative treatment

SD-08 Manufacturer's Instructions

Flooring system

Adhesive for membrane installation

Submit flooring system manufacturer's installation instructions. Submit vaporproofing manufacturer's written recommendations for adhesives to be used in membrane installation.

SD-10 Operation and Maintenance Data

Hardwood strip flooring, Data Package 1; G

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.3 SUSTAINABLE DESIGN CERTIFICATION

Product shall be third party certified in accordance with ULE Greenguard Gold, SCS Scientific Certification Systems Indoor Advantage Gold or equal. Certification shall be performed annually and shall be current.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the building site in original unopened packages, bundles, or containers. Protect materials against dampness during shipment and after delivery. Store material under cover in a well-ventilated building. Prevent exposure to extreme changes of temperature and humidity. Do not store materials in building under construction until wet-applied building materials are dry. Store flooring in accordance with MFMA GRHM,

under adequate and controlled ventilation and under approved temperature and humidity conditions at the location where it is to be laid for at least 7 days before installation. Handle and store preservative-treated materials in accordance with AWPA M4.

1.5 ENVIRONMENTAL CONDITIONS

For at least one week prior to and during installation, in the location to receive finish flooring and the location where flooring will be stored, maintain a temperature of between 65 and 80 degrees F, and a relative humidity of between 40 and 60 percent. When the interior relative humidity exceeds 60 percent during or after installation of flooring, sanding and finishing of flooring shall be delayed for 2 to 3 weeks after completion of laying, unless directed otherwise. Provide adequate ventilation during the entire sealing and finishing process to ensure that no unhealthy or hazardous accumulation of vapors occurs. Ensure that environmental conditions are met.

PART 2 PRODUCTS

2.1 HARDWOOD STRIP FLOORING SYSTEMS ON CONCRETE SLAB

2.1.1 Clipped to Steel Channels on Underlayment (Performance/Stage)

Provide flooring system consisting of hardwood strip flooring plywood sleepers clipped to steel channels that rest on flexible foam underlayment. Anchor steel channels to concrete floor slab.

2.1.2 Wood Sleepers with Performance Foam (Gymnasium)

Provide flooring system consisting of hardwood strip flooring nailed to wood sleepers that are seated on performance foam resting on the concrete floor slab.

2.2 MATERIALS

2.2.1 Strip Flooring

Second or better grade hard maple graded in accordance with current MFMA GRHM. Flooring shall be 25/32 inch thick by 2 1/4 inches or narrower on the face, kiln dried, continuous tongue-and-groove, and end-matched. Each bundle of flooring shall be clearly grade stamped. Moisture content of strip flooring shall not exceed 8 percent at time of arrival on job site and shall be allowed to acclimate in accordance with paragraph entitled "Delivery, Storage, and Handling."

2.2.2 Steel Channels and Clips

Provide channels and clips not less than 16 gagezinc-coated steel.

2.2.3 Flexible Foam Underlayment

Multicellular, closed cell flexible polyethylene plastic foam having smooth skin; density 1.7 to 3.3 pounds per cubic footwhen tested by ASTM D1622/D1622M. Foam shall be 1/2 inch thick by 48 inches wide by manufacturer's standard length, premilled to receive steel channels at 12 inch centers.

2.2.4 Polyethylene Vaporproofing Membrane

ASTM D2103 Type 21110. Minimum thickness shall be 6 mils. Perm rating shall not exceed 0.02 when tested in accordance with ASTM E96/E96M.

2.2.5 Sleepers and Nailers

Surfaced on four sides, 2 by 3 inches nominal size, Standard or No. 2 grade Douglas fir, northern or western and west coast hemlock, engleman-spruce or No. 2 dimension southern pine. Moisture content shall not exceed 15 percent.

2.2.6 Wood Board Subflooring

No. 2 common Douglas fir, northern or western hemlock, englemann spruce, or southern pine No. 2 boards, northern red or Norway pine, surfaced on four sides. Nominal sizes shall be 1 by 6 inches. Moisture content shall not exceed 15 percent.

2.2.7 Plywood Subflooring

Douglas fir, southern pine, or western larch plywood; grade C-D, with exterior glue; 1/2 inch thick by 4 by 8 feet.

2.2.8 Sealing and Finishing for Hardwood Strip Flooring

Conform to MFMA AFSFSCL, Group II, Performance/Stage III, Gymnasium finish. Seal coat and finish coat materials shall be compatible with each other.

2.2.9 Game Line Marking Materials

As recommended by wood flooring finish manufacturer.

2.2.10 Nails

Shape and size as recommended by flooring manufacturer.

2.2.11 Adhesives

Waterproof, suitable for use with molded rubber base, recommended by rubber base manufacturer.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Condition of Subfloors

Do not install flooring on surfaces that are not suitable for proper installation. Before beginning work under this section, correct defects such as rough or scaling concrete, low spots, high spots, uneven surfaces, and repair damaged portions of concrete slabs. Concrete slabs shall be given a leveling course of latex fill and the surface shall not vary more than 1/8 inch when measured with a 10 foot straightedge placed in any direction.

3.1.2 Preparation of Concrete Slab

Sweep concrete floor. Ensure that slab is dry and clean. Remove paint spots, plaster, masonry droppings, grease, dirt, and other foreign matter including chemical curing agents which may affect the bond of adhesive-applied wood flooring systems. Concrete shall be fully cured and dry.

3.1.3 Anchor Plate Assemblies for Portable Sports Equipment

Floor anchor plate assemblies for vertically adjustable portable sports equipment shall be installed where indicated. Flooring shall be cut neatly around floor plates.

3.1.4 Work of Other Trades

Do not start work specified under this section until work of trades which could create moisture, has been completed.

3.1.5 Moisture Content

Check flooring, subflooring, sleepers and nailers with an approved meter verifying conformance with the requirements specified hereinbefore.

3.2 INSTALLATION

3.2.1 Vaporproofing For Slabs on Grade

Cover slab with the polyethylene membrane. Lap joints at least 6 inches. Seal joints with a full coverage of the adhesive recommended by the membrane manufacturer.

3.2.2 Flooring Clipped to Steel Channels

3.2.2.1 Channel Placing

Install each channel in premilled grooves spaced 16 inches on center in flexible foam parallel to the short side of the room, with butted end-to-end joints staggered at least 24 inches. Anchor channels to the slab at 14 inches on center with 3/8 inch diameter, flat headed anchors that penetrate the slab by at least 1-1/4 inches. Set channels level.

3.2.2.2 Laying of Finished Flooring

Lay finished flooring at right angles to the steel channels. Begin installation with double-tongue strips of flooring in center of room. Clip each board down tightly at each channel intersection with zinc-coated flooring clips. Each clip shall firmly engage the side edges of the flooring and the steel channels. Ensure that each clip is placed properly. Stagger adjacent end joints of flooring so that there will be at least two boards between joints. Where floor plates occur, install steel channels along edges of flooring board; provide clips for flooring. Drive each flooring strip up sideways and endways as tightly as practicable using steel driving tools that prevent marring of exposed flooring. Boards shall be scribed to permanent obstructions and securely blocked at wall lines.

3.2.3 Flooring on Wood Sleepers with Performance Foam

3.2.3.1 Installation of Wood Sleepers With Performance Foam

Install foam and wood sleepers, 9 inches on center for 25/32 inch thick flooring, parallel to short side of the room, with butted end-to-end joints, 1/4 inch apart at the joints, staggered at least 24 inches. Provide a 2 inch air space between ends and sides of sleepers at walls and other permanent obstructions. Sleepers shall be seated level and firm with foam bearing completely on the subfloor.

3.2.3.2 Laying of Finished Flooring

Begin installation of flooring in center of space with double-tongue strips of flooring. Lay flooring at right angles to the wood sleepers. Blind nail each strip of flooring to each wood sleeper with 8 penny spiral screw nails. Leave a continuous air space, 2 inches wide, between the finished flooring and perimeter walls and other permanent obstructions. Stagger end joints of adjacent strips of flooring so that there will be at least two boards between each joint.

3.2.4 Molded-Rubber Base Installation

Install molded-rubber base firmly on perimeter walls in continuous adhesive as recommended by the base manufacturer. Provide vertical, circular or semicircular vent holes in base spaced 5 inches on center in a straight row. Do not fasten base to flooring.

3.3 SANDING, FINISHING, AND MARKING

3.3.1 Sanding

Sand wood floor surfaces with a machine using coarse, medium, and fine grades of sandpaper; the edges shall be sanded to a smooth edge; the finished surface shall be smooth and level, free from scratches. A final disc sanding shall be provided. After final sanding or buffing, vacuum floors until clean. Do not walk on floors thereafter until finish has been applied and is dry.

3.3.2 Finishing

Finishing shall be provided as specified in manufacturer's standard instructions.

3.3.3 Marking

Lay out game lines and fields and patterns where indicated, masking edges to provide sharp, clean edges. Edge shall be straight and width shall be uniform. Apply marking of colors indicated, providing a minimum dry film thickness of one mil.

3.4 PROTECTION

After completion of laying, finishing, and marking of the flooring, do not use the floor for at least 72 hours. Avoid heavy traffic on the floor for at least one week. Upon floor drying, use nonstaining, porous building paper of the type and grade recommended by manufacturer, taped along edges.

Remove kraft paper covering after work in this area is completed.

-- 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 D4078	(2002; R 2008) Water Emulsion Floor Polish
ASTM E2129	(2010) Standard Practice for Data Collection for Sustainability Assessment of Building Products
ASTM E648	(2010; E 2011) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
ASTM F1344	(2012) Rubber Floor Tile
ASTM F1482	(2004; E 2009; R 2009) Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring
ASTM F1700	(2004; R 2010) Solid Vinyl Floor Tile
ASTM F1861	(2008; E 2012; R 2012) Resilient Wall Base
ASTM F1869	(2011) Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
ASTM F2169	(2012) Resilient Stair Treads
ASTM F2170	(2011) Determining Relative Humidity in Concrete Floor Slabs in situ Probes
ASTM F2195	(2007) Linoleum Floor Tile
ASTM F710	(2011) Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

GREEN SEAL (GS)

GS-36	(2000) Commercial Adhesives

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 253	(2011) Standard Method of Test for

	Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(1989; R 2005) Adhesive and Sealant Applications

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC	(2009) Leadership in Energy and Environmental Design(tm) New Construction Rating System

1.2 SYSTEM DESCRIPTION

1.2.1 Environmental Data

Submit Table 1 of ASTM E2129 for the following products: Rubber tile, linoleum tile and solid vinyl tile.

1.2.2 Fire Resistance Requirements

Provide a critical radiant flux of not less than 0.45 watts per square centimeter (Class 1) for flooring in corridors and exits when tested in accordance with ASTM E648 or NFPA 253.

1.2.3 Other Submittal Requirements

The following shall be submitted in accordance with LEED NC:

a. documentation indicating percentage of post-industrial and post-consumer recycled content per unit of product. Indicate relative dollar value of recycled content products to total dollar value of products included in project.

b. 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.

c. 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.

1.3 SUSTAINABILITY REQUIREMENTS

Materials in this technical specification may contribute towards contract compliance with sustainability requirements.

1.3.1 LEED REQUIREMENTS

See Section 01 33 29 LEED DOCUMENTATION for project LEED NC local/regional materials, low-emitting materials, recycled content, and rapidly renewable materials requirements.

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-02 Shop Drawings

Resilient Flooring and Accessories; G

SD-03 Product Data

Resilient Flooring and Accessories; G
Adhesives; (LEED NC)
Rubber Tile
Solid Vinyl Tile
Wall Base
Stair Treads, Risers
Local/Regional Materials
Environmental Data
Linoleum Tile

SD-04 Samples

Resilient Flooring and Accessories; G

SD-06 Test Reports

Moisture, Alkalinity and Bond Tests; G

SD-08 Manufacturer's Instructions

Surface Preparation; G
Installation; G

SD-10 Operation and Maintenance Data

Resilient Flooring and Accessories; G

SD-11 Closeout Submittals

LEED Documentation

1.5 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.

1.6 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.

1.7 SCHEDULING

Schedule resilient flooring application after the completion of other work which would damage the finished surface of the flooring.

1.8 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a one year period.

1.9 EXTRA MATERIALS

Provide extra flooring material of each color and pattern at the rate of 5 tiles for each 1000 tiles. 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

Conform to ASTM F1344 Class 1 homogeneous, Type A (solid color) size as indicated on drawings. Provide a hammered surface with chamfered edges. Provide a 2.7 mm overall thickness.

2.2 SOLID VINYL TILE

Conform to ASTM F1700 Class III printed film minimum wear layer thickness 0.020 inch and minimum overall thickness 0.125 inch, Type B (embossed). Sizes as indicated on drawings.

2.3 LINOLEUM TILE

Conform to ASTM F2195 and consist of a homogeneous layer of a mixture of linoleum cement (binder in linoleum consisting of a mixture of linseed oil, pine rosin, fossil, or other resins or rosins, or an equivalent oxidized oleoresinous binder), cork and/or wood flour, mineral fillers, and pigments bonded to a polyester backing. Size as indicated on drawings.

2.4 WALL BASE

Conform to ASTM F1861, Type TS (vulcanized thermoset rubber), Style B (coved - installed with resilient flooring) and walk-off carpet. Provide 4 inch high and a minimum 1/8 inch thick wall base. Provide job formed corners in matching height, shape, and color.

2.5 STAIR TREADS, RISERS

Conform to ASTM F2169, Type TS (vulcanized thermoset rubber). Conform to ASTM F2169 for surface of treads Class 2 raised hammered pattern and have Group 2 strip for visually impaired of contrasting color of abrasive material. Provide square nosing. Provide either a one piece nosing/tread/riser or a two piece nosing/tread design with a matching coved riser.

2.6 MOULDING

Provide tapered mouldings of vinyl, rubberor stainless steel 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.

2.7 ADHESIVES

Provide adhesives for flooring, base and accessories as recommended by the manufacturer and comply with local indoor air quality standards. VOC content shall be less than the current VOC content limits of GS-36 and SCAQMD Rule 1168. Submit manufacturer's descriptive data, documentation stating physical characteristics, and mildew and germicidal characteristics.

2.8 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.

a. Concrete.

2.9 POLISH/FINISH

Provide polish finish as recommended by the manufacturer and conform to ASTM D4078 for polish.

2.10 CAULKING AND SEALANTS

Provide caulking and sealants in accordance with Section 07 92 00 JOINT SEALANTS.

2.11 MANUFACTURER'S COLOR, PATTERN AND TEXTURE

Provide color, pattern and texture for resilient flooring and accessories as indicated 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, mouldings, and accessories sized a minimum 2-1/2 by 4 inch. Submit Data Package 1 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

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 PLACING LINOLEUM AND SOLID VINYL TILES

Install tile flooring and accessories in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's directions. Keep tile lines and joints square, symmetrical, tight, and even. Keep each floor in true, level plane, except where slope is indicated. Vary edge width as necessary to maintain full-size tiles in the field, no edge tile to be less than one-half the field tile size, except where irregular shaped rooms make it impossible. Cut flooring to fit around all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Cut, fit, and scribe edge tile to walls and partitions after field flooring has been applied.

3.5 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.

3.6 PLACING MOULDING

Provide moulding where flooring termination is higher than the adjacent finished flooring and at transitions between different flooring materials. When required, locate moulding under door centerline. Moulding is not required at doorways where thresholds are provided. Secure moulding with adhesive as recommended by the manufacturer. Prepare and apply adhesives in accordance with manufacturer's printed directions. Anchor stainless steel moulding to floor surfaces as recommended by the manufacturer.

3.7 PLACING WALL BASE

Install wall base in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's printed directions. Tighten base joints and make even with adjacent resilient flooring. Fill voids along the top edge of base at masonry walls with caulk. Roll entire vertical surface of base with hand roller, and press toe of base with a straight piece of wood to ensure proper alignment. Avoid excess adhesive in corners.

3.8 PLACING STAIR TREAD AND RISERS

Secure and install stair treads and risers in accordance with manufacturer's printed installation instructions. Cover the surface of treads and risers the full width of the stairs. Provide equal length pieces butted together to cover the treads and risers for stairs wider than manufacturer's standard lengths.

3.9 CLEANING

Immediately upon completion of installation of flooring in a room or an area, dry/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/or 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 65 66

RESILIENT ATHLETIC 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 C920	(2014a) Standard Specification for Elastomeric Joint Sealants
ASTM D395	(2014) Standard Test Methods for Rubber Property - Compression Set
ASTM D412	(2006a; R 2013) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Installation

SD-04 Samples

Flooring

SD-07 Certificates

Flooring

1.3 QUALITY ASSURANCE

1.3.1 Adhesive Application

Adhesive applied and poured-in-place flooring shall be installed by an experienced floor applicator approved by the manufacturer.

1.3.2 Flooring Material

Submit three samples minimum 9 x 11 inches of each color of flooring material required and manufacturer's certificates stating that the resilient athletic flooring materials conform to the specified requirements. Labels or markings affixed to manufacturer's products

attesting that products meet requirements specified herein will be accepted in lieu of certificates.

1.3.3 Sustainable Design Certification

Product shall be third party certified in accordance with ULE Greenguard Gold, SCS Scientific Certification Systems Indoor Advantage Gold or equal. Certification shall be performed annually and shall be current.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver Materials in manufacturer's original unopened containers with labels intact. Materials shall not be delivered to the installation area or installed before all work that may damage the materials or the finished floor, such as overhead work, is completed. Store materials in a clean, dry area. Materials in storage shall be maintained at temperatures recommended by the manufacturer. Protection boards shall be stored flat and off the ground.

1.5 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a one year period.

1.6 EXTRA MATERIALS

1.6.1 Sheet Rubber Composite Floor

Extra material consisting of full width continuous roll shall be provided for maintenance. A minimum of 5 percent of total square yards of each type, pattern, and color shall be provided.

PART 2 PRODUCTS

2.1 SHEET RUBBER COMPOSITION FLOORING TYPE

Sheet rubber flooring shall be prefabricated, homogeneous, natural and synthetic rubbers, and shall be a minimum of 8mm thick, and shall have standard manufacturer finish. Flooring shall be roll type not less than 48 inches wide. Flooring shall have a minimum tensile stress at 100 percent elongation of 200 psi and a minimum ultimate elongation of 250 percent when tested in accordance with ASTM D412. Flooring shall be able to withstand 50 percent compression for 72 hours at 72 degrees F with a residual deformation of less than 8 percent when tested in accordance with ASTM D395.

2.2 ADHESIVES

Adhesive shall be as recommended by the flooring manufacturer and correspond to the specified flooring product and to the substrate.

2.3 CRACK FILLER/LEVELER FOR CONCRETE SURFACES

Crack filler/leveler for concrete floor surfaces shall be as recommended by flooring manufacturer.

2.4 EDGING STRIPS

Strips shall be of the same material and design as recommended by flooring manufacturer if required.

2.5 PRIMER

Concrete primer shall be as recommended by flooring manufacturer and correspond to the specified flooring product and to the substrate.

2.6 SEALANTS

Sealants shall be in accordance with Section 07 92 00 JOINT SEALANTS.

2.7 MANUFACTURERS COLOR

Color shall be as indicated on drawings.

PART 3 EXECUTION

3.1 PREPARATION

Concrete surfaces shall be completely cured and dry. No curing agents, sealers, or hardeners shall be used to aid in the curing of the concrete slab. Surfaces shall be free of paint spots, and other foreign materials. Surfaces shall be ground down or leveled with an approved leveling compound to a tolerance of plus or minus 1/8 inch within a 10 foot radius. Cracks, construction joints, or damaged portions of floor shall be filled with crack filler for concrete surfaces. Expansion joints shall be filled and sealed in accordance with the approved installation instructions of the manufacturer. All sealants shall be in accordance with ASTM C920. Expansion joints shall not be filled with a material that will make them inoperable.

3.2 MOISTURE TEST

The suitability of the concrete subfloor for receiving the resilient flooring with regard to moisture content shall be determined by a moisture test as recommended by the flooring manufacturer.

3.3 INSTALLATION

3.3.1 General Requirements

Installation shall be in accordance with the approved installation instructions. Sheet flooring shall be rolled with a medium-sized roller in both directions to release entrapped air. Submit manufacturer's descriptive data and catalog cuts indicating materials of construction and physical characteristics. Installation, cleaning and maintenance instructions shall be included.

3.3.2 Seams

End seams shall be cut and placed as recommended by the manufacturer. Seams shall be weighted as required.

3.3.3 Sheet Rubber Composition Flooring

Sheet flooring shall be dry cut and layed out flat a minimum of 24 hours prior to adhering to the substrate. End seams shall be single cut. Edge seams shall be cut through overlapping sheets, then snapped into place to ensure tight seams. Seams shall be weighted as required.

3.4 PROTECTION

The installed flooring shall be protected from soiling and damage with heavy reinforced, nonstaining kraft paper, plywood, or hardboard sheets as required. Edges of kraft paper protection shall be lapped and secured to provide a continuous cover. Protective covering shall be removed when directed by the Contracting Officer.

-- End of Section --

SECTION 09 68 00

CARPETING
11/13

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 134	(2011; E 2013) Electrostatic Propensity of Carpets

ASTM INTERNATIONAL (ASTM)

ASTM D3278	(1996; R 2011) Flash Point of Liquids by Small Scale Closed-Cup Apparatus
ASTM D5793	(2013) Binding Sites Per Unit Length or Width of Pile Yarn Floor Coverings
ASTM D5848	(2010; E 2010) 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 E2129	(2010) Standard Practice for Data Collection for Sustainability Assessment of Building Products

CARPET AND RUG INSTITUTE (CRI)

CRI CIS	(2011) Carpet Installation Standard

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)

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

16 CFR 1630	Standard for the Surface Flammability of Carpets and Rugs (FF 1-70)
40 CFR 247	Comprehensive Procurement Guideline for Products Containing Recovered Materials

1.2 SYSTEM DESCRIPTION

1.2.1 Local/Regional Materials

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.

1.2.2 Environmental Data

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. Submit Table 1 of ASTM E2129 for the following products: Entrance carpet tiles. Submit documentation indicating relative dollar value of rapidly renewable materials to total dollar value of products included in project.

1.2.3 Scheduling

Install carpet systems after the installation and ventilation period of materials or finishes which have high short-term emissions of VOCs, formaldehyde, particulates, or other air-borne compounds which may be adsorbed by or settle on the carpet tiles.

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 local/regional materials, low-emitting materials and recycled content requirements

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-02 Shop Drawings

Installation Drawings; G
Moldings; G

SD-03 Product Data

Carpet; G
Moldings; G
Physical Characteristics; (LEED BD+C)
Local/Regional Materials; (LEED BD+C)
Environmental Data

SD-04 Samples

Carpet; G
Moldings; G

SD-06 Test Reports

Moisture and Alkalinity Tests; G

SD-07 Certificates

Carpet
Regulatory Requirements

SD-08 Manufacturer's Instructions

Surface Preparation
Installation

SD-10 Operation and Maintenance Data

Carpet; G
Cleaning and Protection; G
Maintenance Service

SD-11 Closeout Submittals

LEED Documentation
Local/Regional Materials; (LEED BD+C)

1.5 QUALITY ASSURANCE INCLUDING LEED DOCUMENTATION

Provide the Carpet and Rug Institute (CRI) Indoor Air Quality (IAQ) label for carpet, carpet cushion, and adhesives or demonstrate compliance with testing criteria and frequencies through independent laboratory test results. Carpet, carpet cushion, and adhesives bearing the label will indicate that the carpet has been tested and meets the Regulatory Requirements and criteria of the CRI IAQ Carpet Testing Program, and minimizes the impact on indoor air quality. Procure carpet in accordance with 40 CFR 247, and where possible, purchased locally to reduce emissions of fossil fuels from transporting. Conform to EPA requirements in accordance with Section 01 33 29 SUSTAINABILITY REPORTING for carpet. Submit certificates, showing conformance with the referenced standards contained in this section, for the following: Carpet, Carpet Cushion and Molding. Include in the report percentage of post-industrial and post-consumer recycled material and relative dollar value of recycled content products to total dollar value of products included in project.

1.6 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. Do not store carpet near materials that may off gas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives.

1.7 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.

1.8 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; 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 catalog data for 1) Carpet, 2) Carpet Cushion, and 3) Moldings. Also, submit samples of the following:

a. Carpet: Two "Production Quality" full size samples of each carpet proposed for use, showing quality, pattern, and color specified

b. Vinyl or Aluminum Moldings: Two pieces of each type at least 12 inches long

2.1.1 Physical Characteristics

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. Submit documentation indicating relative dollar value of rapidly renewable materials to total dollar value of products included in project.

2.1.2 Entrance

Carpet shall comply with the following:

a. Carpet Construction: Needlebond hobnail.

b. Type: Entrance 24 x 24 inch square.

c. Pile Type: Multilevel loop.

d. Pile Fiber: Polyethylene terephthalate (PET) polyester.

e. Gauge or Pitch: Minimum 1/12 inch in accordance with ASTM D5793.

f. Stitches or Rows/Wires: Minimum 11.0 per square inch.

g. Tufted Weight: Minimum 49 ounces per square yard. This does not include weight of backings. Determine weight in accordance with ASTM D5848.

h. Total Thickness: Minimum 0.362 inch in accordance with ASTM D6859.

i. Pile Density: Minimum 6477.

j. Dye Method: Solution dyed.

k. Backing Materials: Provide manufacturer standard backing system for walk-off carpet.

2.2 PERFORMANCE REQUIREMENTS

2.2.1 Static Control

a. 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.

b. Flammability and Critical Radiant Flux Requirements: Class 1, comply carpet with 16 CFR 1630.

2.2.2 Flammability and Critical Radiant Flux Requirements

Class 1, comply with 16 CFR 1630.

2.3 ADHESIVES AND CONCRETE PRIMER

Adhesives and concrete primers shall 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.

2.4 MOLDINGS

Install carpet moldings, either vinyl or aluminum, where floor covering material changes or carpet edge does not abut a vertical surface. Finish as indicated on drawings.

2.5 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 preparation of substrate, 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 CIS. Submit three copies of test reports of moisture and alkalinity 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 CIS. 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. Submit three copies of drawings indicating areas receiving carpet, carpet types, textures and patterns, direction of pile, location of seams, and locations of edge molding. Submit installation drawings for: for 1) Carpet Moldings diagramming the location of seams, edge moldings, and carpet direction for approval prior to installation.

3.4.1 Entrance Carpet Installation

Install tiles with adhesive as recommended by manufacturer. Lay tiles as indicated on drawings. Neatly cut and fit, securely, cutouts at door jambs, columns, and ducts.

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. Refer to Division 1 specifications for additional information.

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 5 percent of total square yards of each carpet type, pattern, and color.

3.7.2 Maintenance Service

Collect information from the manufacturer about maintenance agreement green lease options, and submit to Contracting Officer. Service shall reclaim materials for recycling and/or reuse. Service shall 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 maintenance agreement take-back program green lease 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/or reuse.

-- End of Section --

SECTION 09 83 13

ACOUSTICAL WALL TREATMENT
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 C423	(2009a) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2012) International Building Code

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	Scientific Certification Systems (SCS)Indoor Advantage

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC	(2009) Leadership in Energy and Environmental Design(tm) New Construction Rating System

UL ENVIRONMENT (ULE)

ULE Greenguard	UL Greenguard Certification Program

1.2 SUSTAINABILITY REQUIREMENTS

Materials in this technical specification may contribute towards contract compliance with sustainability requirements.

1.2.1 LEED REQUIREMENTS

See Section 01 33 29 LEED DOCUMENTATION for project LEED NC local/regional materials, low-emitting materials, recycled content, certified wood, requirements.

1.2.2 Air Quality Certification

Product shall be third party certified in accordance with ULE Greenguard, SCS Scientific Certification Systems Indoor Advantageor equal.

Certification shall be performed annually and shall be current.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. 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

SD-04 Samples

Acoustical Wall Panels; G

SD-07 Certificates

Acoustical Wall Panels

SD-11 Closeout Submittals

LEED Documentation

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 PERFORATED WOOD ACOUSTICAL WALL PANELS XW1, XW2

Provide acoustical wall panels consisting of prefinished, perforated wood with acoustical material 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, openings, and shape and thickness of materials. Perimeter edges shall be non-reinforced. Acoustical wall panels installed in non-sprinklered areas shall comply with the requirements of ICC IBC, Standard 42-2. Submit manufacturer's descriptive data and catalog cuts; wood samples, minimum 18 inches wide by 24 inches long 3 samples of each 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 shall conform to the following:

a. Panel Width: Panel width shall be as detailed.

b. Panel Height: Panel height shall be as detailed.

c. 3/4 inch thick core material with veneer face.

d. 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.

e. Substrate: MDF.

f. Noise Reduction Coefficient (NRC) Range: 0.65 ASTM C423.

g. Edge Detail: Square.

h. Mounting: Acoustical panels shall be mounted by manufacturer's standard mechanical fasteners - Z clip.

2.2 ACOUSTICAL STRETCHED FABRIC SYSTEM TYPE XW6, XW7

Provide acoustical wall panels consisting of prefinished, factory assembled, seamless fabric covered, fiberglass 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 shall be non-reinforced. Comply with EPA requirements in accordance with Section 01 33 29 LEED(TM) DOCUMENTATION. Submit manufacturer's descriptive data and catalog cuts; fabric samples 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 shall conform to the following:

a. Panel Size and Thickness: As indicated on drawings.

b. Framework: Manufacturer's standard framework.

c. Edge Profile: 1-inch square concealed edge.

d. Midwall Profile: 1-inch square butt joint.

e. Core Type Multi Density Fiberglass

1. Density: Minimum 16 PCF.
2. Noise Reduction Coefficient; determined by ASTM C423 type A mounting, 1-inch thickness no less than 0.80 NRC.

f. Fabric Covering: As indicated on drawings.

g. Mounting acoustical panels shall be mounted using manufacturer's standard fasteners for securing framing track directly to substrates. No nailing through fabric accepted.

2.3 ACOUSTICAL STRETCHED FABRIC SYSTEM-All XW4

Provide acoustical wall panels consisting of prefinished, factory

assembled, seamless fabric covered, 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 shall be a formulated resin edge hardener. Comply with EPA requirements in accordance with Section 01 33 29 SUSTAINABILITY REPORTING. Submit manufacturer's descriptive data and catalog cuts; fabric and vinyl 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 shall conform to the following:

a. Panel size as indicated on drawings.

b. Core Type: Acoustical fiberglass -

   1. Density: Minimum 5-7 PCF.
   2. Noise Reduction Coefficient: Determined by ASTM C423 Type A mounting, 1-inch thickness no less than .080 NRC.

c. Fabric covering as indicated on drawings.

d. Mounting acoustical panels shall be mounted as indicated on drawings.

2.4 COLOR

Color shall be as indicated on the drawings. Color listed is not intended to limit the selection of equal colors from other manufacturers.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

Walls shall 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 shall 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, dirty or stained panel surfaces shall be cleaned in accordance with manufacturer's instructions and left free from defects. Panels that are damaged, discolored, or improperly installed shall be removed and new panels provided as directed.

-- 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	(2001; Supplements 2002-2008) Documentation of the Threshold Limit Values and Biological Exposure Indices

ASTM INTERNATIONAL (ASTM)

ASTM D235	(2002; R 2012) Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)
ASTM D4263	(1983; R 2012) Indicating Moisture in Concrete by the Plastic Sheet Method
ASTM D4444	(2008) Use and Calibration of Hand-Held Moisture Meters
ASTM D523	(2014) Standard Test Method for Specular Gloss
ASTM D6386	(2010) Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
ASTM E2129	(2010) Standard Practice for Data Collection for Sustainability Assessment of Building Products
ASTM F1869	(2011) Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

MASTER PAINTERS INSTITUTE (MPI)

MPI 10	(Oct 2009) Exterior Latex, Flat, MPI Gloss Level 1
MPI 107	(Oct 2009) Rust Inhibitive Primer (Water-Based)
MPI 11	(Oct 2009) Exterior Latex, Semi-Gloss, MPI Gloss Level 5
MPI 116	(Oct 2009) Epoxy Block Filler

MPI 134	(Oct 2009) Galvanized Primer (Waterbased)
MPI 138	(Oct 2009) Interior High Performance Latex, MPI Gloss Level 2
MPI 139	(Oct 2009) Interior High Performance Latex, MPI Gloss Level 3
MPI 140	(Oct 2009) Interior High Performance Latex, MPI Gloss Level 4
MPI 141	(Oct 2009) Interior High Performance Latex MPI Gloss Level 5
MPI 144	(Oct 2009) Institutional Low Odor / VOC Interior Latex, MPI Gloss Level 2
MPI 145	(Oct 2009) Institutional Low Odor / VOC Interior Latex, MPI Gloss Level 3
MPI 146	(Oct 2009) Institutional Low Odor/VOC Interior Latex, MPI Gloss Level 4
MPI 147	(Oct 2009) Institutional Low Odor / VOC Interior Latex, Semi-Gloss, MPI Gloss Level 5
MPI 163	(Oct 2009) Exterior W.B. Light Industrial Coating, Semi-Gloss, MPI Gloss Level 5
MPI 23	(Oct 2009) Surface Tolerant Metal Primer
MPI 4	(Oct 2009) Interior/Exterior Latex Block Filler
MPI 47	(Oct 2009) Interior Alkyd, Semi-Gloss, MPI Gloss Level 5
MPI 48	(Oct 2009) Interior Alkyd, Gloss, MPI Gloss Level 6
MPI 49	(Oct 2009) Interior Alkyd, Flat, MPI Gloss Level 1
MPI 50	(Oct 2009) Interior Latex Primer Sealer
MPI 51	(Oct 2009) Interior Alkyd, Eggshell, MPI Gloss Level 2
MPI 56	(Oct 2009) Interior Oil Modified Urethane Clear Gloss
MPI 57	(Oct 2009) Interior Oil Modified Urethane Clear Satin
MPI 7	(Oct 2009) Exterior Oil Wood Primer
MPI 77	(Oct 2009) Epoxy Gloss

MPI 79	(Oct 2009) Alkyd Anti-Corrosive Metal Primer
MPI 90	(Oct 2009) Interior Wood Stain, Semi-Transparent
MPI 94	(Oct 2009) Exterior Alkyd, Semi-Gloss, MPI Gloss Level 5
MPI 95	(Oct 2009) Quick Drying Primer for Aluminum

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	Scientific Certification Systems (SCS)Indoor Advantage
SCS SP-01	(2000) Environmentally Preferable Product Specification for Architectural and Anti-Corrosive Paints

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PA 1	(2000; E 2004) Shop, Field, and Maintenance Painting of Steel
SSPC PA Guide 3	(1982; E 1995) A Guide to Safety in Paint Application
SSPC QP 1	(1998; E 2004) Standard Procedure for Evaluating Painting Contractors (Field Application to Complex Industrial Structures)
SSPC SP 1	(2015) Solvent Cleaning
SSPC SP 12/NACE No.5	(2002) Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating
SSPC SP 2	(1982; E 2000; E 2004) Hand Tool Cleaning
SSPC SP 3	(1982; E 2004) Power Tool Cleaning
SSPC SP 6/NACE No.3	(2007) Commercial Blast Cleaning
SSPC VIS 3	(2004) Guide and Reference Photographs for Steel Surfaces Prepared by Hand and Power Tool Cleaning

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. GENERAL SERVICES ADMINISTRATION (GSA)

FED-STD-313	(Rev D; Notice 1) Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC	(2009) Leadership in Energy and Environmental Design(tm) New Construction Rating System

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

29 CFR 1910.1000	Air Contaminants

UL ENVIRONMENT (ULE)

ULE Greenguard	UL Greenguard Certification Program

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. The following shall be submitted 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. All coats on a particular substrate must be 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.

In keeping with the intent of Executive Order 13101, "Greening the Government through Waste Prevention, Recycling, and Federal Acquisition", products certified by SCS as meeting SCS SP-01 shall be given preferential consideration over registered products. Products that are registered shall be given preferential consideration over products not carrying any EPP designation.

SD-02 Shop Drawings

Piping identification

Submit color stencil codes

SD-03 Product Data

Local/Regional Materials; (LEED NC)

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.

Environmental Data

Materials; (LEED NC)

Submit documentation indicating percentage of post-industrial and post-consumer recycled content per unit of product. Indicate relative dollar value of recycled content products to total dollar value of products included in project.

Coating; G

Manufacturer's Technical Data Sheets; (LEED)

Indicate VOC content.

SD-04 Samples

Color; G

Submit manufacturer's samples of paint colors. Cross reference color samples to color scheme as indicated.

SD-07 Certificates

Applicator's qualifications

Qualification Testing laboratory for coatings; G

Sustainable Design Certification; G

SD-08 Manufacturer's Instructions

Application instructions

Mixing

Detailed mixing instructions, minimum and maximum application temperature and humidity, potlife, and curing and drying times between coats.

Manufacturer's Material Safety Data Sheets

Submit manufacturer's Material Safety Data Sheets for coatings, solvents, and other potentially hazardous materials, as defined in FED-STD-313.

SD-10 Operation and Maintenance Data

Coatings:; G

Preprinted cleaning and maintenance instructions for all coating systems shall be provided.

SD-11 Closeout Submittals

Local/Regional Materials; (LEED)

LEED documentation relative to local/regional materials credit in accordance with LEED Reference Guide. Include in LEED Documentation Notebook.

Materials; (LEED)

LEED documentation relative to recycled content credit in accordance with LEED Reference Guide. Include in LEED Documentation Notebook.

LEED documentation relative to low emitting materials credit in accordance with LEED Reference Guide. Include in LEED Documentation Notebook.

1.3 APPLICATOR'S QUALIFICATIONS

1.3.1 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

1.3.2 SSPC QP 1 Certification

All contractors and subcontractors that perform surface preparation or coating application shall be certified by the Society for Protective Coatings (formerly Steel Structures Painting Council) (SSPC) to the requirements of SSPC QP 1 prior to contract award, and shall remain certified while accomplishing any surface preparation or coating application. The painting contractors and painting subcontractors must remain so certified for the duration of the project. If a contractor's or subcontractor's certification expires, the firm will not be allowed to

perform any work until the certification is reissued. Requests for extension of time for any delay to the completion of the project due to an inactive certification will not be considered and liquidated damages will apply. Notify the Contracting Officer of any change in contractor certification status.

1.4 QUALITY ASSURANCE

1.4.1 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." Products which do not conform, shall be removed from the job site and replaced with new products that conform to the referenced specification. Testing of replacement products that failed initial testing shall be 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 epoxy and urethane based paint products. Test paint products as specified in the paragraph "Testing Procedure" where applicable.

1.4.1.1 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 shall provide one quart samples of the selected paint materials. The samples shall be taken in the presence of the Contracting Officer, and labeled, identifying each sample. Provide labels in accordance with the paragraph "Packaging, Labeling, and Storage" of this specification.

1.4.1.2 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. The qualification testing lab report shall include the backup data and summary of the test results. The summary shall list all of the reference specification requirements and the result of each test. The summary shall clearly indicate 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 the Contractor chooses MPI 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.

1.4.2 Sustainable Design Certification

Product shall be third party certified in accordance with ULE Greenguard, SCS Scientific Certification Systems Indoor Advantage or equal. Certification shall be performed annually and shall be current.

1.5 REGULATORY REQUIREMENTS

1.5.1 Environmental Protection

In addition to requirements specified elsewhere for environmental protection, provide coating materials that conform to the restrictions of the local Air Pollution Control District and regional jurisdiction. Notify Contracting Officer of any paint specified herein which fails to conform.

1.5.2 Lead Content

Do not use coatings having a lead content over 0.06 percent by weight of nonvolatile content.

1.5.3 Chromate Content

Do not use coatings containing zinc-chromate or strontium-chromate.

1.5.4 Asbestos Content

Materials shall not contain asbestos.

1.5.5 Mercury Content

Materials shall not contain mercury or mercury compounds.

1.5.6 Silica

Abrasive blast media shall not contain free crystalline silica.

1.5.7 Human Carcinogens

Materials shall not contain ACGIH 0100 confirmed human carcinogens (A1) or suspected human carcinogens (A2).

1.6 PACKAGING, LABELING, AND STORAGE

Paints shall be 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. Pigmented paints shall be furnished in containers not larger than 5 gallons. Paints and thinners shall be stored 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. Do not store paint, polyurethane, varnish, or wood stain products with materials that have a high capacity to adsorb VOC emissions. Do not store paint, polyurethane, varnish, or wood stain products in occupied spaces.

1.7 SAFETY AND HEALTH

Apply coating materials using safety methods and equipment in accordance with the following:

Work shall 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. The Activity Hazard Analysis shall include analyses of the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.

1.7.1 Safety Methods Used During Coating Application

Comply with the requirements of SSPC PA Guide 3.

1.7.2 Toxic Materials

To protect personnel from overexposure to toxic materials, conform to the most stringent guidance of:

a. The applicable manufacturer's Material Safety Data Sheets (MSDS) or local regulation.

b. 29 CFR 1910.1000.

c. ACGIH 0100, threshold limit values.

1.8 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.

1.8.1 Coatings

Do not apply coating when air or substrate conditions are:

a. Less than 5 degrees F above dew point;

b. Below 50 degrees F or over 95 degrees F, unless specifically pre-approved by the Contracting Officer and the product manufacturer. Under no circumstances shall application conditions exceed manufacturer recommendations.

1.8.2 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.

1.9 SUSTAINABLE DESIGN REQUIREMENTS

1.9.1 Local/Regional Materials

Use materials or products extracted, harvested, or recovered, as well as manufactured, within a 500 mile radius from the project site, if available from a minimum of three sources. See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total local material requirements. Paint and coating materials may be locally available.

1.9.2 Environmental Data

Submit Table 1 of ASTM E2129 for the following products, paints.

1.10 SCHEDULING

Allow paint, polyurethane, varnish, and wood stain installations to cure prior to the installation of materials that adsorb VOCs, including ceiling tile and carpet.

1.11 COLOR SELECTION

Colors of finish coats shall be as indicated or specified. Where not indicated or specified, colors shall be selected by the Contracting Officer. 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.

Color, texture, and pattern of wall coating systems shall be as indicated 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 buildings and appurtenances. Also included are existing coated surfaces made bare by cleaning operations.

1.12.1.2 Interior Painting

Includes new surfaces of the buildings 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.

1.12.3 Mechanical and Electrical Painting

Includes field coating of interior and exterior new surfaces.

a. Where a space or surface is indicated to be painted, include the following items unless indicated otherwise.

(1) Exposed piping, conduit, and ductwork;

(2) Supports, hangers, air grilles, and registers;

(3) Miscellaneous metalwork and insulation coverings.

b. Do not paint the following, unless indicated otherwise:

(1) New zinc-coated, aluminum, and copper surfaces under insulation.

(2) New aluminum jacket on piping.

(3) New interior ferrous piping under insulation.

1.12.3.1 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. In lieu of red enamel finish coat, provide piping with 2 inch wide red enamel bands or self-adhering red plastic bands spaced at maximum of 20 foot intervals.

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 shall only be accomplished by 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 (metals, plastics, wood, paper, leather, cloth, etc.). 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 manufacturer's technical data sheets for specified coatings and solvents. Minimum 20 percent post-consumer recycled content for light-colored paints and primers. Minimum 50 percent post-consumer recycled content for dark-colored paints and primers. All consolidated latex paints shall contain a minimum of 100 percent post-consumer recycled content. Comply with applicable regulations regarding toxic and hazardous materials.

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, workmen skilled in the trades involved shall reinstall removed items. Restore surfaces contaminated by coating materials, to original condition and repair damaged items.

3.2 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. Oil and grease shall be removed prior to mechanical cleaning. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces. Exposed ferrous metals such as nail heads on or in contact with 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.

3.3 PREPARATION OF METAL SURFACES

3.3.1 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 or SSPC SP 3. Shop-coated ferrous surfaces shall be protected 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.

3.3.2 Final Ferrous Surface Condition:

For tool cleaned surfaces, the requirements are stated in SSPC SP 2 and SSPC SP 3. As a visual reference, cleaned surfaces shall be similar to photographs in SSPC VIS 3.

3.3.3 Galvanized Surfaces

a. New or Existing Galvanized Surfaces With Only Dirt and Zinc Oxidation Products: Clean with solvent or non-alkaline detergent solution in accordance with SSPC SP 1. If the galvanized metal has been passivated or stabilized, the coating shall be completely removed by brush-off abrasive blast. New galvanized steel to be coated shall not be "passivated" or "stabilized" 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.

3.3.4 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.

3.3.5 Terne-Coated Metal Surfaces

Solvent clean surfaces with mineral spirits, ASTM D235. Wipe dry with clean, dry cloths.

3.4 PREPARATION OF CONCRETE AND CEMENTITIOUS SURFACE

3.4.1 Concrete and Masonry

a. Curing: Concrete, stucco and masonry surfaces shall be allowed to cure at least 30 days before painting, except concrete slab on grade, which shall be allowed to cure 90 days before painting.

b. Surface Cleaning: Remove the following deleterious substances.

(1) Dirt, Chalking, Grease, and Oil: Wash new surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, and 4 quarts of warm water. Then rinse thoroughly with fresh water.

(2) Fungus and Mold: Wash new surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, 1 quart 5 percent sodium hypochlorite solution and 3 quarts of warm water. Rinse thoroughly with fresh water.

(3) Paint and Loose Particles: Remove by wire brushing.

(4) Efflorescence: Remove by scraping or wire brushing followed by washing with a 5 to 10 percent by weight aqueous solution of hydrochloric (muriatic) acid. Do not allow acid to remain on the surface for more than five minutes before rinsing with fresh water. Do not acid clean more than 4 square feet of surface, per workman, at one time.

c. Cosmetic Repair of Minor Defects: Repair or fill mortar joints and minor defects, including but not limited to spalls, in accordance with manufacturer's recommendations and prior to coating application.

d. Allowable Moisture Content: Latex coatings may be applied to damp surfaces, but not to surfaces with droplets of water. Do not apply epoxies to damp vertical surfaces as determined by ASTM D4263 or horizontal surfaces that exceed 3 lbs of moisture per 1000 square feet in 24 hours as determined by ASTM F1869. In all cases follow manufacturers recommendations. Allow surfaces to cure a minimum of 30 days before painting.

3.4.2 Gypsum Board, Plaster, and Stucco

a. Surface Cleaning: Plaster and stucco shall be clean and free from loose matter; gypsum board shall be 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. New plaster to be coated shall have 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.

3.5 PREPARATION OF WOOD AND PLYWOOD SURFACES

3.5.1 New Plywood and Wood Surfaces, Except Floors:

a. Wood surfaces shall be cleaned of foreign matter.

Surface Cleaning: Surfaces shall be 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.

b. Moisture content of the wood shall not exceed 12 percent as measured by a moisture meter in accordance with ASTM D4444, Method A, unless otherwise authorized.

c. Wood surfaces adjacent to surfaces to receive water-thinned paints shall be primed and/or touched up before applying water-thinned paints.

d. Cracks and Nailheads: Set and putty stop nailheads and putty cracks after the prime coat has dried.

e. Cosmetic Repair of Minor Defects:

(1) Knots and Resinous Wood: 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.

3.5.2 Wood Floor Surfaces, Natural Finish

a. Initial Surface Cleaning: As specified in paragraph entitled "Surface Preparation."

b. Sanding and Scraping: Sanding of wood floors is specified in Section 09 64 66 WOOD ATHLETIC FLOORING. Floors of oak or similar open-grain wood shall be filled with wood filler recommended by the finish manufacturer and the excess filler removed.

c. Final Cleaning: After sanding, sweep and vacuum floors clean. Do not walk on floors thereafter until specified sealer has been applied and is dry.

3.5.3 Interior Wood Surfaces, Stain Finish

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 not less than 8 hours before the application of stain; excess filler shall be removed and the surface sanded smooth.

3.6 APPLICATION

3.6.1 Coating Application

Painting practices shall 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 shall show no signs of deterioration. Uniform suspension of pigments shall be maintained 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. Rollers for applying paints and enamels shall be 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.

Paints, except water-thinned types, shall be applied only to surfaces that

are completely free of moisture as determined by sight or touch.

Thoroughly work coating materials into joints, crevices, and open spaces. Special attention shall be given to insure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces.

Each coat of paint shall be applied so dry film shall be of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete.

Touch up damaged coatings before applying subsequent coats. Interior areas shall be broom clean and dust free 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. Each coat shall cover surface of preceding coat or surface completely, and there shall be a 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.

e. Floors: For nonslip surfacing on level floors, as the intermediate coat is applied, cover wet surface completely with almandite garnet, Grit No. 36, with maximum passing U.S. Standard Sieve No. 40 less than 0.5 percent. When the coating is dry, use a soft bristle broom to sweep up excess grit, which may be reused, and vacuum up remaining residue before application of the topcoat. For nonslip surfacing on ramps, provide MPI 77 with non-skid additive, applied by roller in

accordance with manufacturer's instructions.

3.6.2 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. The written permission shall include quantities and types of thinners to use.

When thinning is allowed, paints shall be thinned immediately prior to application with not more than 1 pint of suitable thinner per gallon. The use of thinner shall not relieve the Contractor from obtaining complete hiding, full film thickness, or required gloss. Thinning shall not cause the paint to exceed limits on volatile organic compounds. Paints of different manufacturers shall not be mixed.

3.6.3 Two-Component Systems

Two-component systems shall be mixed in accordance with manufacturer's instructions. Any thinning of the first coat to ensure proper penetration and sealing shall be as recommended by the manufacturer for each type of substrate.

3.6.4 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, 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.

3.7 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. Pipes and Tubing: The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat, but shall be overcoated with the specified ferrous-metal primer prior to application of finish coats.

e. 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.

3.8 COATING SYSTEMS FOR CONCRETE AND CEMENTITIOUS SUBSTRATES

Apply coatings of Tables in Division 3, 4 and 9 for Exterior and Interior.

3.9 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.

d. Wood Floors to Receive Natural Finish: Thin first coat 2 to 1 using thinner recommended by coating manufacturer. Apply all coatings at rate of 300 to 350 square feet per gallon. Apply second coat not less than 2 hours and not over 24 hours after first coat has been applied. Apply with lambs wool applicators or roller as recommended by coating manufacturer. Buff or lightly sand between intermediate coats as recommended by coating manufacturer's printed instructions.

3.10 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.

3.11 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.

3.12 WASTE MANAGEMENT

As specified in the Waste Management Plan and as follows. Do not use kerosene or any such organic solvents to clean up water based paints. Properly dispose of paints or solvents in designated containers. Close and seal partially used containers of paint to maintain quality as necessary for reuse. Store in protected, well-ventilated, fire-safe area at moderate temperature. Place materials defined as hazardous or toxic waste in designated containers. Set aside extra paint for future color matches or reuse by the Government.

3.13 PAINT TABLES

All DFT's are minimum values. Use only interior paints and coatings that meet VOC requirements of LEED low emitting materials credit. Acceptable products are listed in the MPI Green Approved Products List, available at http://www.specifygreen.com/APL/ProductIdxByMPInum.asp.

3.13.1 EXTERIOR PAINT TABLES

DIVISION 3: EXTERIOR CONCRETE PAINT TABLE

A. New concrete;vertical surfaces, including undersides of balconies and soffits but excluding tops of slabs:

1. Latex
   New; MPI EXT 3.1A-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 11	MPI 11	MPI 11

   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 concrete masonry on uncoated surface:

1. Latex
   New; MPI EXT 4.2A-G5 (Semigloss)

Block Filler:	Primer:	Intermediate:	Topcoat:
MPI 4	N/A	MPI 11	MPI 11

   System DFT: 11 mils

   Topcoat: Coating to match adjacent surfaces.

DIVISION 5: EXTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE

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)

Primer:	Intermediate:	Topcoat:
MPI 23	MPI 94	MPI 94

   System DFT: 5.25 mils

STEEL / FERROUS SURFACES
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

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

2. MPI EXT 5.4F-G (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 95	MPI 94	MPI 94

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-G5(Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 79	MPI 163	MPI 163

System DFT: 5 mils

DIVISION 6: EXTERIOR WOOD; DRESSED LUMBER, PANELING, DECKING, SHINGLES PAINT TABLE

A. New 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 7	MPI 10	MPI 10

System DFT: 5 mils

3.13.2 INTERIOR PAINT TABLES
DIVISION 4: INTERIOR CONCRETE MASONRY UNITS PAINT TABLE

A. Concrete masonry:

2. Institutional Low Odor / Low VOC Latex
New; MPI INT 4.2E-G2 (Flat)

Filler	Primer:	Intermediate:	Topcoat:
MPI 4	N/A	MPI 144	MPI 144

System DFT: 4 mils

DIVISION 4: INTERIOR CONCRETE MASONRY UNITS PAINT TABLE

New; MPI INT 4.2E-G3 (Eggshell)

Filler	Primer:	Intermediate:	Topcoat:
MPI 4	N/A	MPI 145	MPI 145

System DFT: 4 mils

New; MPI INT 4.2E-G4 (Satin)

Filler	Primer:	Intermediate:	Topcoat:
MPI 4	N/A	MPI 146	MPI 146

System DFT: 4 mils

New; MPI INT 4.2E-G5 (Semigloss)

Filler	Primer:	Intermediate:	Topcoat:
MPI 4	N/A	MPI 147	MPI 147

System DFT: 4 mils

B. New Concrete masonry units in restrooms, shower areas, and other high humidity areas unless otherwise specified:

1. Epoxy

MPI INT 4.2G-G6 (Gloss)

Filler:	Primer:	Intermediate:	Topcoat:
MPI 116	N/A	MPI 77	MPI 77

System DFT: 10 mils

Fill all holes in masonry surface

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), and miscellaneous metal items not otherwise specified except floors, hot metal surfaces, and new prefinished equipment:

1. 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

2. Alkyd

MPI INT 5.1E-G3 (Eggshell)

Primer:	Intermediate:	Topcoat:
MPI 79	MPI 51	MPI 51

System DFT: 5.25 mils

INTERIOR STEEL / FERROUS SURFACES

B. 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

2. Alkyd

MPI INT 5.4J-G2 (Flat)

Primer:	Intermediate:	Topcoat:
MPI 95	MPI 49	MPI 49

System DFT: 5 mils

MPI INT 5.4J-G3 (Eggshell)

Primer:	Intermediate:	Topcoat:
MPI 95	MPI 51	MPI 51

System DFT: 5 mils

MPI INT 5.4J-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 95	MPI 47	MPI 47

System DFT: 5 mils

MPI INT 5.4J-G6 (Gloss)

Primer:	Intermediate:	Topcoat:
MPI 95	MPI 48	MPI 48

System DFT: 5 mils

DIVISION 6: INTERIOR WOOD PAINT TABLE

A. New Wood and Plywood, except floors; natural finish or stained:

1. Stained, oil-modified polyurethane

New; MPI INT 6.4E-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)

DIVISION 6: INTERIOR WOOD PAINT TABLE

Stain:	Primer:	Intermediate:	Topcoat:
MPI 90	MPI 56	MPI 56	MPI 56

System DFT: 4 mils

Note: Wood Veneer Panels - Color and sheen to match manufactured acoustical wood panels.

B. New Wood Doors; Stained:

1. Stained, oil-modified polyurethane
New; MPI INT 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: 1. Sand between all coats per manufacturers recommendations.
2. Wood door color and sheen to match manufactured acoustical wood panels.

DIVISION 9: INTERIOR PLASTER, GYPSUM BOARD, TEXTURED SURFACES PAINT TABLE

A. New Wallboard not otherwise specified:

1. Institutional Low Odor / Low VOC Latex
New; MPI INT 9.2M-G2 (Flat)

Primer:	Intermediate:	Topcoat:
MPI 50	MPI 144	MPI 144

System DFT: 4 mils

New; MPI INT 9.2M-G3 (Eggshell)

Primer:	Intermediate:	Topcoat:
MPI 50	MPI 145	MPI 145

System DFT: 4 mils

New; MPI INT 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 Wallboard in toilets, food-preparation, food-serving, restrooms, shower areas, areas requiring a high degree of sanitation, and other high humidity areas not otherwise specified.:

1. Epoxy
New; MPI INT 9.2E-G6 (Gloss)

Primer:	Intermediate:	Topcoat:
MPI 50	MPI 77	MPI 77

System DFT: 4 mils

DIVISION 9: INTERIOR PLASTER, GYPSUM BOARD, TEXTURED SURFACES PAINT TABLE

-- End of Section --

SECTION 10 10 00

VISUAL COMMUNICATIONS SPECIALTIES
02/09

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 NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1	(2009; Errata 2010) Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

ASTM INTERNATIONAL (ASTM)

ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM C1048	(2012; E 2012) Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM F148	(2013) Binder Durability of Cork Composition Gasket Materials
ASTM F152	(1995; R 2009) Tension Testing of Nonmetallic Gasket Materials

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC	(2009) Leadership in Energy and Environmental Design(tm) New Construction Rating System

1.2 SYSTEM DESCRIPTION

The term visual display board when used herein includes presentation boards, marker boards, tackboards, board cases, display track system and horizontal sliding units; submit manufacturer's descriptive data and catalog cuts plus manufacturer's installation instructions, and cleaning and maintenance instructions. Visual display boards shall be from manufacturer's standard product line. Submit certificate of compliance signed by Contractor attesting that visual display boards conform to the requirements specified.

1.3 SUSTAINABILITY REQUIREMENTS

Materials in this technical specification may contribute towards contract compliance with sustainability requirements.

1.3.1 LEED REQUIREMENTS

See Section 01 33 29 LEED DOCUMENTATION for project LEED NC low-emitting materials, recycled content, requirements.

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

Visual Display Board; G

SD-04 Samples

Aluminum; G
Porcelain Enamel; G
Materials; G

SD-07 Certificates

Visual Display Board

SD-11 Closeout Submittals

LEED Documentation

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. Visual display boards shall be allowed to acclimate to the building temperature for 24 hours prior to installation.

1.6 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a one year period.

PART 2 PRODUCTS

2.1 MATERIALS

Submit section of core material showing the lamination of colored cork, natural cork, woven fabric, non-woven fabric, and vinyl wall covering. Submit sample of hardwood and plastic laminate finish, and glass type. Samples shall be minimum 4 by 4 inches and show range of color.

2.1.1 Porcelain Enamel

Provide marker board writing surface composed of porcelain enamel fused to a nominal 28 gauge thick steel, laminated to a minimum 1/4 inch thick core material with a steel or foil backing sheet. Writing surface shall be capable of supporting paper by means of magnets. Marker board surface for display track system may be a powder paint dry erase surface adhered to a nominal 18 gauge thick steel. Submit section showing porcelain enamel coating, steel, core material and backing.

2.1.2 Cork

Cork shall be 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. The wearing surface shall be free from streaks, spots, cracks or other imperfections that would impair its usefulness or appearance. The material shall be seasoned, and a clean cut made not less than 1/2 inch from the edge shall show no evidence of soft sticky binder.

2.1.2.1 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 shall be colored throughout and shall be washable. The burlap backing shall be deeply imbedded and keyed to the work sheet being partially concealed in it and meeting the requirements of ASTM F148.

2.1.2.2 Natural Cork

Material shall be a single layer of pure grain natural cork without backing or facing. The color shall be light tan. The cork sheet shall have a tensile strength of not less than 40 psi when tested in accordance with ASTM F152 (tack rails).

2.1.3 Woven Fabric

Provide plain weave fabric. Fiber content shall be a recycled polyester and nylon blend. Fabric shall have a Class A flame spread rating of 0-50 and smoke development rating of 0-450 in accordance with ASTM E84.

2.1.4 Aluminum

Aluminum frame extrusions shall be alloy 6063-T5 or 6063-T6, conform to ASTM B221, and be a minimum 0.06 inches thick. Exposed aluminum shall have an anodized, satin finish. Straight, single lengths shall be used wherever possible. Joints shall be kept to a minimum. Corners shall be mitered and shall have a hairline closure. Submit sections of frame, map rail, chalktray, two map hooks and one flag holder.

2.1.5 Glass

Glass shall be comprised of tempered glass in accordance with ANSI Z97.1 and shall conform to ASTM C1048, Kind FT (fully tempered), Condition A (uncoated), Type I, Class I (clear), thickness as specified.

2.2 MARKERBOARD

Markerboard shall have a porcelain enamel writing surface and a chalktray.

Markerboard shall be a factory assembled unit complete in one piece, without joints. Frame shall be aluminum. Chalktray shall be the same material as the frame and extend the full length of the markerboard. The markerboard shall have a map rail. The map rail with a cork tackable insert shall extend the full length of the markerboard, and shall have map hooks with clips for holding sheets of paper. Two map hooks shall be provided for each 4 foot of map rail. One flag holder to be provided for each unit. Dry erase markings shall be removable with a felt eraser or dry cloth without ghosting. Each unit shall come complete with an eraser and four different color compatible dry erase markers. The size shall be as shown in the drawings.

2.3 TACKBOARDS

2.3.1 Cork - Tack and Map Rail Only

Tackboard shall consist of a minimum 1/4 inch thick natural cork laminated to a minimum 1/4 inch thick hardboard, and shall have an aluminum frame. Refer to markerboards for sizes.

2.3.2 Fabric Covered, XW3

Tackboard shall be 5/8 inch total thickness, 1/2 inch 6-7 PCF density fiber core, 1/8 inch thick 10-12 PCF density fiberglass face, square and chemically hardened edges wrapped in a woven fabric.

2.4 RECESSED DISPLAY CABINETS

Display cabinets shall be recessed with sliding glass fronts, three (3) adjustable glass shelves and LED light fixtures. Length, depth and height as indicated on drawings. Back panel shall consist of tackable material selected from manufacturer's standard product. Sliding glass doors shall consist of 1/4 inch tempered glass that slide on ball bearing rollers; fitted with plunger-type lock and ground in finger pulls. Shelves to be adjustable and furnished with brackets and shelf standards. Provide aluminum extrusions. Trim shall be heavy gauge aluminum and shall meet or exceed ASTM B221 alloy standards. Perimeter flanges are not to be included, refer to drawings for details. Provide light fixture type compatible with 277 v.

2.5 HORIZONTAL SLIDING UNITS

The horizontal sliding unit shall be composed of a fixed back panel, sliding panels, an aluminum track assembly, and shall have a map rail and chalktray. The unit shall have 2 tracks. The fixed back panel shall be markerboard. The unit shall have 2 markerboard sliding panels. The track assembly and exposed members, including panel edging and chalktray, shall be extruded aluminum. Frame assembly shall be reinforced at corners. Sliding panels shall be suspended from the top and shall slide over the aluminum track using molded nylon ball bearing rollers at the top of the track and nylon guide rollers at the bottom of the track to eliminate vibration and to provide quiet and smooth operation of the panels. Sliding panels shall have finger pulls at each end. The map rail shall have a tackable cork insert and extend the length of the horizontal sliding unit. The map rail shall have map hooks with clips for holding sheets of paper. Two map hooks shall be provided for each 4 foot of map rail. One flag holder to be provided for each unit Chalktray shall extend the full length of the horizontal sliding unit. Dry erase markings on the marker board shall be removable with a felt eraser or dry cloth without ghosting. Each

unit shall come complete with an eraser and four different color compatible dry erase markers. The size shall be as shown in the drawings.

2.6 COLOR

Finish colors for required items shall be as indicated.

PART 3 EXECUTION

3.1 INSTALLATION

Perform installation and assembly in accordance with manufacturer's printed instructions. Use concealed fasteners. Visual display boards shall be attached 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. Installation shall not be initiated until completion of room painting and finishing operations. Visual display boards shall be installed in locations and at mounting heights indicated. Visual display boards shall be installed level and plumb, and if applicable doors shall be aligned and hardware shall be adjusted. Damaged units shall be repaired or replaced as directed by the Contracting Officer.

3.2 CLEANING

Writing surfaces shall be cleaned in accordance with manufacturer's instructions.

-- End of Section --

SECTION 10 14 00.20

INTERIOR SIGNAGE
11/12

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 in the text by basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes
AA PK-1	(2009) Pink Sheets: Designations and Chemical Composition Limits for Aluminum Alloys in the Form of Castings & Ingot

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A117.1	(2009) Accessible and Usable Buildings and Facilities
ANSI Z97.1	(2009; Errata 2010) Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

AMERICAN WELDING SOCIETY (AWS)

AWS D1.2/D1.2M	(2014) 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	(2009) Accessible and Usable Buildings and Facilities

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2015; ERTA 2015) Life Safety Code

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC	(2009) Leadership in Energy and

Environmental Design(tm) New Construction Rating System

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 SUSTAINABILITY REQUIREMENTS

Materials in this technical specification may contribute towards contract compliance with sustainability requirements.

1.2.1 LEED Requirements

See Section 01 33 29 LEED DOCUMENTATION for project LEED NC recycled content, low emitting materials, requirements.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G

SD-03 Product Data

Installation; G
Warranty; G

SD-04 Samples

Interior Signage; G
Software; G

SD-10 Operation and Maintenance Data

Approved Manufacturer's Instructions; G
Protection and Cleaning; G

SD-11 Closeout Submittals

LEED Documentation

1.4 EXTRA MATERIALS

Provide 5 extra frames and extra stock of the following: 10 blank plates of each color and size for sign types 10 changeable message strips for sign type. Provide 50 paper inserts and one copy of the software for user produced signs and inserts after project completion and equipment necessary for removal of signage parts and pieces.

1.5 QUALITY ASSURANCE

1.5.1 Samples

Submit interior signage samples of each of the following sign types showing typical quality, workmanship and color: Directional sign, Standard Room sign, Changeable message strip sign. The samples may be installed in the work, provided each sample is identified and location recorded.

1.5.2 Detail Drawings

Submit detail drawings showing elevations of each type of sign, dimensions, details and methods of mounting or anchoring, mounting height, shape and thickness of materials, and details of construction. Include a schedule showing the location, each sign type, and message.

1.6 DELIVERY, STORAGE, AND HANDLING

Materials shall be packaged to prevent damage and deterioration during shipment, handling, storage and installation. Product shall be delivered to the jobsite in manufacturer's original packaging and stored in a clean, dry area in accordance with manufacturer's instructions.

1.7 WARRANTY

Warrant the interior signage for a period of 2 years against defective workmanship and material. Warranties shall be signed by the authorized representative of the manufacturer. Submit warranty accompanied by the document authenticating the signer as an authorized representative of the guarantor. Guarantee that the signage products and the installation are free from any defects in material and workmanship from the date of delivery.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Signs, plaques, directories, and dimensional letters shall be the standard product of a manufacturer 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 letterforms and graphics true and clean.

2.2 ROOM IDENTIFICATION/DIRECTIONAL SIGNAGE SYSTEM

2.2.1 Standard Room Signs

Signs shall consist of laminated thermosetting type MP plastic (three-ply melamine laminate with phenolic core) conforming to ANSI Z97.1, color to be integral and shall conform to the following:

a. Units shall be frameless. Corners of signs shall be rounded to 1/2 inch radius.

2.2.2 Changeable Window Signs

Changeable window signs shall be of same construction as standard room signs to include a clear sleeve that will accept a paper or plastic insert identifying changeable text. The insert shall be prepared with a

typewritten message. Provide paper and software for creating text and symbols for computers identified by owner for Owner production of paper inserts after project completion. Furnish one suction device to assist in removing face sheet.

2.2.3 Type of Mounting For Signs

Provide extruded aluminum brackets for hanging, projecting, and double-sided signs. Mounting for framed, hanging, and projecting signs shall be by mechanical fasteners. Surface mounted signs shall be mounted with 1/16 inch thick closed cell vinyl foam with adhesive backing. Adhesive shall be transparent, long aging, high tech formulation on two sides of the vinyl foam.

2.2.4 Graphics

Signage graphics for modular signs shall conform to the following:

a. Embossed methods other than sandblasting such as vacuum formed to create ADA compliant projected graphics.

2.2.5 Character Proportions and Heights

Letters and numbers on signs conform to 36 CFR 1191.

2.2.6 Tactile Letters, Symbols and Braille

Raised letters and numbers on signs shall conform to 36 CFR 1191.

2.2.7 Code Required Signs

Provide code required signage to comply with ANSI A117.1.

2.3 Specialty Signs

Signs shall conform to the following:

a. Frames shall be aluminum, radius 1/4 inch thick.
b. End caps shall be aluminum with round style corners.
c. Changeable window insert shall be non-glare acrylic sleeve, 1/16 inch thick. The insert shall be typeset message or graphic mounted on paper cardstock. Provide paper and software for creating text and symbols for computers identified by owner for owner production of paper inserts after project completion. Furnish three suction device to assist in removing face sheet.
d. Decorative panels shall be acrylic plastic 0.080 inch thickness minimum conforming to ANSI Z97.1.
e. Raised text panels shall be acrylic plastic 0.080 inch thickness minimum conforming to ANSI Z97.1.
f. Signage graphics for modular signs shall conform to the following:

    1. First Surface Copy Direct Print or Silkscreened (Non-Tactile): Message may be applied to panel using the silkscreen process. Silkscreened images shall be executed with photo screens prepared from original art. Handcut screens will not be accepted. Original art is defined as artwork that is a first generation reproduction of the specified art. Edges and corners shall be clean.
    2. Surface Applied Photopolymer: Integral graphics and Braille

achieved by photomechanical stratification processes. Photopolymer used for ADA compliant graphics shall be of the type that has a minimum durometer reading of 90. Tactile graphics shall be raised 1/32 inch from the first surface of plaque by photomechanical stratification process.

g. Mounting for framed signs shall be by concealed mechanical fasteners.

2.4 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. The floor level designation shall also be tactile in accordance with ICC A117.1.

2.5 ALUMINUM ALLOY PRODUCTS

Aluminum extrusions shall be at least 1/8 inch thick, and aluminum plate or sheet shall be at least 0.0508 inch thick. Extrusions shall conform to ASTM B221; plate and sheet shall conform to ASTM B209. Where anodic coatings are specified, alloy shall conform to AA PK-1 alloy designation 514.0. Exposed anodized aluminum finishes shall be as shown. Welding for aluminum products shall conform to AWS D1.2/D1.2M.

2.6 ANODIC COATING

Anodized finish shall conform to AA DAF45 as follows:

a. Clear (natural) designation AA-M10-C22-A31, Architectural Class II 0.4 mil or thicker.

2.7 FABRICATION AND MANUFACTURE

2.7.1 Factory Workmanship

Holes for bolts and screws shall be drilled or punched. Drilling and punching shall produce clean, true lines and surfaces. Exposed surfaces of work shall have a smooth finish and exposed riveting shall be flush. Fastenings shall be concealed where practicable.

2.7.2 Dissimilar Materials

Where dissimilar metals are in contact, the surfaces will be protected to prevent galvanic or corrosive action.

2.8 COLOR, FINISH, AND CONTRAST

Color shall be as indicated. Finish of all signs shall be eggshell, matte, or other non-glare finish as required in handicapped-accessible buildings.

2.9 TYPEFACE

ADA-ABA compliant font for Room Signs.

PART 3 EXECUTION

3.1 INSTALLATION

Signs shall be installed plumb and true and in accordance with approved manufacturer's instructions at locations shown on the detail drawings. Submit six copies of operating instructions outlining the step-by-step procedures required for system operation. The instructions shall 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. Each set shall be permanently bound and shall have a hard cover. The following identification shall be inscribed on the covers: the words "OPERATING AND MAINTENANCE INSTRUCTIONS", name and location of the facility, name of the Contractor, and contract number. Mounting height and mounting location shall conform to 36 CFR 1191. Required blocking shall be installed. Signs on doors or other surfaces shall not be installed until finishes on such surfaces have been installed. Signs installed on glass surfaces shall be installed with matching blank back-up plates in accordance with manufacturer's instructions.

3.1.1 Anchorage

Anchorage shall be in accordance with approved manufacturer's instructions. Anchorage not otherwise specified or shown shall 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. Exposed anchor and fastener materials shall be compatible with metal to which applied and shall have matching color and finish.

a. Signs mounted to painted gypsum board surfaces shall be removable for painting maintenance.

b. Mount signs mounted to lay-in ceiling grids with clip connections to ceiling tees.

3.1.2 Protection and Cleaning

Protect the work against damage during construction. Hardware and electrical equipment shall be adjusted for proper operation. Glass, frames, and other sign surfaces shall be cleaned at completion of sign installation in accordance with the manufacturer's approved instructions and the requirements of Section 01 78 23 OPERATION AND MAINTENANCE DATA, Package 1. Submit six copies of maintenance instructions listing routine procedures, repairs, and guides.

-- End of Section --

SECTION 10 14 01

EXTERIOR SIGNAGE
04/06

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1	(2009; Errata 2010) Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

AMERICAN WELDING SOCIETY (AWS)

AWS C1.1M/C1.1	(2012) Recommended Practices for Resistance Welding

ASTM INTERNATIONAL (ASTM)

ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM C1036	(2010; E 2012) Standard Specification for Flat Glass

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM AMP 500	(2006) Metal Finishes Manual

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC	(2009) Leadership in Energy and Environmental Design(tm) New Construction Rating System

1.2 GENERAL REQUIREMENTS

All exterior signage shall be provided by a single manufacturer. Exterior signage shall be of the design, detail, sizes, types, and message content shown on the drawings, shall conform to the requirements specified, and shall be provided at the locations indicated. Submit exterior signage schedule in electronic media with spread sheet format. Spread sheet shall include sign location, sign type, and message. Signs shall be complete with lettering, framing as detailed, and related components for a complete installation. 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.

1.2.1 Wind Load Requirements

Exterior signage shall be designed to withstand windload as indicated on Drawing S002. Submit design analysis and supporting calculations performed in support of specified signage.

1.2.2 Character Proportions and Heights

Letters and numbers on indicated signs for handicapped-accessible buildings shall have a width-to-height ratio between 3:5 and 1:1 and a stroke-width-to-height ratio between 1:5 and 1:10. Characters and numbers on indicated signs shall be sized according to the viewing distance from which they are to be read. The minimum height is measured using an upper case letter "X". Lower case characters are permitted only where indicated.

1.3 SUSTAINABILITY REQUIREMENTS

Materials in this technical specification may contribute towards contract compliance with sustainability requirements.

1.3.1 LEED REQUIREMENTS

See Section 01 33 29 LEED DOCUMENTATION for project LEED NC local/regional materials recycled, optimize energy performance content requirements.

1.3.2 EPA Comprehensive Procurement Guidelines

See Section 01 62 35 RECYCLED/RECOVERED/BIOBASED MATERIALS for requirements associated with EPA designated products.

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-02 Shop Drawings

Approved Detail Drawings; G

SD-03 Product Data

Modular Exterior Signage System
Installation
Exterior Signage; G
Wind Load Requirements

SD-04 Samples

Exterior Signage; G

SD-10 Operation and Maintenance Data

Protection and Cleaning

SD-11 Closeout Submittals

LEED Documentation

1.5 QUALIFICATIONS

Signs, plaques, and dimensional letters shall be the standard product of a manufacturer regularly engaged in the manufacture of the products. Items of equipment shall essentially duplicate equipment that has been in satisfactory use at least 2 years prior to bid opening.

1.6 DELIVERY AND STORAGE

Materials shall be wrapped for shipment and storage, delivered to the jobsite in manufacturer's original packaging, and stored in a clean, dry area in accordance with manufacturer's instructions.

1.7 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period shall be provided.

PART 2 PRODUCTS

2.1 MODULAR EXTERIOR SIGNAGE SYSTEM

Exterior signage shall consist of identification type signs located where shown. Dimensions, details, materials, message content, and design of signage shall be as shown. Submit manufacturer's descriptive data and catalog cuts.

2.1.1 Marquee Signs

Single-side LED display mounted to field constructed site wall. LED sign is to be a 20mm true multi-color display with a minimum of 16.7 million colors. Overall sign size shall be as indicated. The minimum character size shall be 5-1/2 inches tall and the maximum character size shall be 31 inches. A pair of signs is to be 240 VAC, with a maximum of 10.6 amps and 2544 watts. Custom graphics shall be available. Sign shall automatically adjust brightness for night or day and sunny or overcast viewing. Aluminum face and framing is to be finished with a factory-applied 2-component acrylic polyurethane coating. Sign is to be equipped with wireless controller and receiver. Controller shall be equipped with an easy to use software program that includes the following:

a. Message scheduling for different times and days.
b. Provisions for viewing message before it is displayed.
c. Allows for displays via serial addressing, modems, wireless and Local Area Networks (LAN).
d. Enables graphics and animations in popular formats.
e. Includes ActiveX control for real-time applicatiions.
f. Supports Alpha plug-ins.
g. Supports a wide variety of scanners.
h. Allows both text graphics and animations to be used in messages.

2.2 DIMENSIONAL BUILDING LETTERS

2.2.1 Fabrication

Letters shall be fabricated from 0.25 inch aluminum sheet. Letters shall be cleaned by chemical etching or cleaned ultrasonically in a special degreasing bath. Letters shall be packaged for protection until

installation.

2.2.2 Typeface

Typeface shall be as indicated.

2.2.3 Size

Letter size shall be as indicated.

2.2.4 Finish

Baked enamel or two-component acrylic polyurethane finish shall be provided.

2.2.5 Mounting

Threaded studs of number and size as recommended by manufacturer, shall be used for concealed anchorage. Letters which project from the building line shall have stud spacer sleeves. Letters, studs, and sleeves shall be non-magnetic stainless steel. Templates for mounting shall be supplied.

2.3 ALUMINUM ALLOY PRODUCTS

Aluminum alloy products shall conform to ASTM B209 for sheet or plate castings. Aluminum plate or sheet at least 1/4 inch thick. Welding for aluminum products shall conform to AWS C1.1M/C1.1.

2.4 ORGANIC COATING

Surfaces shall be cleaned, primed, and given a semi-gloss baked enamel or two-component acrylic polyurethane finish in accordance with NAAMM AMP 500, AMP 505, with total dry film thickness not less than 1.2 mils.

2.5 GLASS

Glass shall be in accordance with ASTM C1036, Type 1, Class 1, Quality q^3 and ANSI Z97.1

2.6 ANCHORS AND FASTENERS

Exposed anchor and fastener materials shall be compatible with metal to which applied and shall match in color and finish and shall be non-rusting, non-corroding, and non-staining. Exposed fasteners shall be tamper-proof.

2.7 SHOP FABRICATION AND MANUFACTURE

2.7.1 Factory Workmanship

Work shall be assembled in the shop, as far as practical, ready for installation at the site. Work that cannot be shop assembled shall be given a trial fit in the shop to ensure proper field assembly. Holes for bolts and screws shall be drilled or punched. Drilling and punching shall produce clean, true lines and surfaces. Welding shall be continuous along the entire area of contact. Exposed welds shall be ground smooth. Exposed surfaces of work shall have a smooth finish and exposed riveting shall be flush. Fastenings shall be concealed where practical. Joints exposed to the weather shall be formed to exclude water. Drainage and weep holes shall be included as required to prevent condensation buildup.

2.7.2 Dissimilar Materials

Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of asphalt varnish or a coat of zinc-molybdate primer to prevent galvanic or corrosive action.

2.7.3 Shop Painting

Surfaces of miscellaneous metal work, except nonferrous metal, corrosion resisting steel, and zinc-coated work, shall be given one coat of zinc-molybdate primer or an approved rust-resisting treatment and metallic primer in accordance with manufacturer's standard practice. Surfaces of items to be embedded in concrete shall not be painted. Upon completion of work, damaged surfaces shall be recoated.

2.8 COLOR, FINISH, AND CONTRAST

Color shall be as indicated on the drawings. Color listed is not intended to limit the selection of equal colors from other manufacturers.

PART 3 EXECUTION

3.1 INSTALLATION

Signs and dimensional letters shall 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. Circuits installed underground shall conform to the requirements of Section 33 70 02 UNDERGROUND ELECTRICAL DISTRIBUTION. Signs shall be installed plumb and true at mounting heights indicated, and by method shown or specified. Signs mounted on other surfaces shall not be installed until finishes on such surfaces have been completed. Submit manufacturer's installation instructions and cleaning instructions.

3.1.1 Anchorage

Anchorage and fastener materials shall be in accordance with approved manufacturer's instructions for the indicated substrate. Anchorage not otherwise specified or indicated shall include slotted inserts, and expansion shields for masonry.

3.1.2 Protection and Cleaning

The work shall be protected against damage during construction. Hardware and electrical equipment shall be adjusted for proper operation. Glass, frames, and other sign surfaces shall 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 shall be maintained until instructed to be removed by the Contracting Officer or until the facility is to be opened for business. Submit six copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. The instructions shall include simplified diagrams for the equipment as installed. Signs shall be cleaned, as required, at time of cover removal.

3.2 FIELD PAINTED FINISH

Miscellaneous metals and frames shall be field painted in accordance with Section 09 90 00 PAINTS AND COATINGS. Anodized metals, masonry, and glass shall be protected from paint. Finish shall be free of scratches or other blemishes.

-- End of Section --

SECTION 10 21 13

TOILET COMPARTMENTS
01/07

PART 1 GENERAL

1.1 REFERENCES

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

ALUMINUM ASSOCIATION (AA)

AA DAF45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2013) 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 A385/A385M	(2011) Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM D1972	(1997; R 2005) Standard Practice for Generic Marking of Plastic Products
ASTM E2129	(2010) Standard Practice for Data Collection for Sustainability Assessment of Building Products

INTERNATIONAL CODE COUNCIL (ICC)

ICC A117.1	(2009) 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 NC	(2009) Leadership in Energy and Environmental Design(tm) New Construction Rating System

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 SYSTEM DESCRIPTION

Provide a complete and usable toilet partition system, including toilet enclosures, 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 and Installation Drawings. Fabrication drawings are to clearly show details of accessories and hardware fastened to partitions. Installation drawings are to show partition layout and interfaces with surrounding construction. Submit manufacturer's Cleaning and Maintenance Instructions with Fabrication Drawings for review.

1.2.1 Sustainable Design Requirements

1.2.1.1 Local/Regional Materials Documentation

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.

1.2.1.2 Environmental Data

Submit documentation indicating percentage of post-industrial and post-consumer recycled content per unit of product. Indicate relative dollar value of recycled content products to total dollar value of products included in project. Submit Table 1 of ASTM E2129 for the following products: Partitions.

1.2.2 Plastic Identification

Verify that plastic products to be incorporated into the project are labeled in accordance with ASTM D1972. Where products are not labeled, provide product data indicating polymeric information in the Operation and Maintenance Manual.

Type 2	High Density Polyethylene (HDPE)

1.3 SUSTAINABILITY REQUIREMENTS

Materials in this technical specification may contribute towards contract compliance with sustainability requirements.

1.3.1 LEED REQUIREMENTS

See Section 01 33 29 LEED DOCUMENTATION for project LEED NC local/regional materials, low-emitting materials, and recycled content requirements.

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-02 Shop Drawings

Fabrication Drawings
Installation Drawings; G

SD-03 Product Data

Cleaning and Maintenance Instructions
Colors And Finishes
Anchoring Devices and Fasteners
Hardware and Fittings
Brackets
Door Hardware
Local/Regional Materials Documentation; (LEED NC)
Environmental Data
Toilet Enclosures; (LEED NC)
Urinal Screens; (LEED NC)
Pilaster Shoes; (LEED NC)

SD-04 Samples

Colors and Finishes; G
Hardware and Fittings
Anchoring Devices and Fasteners

SD-07 Certificates

Warranty

SD-10 Operation and Maintenance Data

Plastic Identification

SD-11 Closeout Submittals

LEED Documentation
Local/Regional Materials Documentation; (LEED)
Toilet Enclosures; (LEED)
Urinal Screens; (LEED)
Pilaster Shoes; (LEED)

1.5 REGULATORY REQUIREMENTS

Conform to ICC A117.1 code for access for the handicapped operation of toilet compartment door and hardware.

1.6 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.

1.7 WARRANTY

Provide certification or warranties that metal toilet partitions will be free of defects in materials, fabrication, finish, and installation and will remain so for a period of not less than 2 years after completion.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 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.

2.1.2 Brackets

Wall brackets shall be two-ear panel brackets, T-style, 1-inch stock. Provide stirrup style panel-to-pilaster brackets.

2.1.3 Hardware and Fittings

2.1.3.1 General Requirements

Conform hardware for the toilet partition system to 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 latching devices and hinges for handicap compartments with 36 CFR 1191; provide stainless steel devices and hinges with door latches that operate without either tight grasping or twisting of the wrist of the operator. Submit three samples of each item, including anchoring devices and fasteners. Approved hardware samples may be installed in the work if properly identified.

a. Aluminum shall conform to ASTM B221.

b. Corrosion-resistant steel shall conform to ASTM A167, Type 304.

2.1.3.2 Finishes

a. Aluminum shall have a clear anodic coating conforming to AA DAF45.

b. Corrosion-resistant steel shall have a No. 4 finish.

c. Exposed fasteners shall match the hardware and fittings.

2.1.4 Door Hardware

2.1.4.1 Hinges

Hinges shall be adjustable to hold in-swinging doors open at any angle up to 90 degrees and outswinging doors to 10 degrees. Provide self-lubricating hinges with the indicated swing. Hinges shall be through bolted and have the following type of return movement:

a. Gravity return movement

2.1.4.2 Latch and Pull

Latch and pull shall be a combination rubber-faced door strike and keeper equipped with emergency access and ADA compliant.

2.1.4.3 Coat Hooks

Coat hooks shall be combination units with hooks and rubber tipped pins. Equip outswing doors with an additional door pull and stop.

2.2 PARTITION PANELS AND DOORS

Fabricate partition panels and doors not less than 1 inch thick.

2.2.1 Toilet Enclosures

Conform toilet enclosures to CID A-A-60003, Type I, Style A, floor supported C, overhead braced. Furnish width, length, and height of toilet enclosures as shown. Provide a width of 1 inch. Finish surface of panels shall be HDPE, Finish 5; water resistant; graffiti resistant; non-absorbent. See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total recycled content requirements. Reinforce panels indicated to receive toilet paper holders or grab bars for mounting of the items required. Provide grab bars to withstand a bending stress, shear stress, shear force, and a tensile force induced by 250 lbf. Grab bars shall not rotate within their fittings.

2.2.2 Urinal Screens

Conform urinal screens to CID A-A-60003, Type III, wall mounted. Provide finish for surface of screens as HDPE, Finish 5; water resistant; graffiti resistant; non-absorbent. See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total recycled content requirements. This item may contain post-consumer or post-industrial recycled content. Furnish width and height of urinal screens as shown. Provide thickness of 1 inch. Secure wall hung urinal screens with 42 inch long, continuous flanges. Fabricate screens from the same types of panels and pilasters as the toilet partitions. Use corrosion-resistant steel fittings and fasteners.

2.3 FLOOR-ANCHORED PARTITIONS

Pilasters shall be not less than 1-1/4 inch thick with face sheets not less than 0.0635 inch thick. Provide anchoring device at the bottom of the pilaster consisting of a steel bar not less than 1/2 by 7/8 inch welded to the reinforced face sheets and having not less than two 3/8 inch round anchorage devices for securing to the floor slab. Provide anchorage devices complete with threaded rods, expansion shields, lock washers, and leveling-adjustment nuts. Trim piece at the floor shall be 3 inch high and fabricated from not less than 0.030 inch thick corrosion-resistant steel.

2.4 OVERHEAD-BRACED PARTITIONS

Pilasters shall be not less than 1-1/4 inch thick with face sheets not less than 0.0393 inch thick. Provide anchoring device at the bottom of the pilaster consisting of a channel-shaped floor stirrup fabricated from not less than 0.0635 inch thick material and a leveling bolt. Secure the stirrup to the pilaster with not less than a 3/16 inch bolt and nut after the pilaster is leveled. Secure the stirrup to the floor with not less than two lead expansion shields and sheetmetal screws. Fabricate overhead

brace from a continuous extruded aluminum tube not less than 1 inch wide by 1-1/2 inch high, 0.125-inch wall thickness. Finish shall be AA-C22A31 in accordance with AA DAF45. Set and secure brace into the top of each pilaster. Fabricate 3 inch high trim piece at the floor from not less than 0.030 inch thick corrosion-resistant steel.

2.5 PILASTER SHOES

Provide shoes at pilasters to conceal floor-mounted anchorage. Pilaster shoes shall be stainless steel. See Section 01 33 29 LEED(tm) DOCUMENTATION for cumulative total recycled content requirements. Height shall be 3 inches.

2.6 HARDWARE

Hardware for the toilet partition system shall conform to CID A-A-60003 for the specified type and style of partitions. Hardware shall be pre-drilled by manufacturer. Hardware finish shall be highly resistant to alkalis, urine, and other common toilet room acids. Hardware shall include: heavy-duty extruded aluminum hinges, gravity type, adjustable for door close positioning; nylon bearings; black anodized aluminum door latch; door strike and keeper with rubber bumper; heavy-duty hook and bumper. Latching devices and hinges for handicap compartments shall comply with 36 CFR 1191 and shall be heavy-duty extruded aluminum door latches that operate without either tight grasping or twisting of the wrist of the operator. Screws and bolts shall be stainless steel, tamper proof type. Wall mounting brackets shall be continuous, full height, heavy duty aluminum, in accordance with toilet compartment manufacturer's instructions. Floor-mounted anchorage shall consist of corrosion-resistant anchoring assemblies with threaded rods, lock washers, and leveling adjustment nuts at pilasters for structural connection to floor.

2.7 COLORS AND FINISHES

2.7.1 Colors

Provide manufacturer's standard color charts for color of finishes for toilet partition system components. Submit three samples showing a finished edge on two adjacent sides and core construction, each not less than 12-inch square

2.7.2 Finish No. 5

Provide solid plastic fabricated of polymer resins (polyethylene) HDPE formed under high pressure rendering a single component section not less than one inch thick. Colors shall extend throughout the panel thickness. Provide exposed finish surfaces: smooth, waterproof, non-absorbent, and resistant to staining and marking with pens, pencils, or other writing devices. Solid plastic partitions shall not show any sign of deterioration when immersed in the following chemicals and maintained at a temperature of 80 degrees F for a minimum of 30 days:

Acetic Acid (80 percent)	Hydrochloric Acid (40 percent)
Acetone	Hydrogen Peroxide (30 percent)
Ammonia (liquid)	Isopropyl Alcohol

Ammonia Phosphate	Lactic Acid (25 percent)
Bleach (12 percent)	Lime Sulfur
Borax	Nicotine
Brine	Potassium Bromide
Caustic Soda	Soaps
Chlorine Water	Sodium Bicarbonate
Citric Acid	Trisodium Phosphate
Copper Chloride	Urea; Urine
Core Oils	Vinegar

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 will adversely affect satisfactory execution of the work of this section. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

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 not less than two wall brackets attached near the top and bottom of the panel. 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. Toggle bolts shall have 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. Toggle bolts shall have 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 inch. Expansion shields shall have a load-carrying strength of not less than 600 pounds per anchor.

3.3 FLOOR-ANCHORED PARTITIONS

Secure pilasters to the floor with the anchorage device specified. Make all leveling devices readily accessible for leveling, plumbing, and tightening the installation. Level tops of doors with tops of pilasters when doors are in a closed position. Expansion shields shall have a minimum 2-inch penetration into the concrete slab.

3.4 OVERHEAD-BRACED PARTITIONS

Secure pilasters to the floor with the anchorage device specified. Make all leveling devices readily accessible for leveling, plumbing, and tightening the installation. Secure overhead brace to the pilaster face with not less than two fasteners per face. Expansion shields shall have a minimum 2-inch penetration into the concrete slab. Make tops of doors parallel with the overhead brace when doors are in a closed position.

3.5 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 shall have a uniform vertical edge clearance of approximately 3/16 inch and shall rest open at approximately 30 degrees when unlatched.

3.6 CLEANING

Clean all surfaces of the work, and adjacent surfaces soiled as a result of the work, in an approved manner compliant with the manufacturer's recommended cleaning and protection from damage procedures until accepted. Remove all equipment, tools, surplus materials, and work debris from the site.

-- End of Section --

SECTION 10 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	(2011; E 2011) 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 Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

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 ceiling and surface-mounted installation details.

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 3/4 inch deep, 0.060 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 --

SECTION 10 22 19

DEMOUNTABLE MOVABLE PARTITIONS
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 E413	(2010) Rating Sound Insulation
ASTM E72	(2015) Conducting Strength Tests of Panels for Building Construction
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E90	(2009) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

BIFMA INTERNATIONAL (BIFMA)

ANSI/BIFMA X5.6	(2010) Panel Systems

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 1286	(2008; Reprint Feb 2015) Office Furnishings

1.2 SUSTAINABILITY REPORTING

Materials in this technical specification may contribute towards contract compliance with sustainability requirements.

1.2.1 CERTIFICATION REQUIREMENTS

See Section 01 33 29 SUSTAINABILITY REPORTING for project certification local/regional materials, low-emitting materials, recycled content, and documentation requirements.

1.2.2 USDA Biobased

See Section 01 33 29 SUSTAINABILITY REPORTING for requirements associated

with USDA Biobased designated products.

1.3 SUBMITTALS

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

SD-02 Shop Drawings

Installation

SD-03 Product Data

Warranty

SD-04 Samples

Partition System

SD-07 Certificates

Fire-Resistance Rating and Burning Characteristics
Acoustical Performance
Structural Performance

1.4 QUALITY ASSURANCE

Manufacturer shall specialize in designing and manufacturing the type of partition specified in this section, and shall have a minimum of 5 years of documented successful experience. Manufacturer shall have the facilities capable of meeting contract requirements, single-source responsibilities and warranty. Partition installer shall have a minimum of 5 years of documented successful experience in the installation of partitions similar to the requirements of this section. When required by the manufacturer, panels shall be installed by an authorized dealer with a certified installation crew.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver materials to project site in accordance with manufacturer's instructions in original unopened and undamaged packages and stored in a clean, dry, and secure place free from damage during construction activities. Packages shall contain labels which indicate manufacturer's name, brand name, size, finish and placement location.

1.6 PROJECT/SITE CONDITIONS

Temperature and humidity conditions within the area to receive partitions shall be maintained as close as possible to the final occupancy standards. A minimum of 60 degrees F shall be maintained continuously. Installation shall not begin until the building envelope provides complete protection from the weather.

1.7 WARRANTY

Warrant the partition system for a period of 10 years, excluding fabrics and other covering materials that shall be guaranteed for 3 years. Warranties shall be signed by the authorized representative of the manufacturer. Warranties accompanied by document authenticating the signer as an authorized representative of the guarantor shall be presented to the Contracting Officer upon the completion of the project. Guarantee that the panel system and installation are free from any defects in material and workmanship from the date of delivery.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

2.1.1 Fire-Resistance Rating and Burning Characteristics

Partition system shall have a Class A (under 25) Flame Spread Rating in conformance with ASTM E84.

2.1.2 Acoustical Performance

Submit certification attesting that sound-rated partition assemblies have a minimum Sound Transmission Coefficient (STC) of 44. STC range shall be determined in accordance with Sound Transmission Test by Two-Room Method and reported in accordance with ASTM E90 and ASTM E413 for frequency data. Tested assembly shall have been assembled in the same manner that the partitions will be installed on the project.

2.1.3 Structural Performance

Submit test results from and independent laboratory certifying the following results.

2.1.3.1 Transverse-Load Capacity

Demountable partitions shall be able to sustain a 5 psf minimum transverse loading with panel deflection no greater than 1/120th of the vertical span when tested in accordance with ASTM E72.

2.1.3.2 Load-Bearing Capability

Not less than 300 lb concentrated 3.2 lb/linear inch distributed proof load when tested according to ANSI/BIFMA X5.6.

2.1.3.3 Non-Load Bearing Capability

Wall system is designed for non-load bearing capability.

2.1.4 Electrical and Communication Capability

Electrical components, devices, and accessories shall meet requirements of UL 1286 and NFPA 70. 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, a statement from a nationally recognized, adequately equipped testing agency shall be submitted indicating that the items have been tested in accordance with he required procedures of UL and that the material and equipment comply with contract requirements. Electrical work

shall conform to the requirements of Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

2.2 PARTITION TYPE

Fabricate a partition system consisting of a series of individual, floor-supported, floor-to-ceiling factory constructed/pre-fabricated panels as shown. Top channel shall hold panels in place and shall accommodate a floor-to-ceiling variation. The partition system shall be complete with accessories to meet performance requirements. Partition system shall provide accommodations for electrical switches and outlets at multiple heights in the panel. Panels shall include light switches, receptacles, and double gang outlet boxes for data/voice jacks at mounting heights and locations as indicated on the electrical drawings. Building electrical power shall be ceiling feed and shall be in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. After finish samples are approved, and prior to installation of panels, a minimum 8 x 8 foot mock-up shall be provided for each color and type of panel. Once approved, the mock-up samples shall be used as a standard of workmanship within the facility. Remove mock-ups when directed. Approved mock-ups may become part of the completed work if approved by the Contracting Officer. Submit three 8 x 8 inch samples of partition showing partition construction and indication of materials proposed and method of attaching partition to walls, floor, and ceiling. Also three color samples of all exposed finishes of panels and components.

2.3 MATERIALS AND COMPONENTS

2.3.1 Panels

Panels shall be 3-1/2 inch thick with an extruded aluminum frame and two removable panel shells consisting of 22 gage steel sheet glued to horizontal and vertical stiffeners with non-toxic fiberglass insulation. Panels shall be complete with pliable PVC recessed at joints to align panels. Panels shall be manufacturer's standard construction with fillers and bracing as required.

2.3.2 Framing System

Framing system shall consist of extruded anodized aluminum or roll-formed steel components which include ceiling runners, floor track, studs or posts, bracing, and suitable treated fasteners to prevent corrosion. Post covers shall be provided if applicable. When assembled, framing system with panels shall form a rigid, stable partition.

2.3.3 Glass and Glazing

The glass and glazing for doors shall be provided where shown on the drawings. Glass shall be clear and shall comply with Section 08 81 00 GLAZING. All glass shall be factory installed using extruded clear vinyl glazing beads. No protruding glazing beads or removable stops will be visible.

2.3.4 Doors and Frames

Demountable partitions shall be complete with doors and frames as shown which are fully contained with the panels. Doors shall be unfinished 1-3/4 inch thick flush type solid core wood veneered of manufacturer's standard construction. Door frames shall provide a compatible appearance

with other trim components and shall allow for variations in floor level. Door wood veneer species cut and veneer match shall match other wood doors in adjacent area.

2.3.5 Door Hardware

Hardware for doors shall be in accordance with Section 08 71 00 DOOR HARDWARE. Hardware cutouts and reinforcement shall be provided as required in doors and frames for hardware furnished.

2.3.6 Base Trim

Base trim shall be nominal 5 inches high without exposed fasteners. Base shall be flush. Base is to accommodate electrical wiring and receptacles.

2.4 FINISHES

Finish of panels shall be factory-applied paint finish. Finish of exposed trim shall be aluminum factory-applied paint. Base trim shall match other exposed trim .

PART 3 EXECUTION

3.1 EXAMINATION

Verify field dimensions before fabrication of partitions and record on shop drawings. Coordinate fabrication schedule with construction schedule and progress to avoid delay in the work.

3.2 PREPARATION

Locations scheduled to receive partitions shall be inspected for compliance with manufacturer's requirements. Floor and ceiling dimensions shall be verified in accordance with approved shop drawings prior to starting the work. Floor under partitions shall be level to within 1/8 inch in 10 feet, non-accumulative. Conditions which may adversely affect the partition installation shall be corrected before installing partitions. Floor construction and carpeting shall be completed, the suspended ceiling grid shall be installed, and other finishing operations such as painting completed prior to partition installation.

3.3 INSTALLATION

Install partitions in accordance with details in the drawings, approved shop drawings, and manufacturer's published instructions. The system shall be assembled and erected with the least possible drilling and cutting of existing construction and shall be capable of disassembly by means of ordinary tools. The partition installation shall be complete with accessories to meet specified requirements. Installation shall include concealed fastening devices and pressure-fit components that will not mar the floor, wall and ceiling surfaces and shall be free of exposed screws, nuts, rivets or bolts. Panels shall be installed in a rigid manner, straight and plumb, with horizontal lines level. Seals shall be installed to prevent light and sound transmission at connections to ceilings, floors, fixed walls and abutting surfaces. Drawings shall include dimensions verifying conformance to life safety code and electrical switch, outlet, infeed and jumper placements.

3.3.1 Doors and Windows

Doors shall be hung to swing freely and hardware shall be carefully fitted. Glass for glazed openings shall be installed on shims in a vinyl or polyurethane foam gasket. Glass stops shall be installed without exposed fastenings.

3.3.2 Wall Base

Partition base covers shall snap on. Base shall tightly adhere to wall surfaces.

3.4 ADJUSTMENTS

Damaged partition finish and components and damaged floor, wall and ceiling finishes shall be repaired to the original conditions or replaced.

3.5 CLEANING

Upon completion of installation, partition components and finishes shall be cleaned in accordance with partition manufacturer's recommendations. Alkaline or abrasive agents shall not be used. Precautions to avoid scratching or marring partition finish surfaces shall be exercised.

3.6 PROTECTION

Protect partitions from damage through the duration of construction activities.

-- End of Section --

SECTION 10 22 26.23

COILING PARTITIONS
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 A653/A653M	(2013) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM C423	(2009a) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
ASTM D751	(2006; R 2011) Coated Fabrics
ASTM E336	(2014) Measurement of Airborne Sound Insulation in Buildings
ASTM E413	(2010) Rating Sound Insulation
ASTM E557	(2012) Installation of Operable Partitions
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E90	(2009) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

CHEMICAL FABRICS AND FILM ASSOCIATION (CFFA)

CFFA-W-101-D	(2002) Quality Standard for Vinyl Coated Fabric Wallcovering

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2015) Life Safety Code
NFPA 286	(2015) Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	Scientific Certification Systems (SCS)Indoor Advantage

UL ENVIRONMENT (ULE)

ULE Greenguard	UL Greenguard Certification Program

UNDERWRITERS LABORATORIES (UL)

UL 10B	(2008; Reprint Feb 2015) 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 Contractor Quality Control approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Manufacturer's Qualifications; G

Manufacturer's Sample Warranty

Statement of Code Compliance; G

Statement of Standards Conformity; G

Verification of Field Measurements; G

Existing Electrical Data

SD-02 Shop Drawings

Submit Fabrication Drawings for coiling Partitions consisting of fabrication and assembly details to be performed in the factory.

Submit Installation Drawings for the following items in accordance with paragraph entitled, "Installation," of this section.

coiling Partition Layouts; G

Suspension System; G

Finish Hardware; G

Jamb Panels; G

Accessories; G

Electrical Operators; G

Wiring diagrams; G

Submit drawings for the system that include dimensions and weight of stacked partition, layout of the work including stacking area, track and jamb fastening methods, seal details, and installation details. Submit wiring diagram and installation details for electrical operator.

SD-03 Product Data

Framework

Suspension system

Finish Hardware

Sound Seals and Sweepstrips

Covering

Ceiling Guard

Meeting Posts

Jamb Panels

Rolling Post

Pull-In Latch

Electrical Operator

Switches

Certification

SD-04 Samples

Covering; G

SD-06 Test Reports

Laboratory Acoustical Requirements

Acoustical test

SD-07 Certificates

Submit Certificates to the Contracting Officer for this installation clearly indicating:

Statement of Code Compliance; G

Statement of Standards Conformity; G

SD-10 Operation and Maintenance Data

Coiling partitions, Data Package 1; ; G

Electrical operators, Data Package 5; ; G

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

SD-11 Closeout Submittals

Manufacturer's Guarantee

1.3 PRE-INSTALLATION REQUIREMENTS

1.3.1 Preconstruction Requirements

No less than 30 calendar days prior to the scheduled commencement of installation of coiling Partitions, submit the following to the Contracting Officer:

Manufacturer's Qualifications

Manufacturer's Sample Warranty

Statement of Code Compliance

Statement of Standards Conformity

Verification of Field Measurementsand Existing Electrical Data

Fabrication Drawings and Installation Drawings

1.3.2 Product Data

Submit the following information for review:

Finish Hardware

Jamb Panels and Accessories

Sound Seals and Sweepstrips

Ceiling Guard

Meeting Posts

Rolling Post

Pull-In Latch

Electrical Operator

Switches

1.3.3 Manufacturer's Guarantee

Provide Manufacturer's Guarantee for partitions against defects in

material and workmanship for a period of two years from date of installation. In addition, provide ten year guarantee for the pantographs, trolleys and tracks from date of acceptance for beneficial use.

1.4 SUSTAINABLE DESIGN CERTIFICATION

Product shall be third party certified in accordance with ULE Greenguard Gold, SCS Scientific Certification Systems Indoor Advantage Gold or equal. Certification shall be performed annually and shall be current.

1.5 DELIVERY, HANDLING AND STORAGE

Deliver materials to project site in manufacturer's original, unopened, and undamaged packages with labels legible and intact. Labels must indicate the manufacturer, brand name, size, finish, and placement location. Store coiling partitions and accessories in unopened packages in a manner that will prevent damage. Handle partition materials in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 COILING PARTITIONS

Provide full coiling type partitions, factory finished, supported from overhead track without floor guides, and complete with all hardware, track, and accessories necessary for operation. Provide partition framework with a mechanism that gives stability and maintains uniform spacing of partition folds in all partition positions. Provide completely concealed framework with a vinyl-coated fabric covering. Provide partitions manually and electrically operated, bi-parting and one-way type as indicated. Provide patterns and colors of fabric approved by the Contracting Officer as indicated. Provide manufacturer's standard pendant pull on leading edge of manually operated partitions over 12 feet high.

2.2 MATERIALS

2.2.1 Aluminum Extrusions

ASTM B221, Alloy 3003.

2.2.2 Steel Sheets

ASTM A653/A653M, G90 coating designation.

2.2.3 Fabric Covering

CFFA-W-101-D, Type II.

2.2.4 Seals and Sweepstrips

Provide perimeter seals of manufacturer's standard product, without crack or craze when subjected to severe usage.

2.2.5 Ceiling Guards

Furnish partitions with ceiling guards or integral track and ceiling guards as recommended by the manufacturer.

2.3 PERFORMANCE REQUIREMENTS

2.3.1 Fire Endurance

For partitions more than 60 square feet in area, provide fabric and lining with flame spread rating of 25 or less, fuel contribution rating of 15 or less, smoke generation of 50 or less when tested in accordance with ASTM E84. Complete assembly must also meet or surpass the requirements of NFPA 101 and UL 10B.

2.3.2 Laboratory Acoustical Requirements

Provide certificates verifying coiling partitions have been tested in accordance with ASTM C423 and ASTM E90 by a laboratory accredited by the U.S. Bureau of Standards and have attained a sound transmission class (STC) of not less than 45 in a fully extended position. Partition tested must be of the same construction, materials, and model number as the partition to be provided and be fully operable. Test specimen must be not less than 126 square feet in area. Panel weight must be 5 lbs per square ft.

2.4 ELECTRICAL OPERATORS

Provide manufacturer's recommended standard electrical operator for partitions indicated. Provide wiring diagrams.

2.5 FABRICATION

2.5.1 Framework

Fabricate framework, including posts, pantographs, hinges, hinge plates, and rods from either extruded aluminum or ferrous metal. Arrange frames requiring pantographs for horizontal pantograph action with pantographs located at top and bottom of the frame. Provide pantographs spaced not over 4 feet apart. Provide intermediate pantograph at center of doors less than 8 feet high unless the door has vertical metal reinforcing. The pantographs must operate smoothly with positive coiling action and have a control device to prevent flattening of the folds when the panel is fully extended. Ferrous metal must be either cadmium plated or zinc coated.Posts, at the option of the door manufacturer, may have phosphate treatment and manufacturer's shop finish paint.

2.5.2 Suspension System

Provide a suspension system consisting of steel or aluminum track and trolleys designed to support the weight of the partition. Provide steel track of 16 gage minimum, phosphate treated and finished, or zinc or cadmium coated. Provide extruded aluminum track with minimum thickness of 1/8 inch. Tracks may have an integral ceiling guard. Trolleys must have at least two ball bearing nylon or steel tired wheels spaced according to manufacturer's design criteria and four at an end post.

2.5.3 Covering

Covering fabrics must conform to the requirements of ASTM D751 and NFPA 286.

Attach fabric to the framework with fasteners that permit easy removal of the cover but prevent sagging or separation. Position vertical seams in the bottoms of valleys and reinforce. Provide top and bottom edges of cover fabrics with 1/2 inch minimum turned hems.

2.5.4 Sound Insulation

Provide sound insulation as necessary to achieve the specified sound transmission mission class, conforming to ASTM E413.

2.5.5 Air Release

Provide an air release system which allows trapped air within the partition to be released during the stacking process.

2.5.6 Seals

Provide perimeter seals as necessary to produce the sound transmission class specified.

2.5.7 Hardware

Provide hardware of the heavy-duty type standard with the manufacturer. Provide pulls and latches for all partitions. Provide partitions with keyed locks.

2.5.8 Accessories

Provide multiple meeting posts, switches, ceiling guards, recessed tracks as indicated.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Existing Work

Check openings scheduled to receive coiling partitions for correct dimensions.

Install partitions in accordance with the approved coiling Partition Layouts, manufacturer's directions, and ASTM E557. Provide structural support for the track support elements as indicated.

Submit to the Contracting Officer a certification of the following:

Statement of Code Compliance for the completed partition installation.

Statement of Standards Conformity

3.1.2 Electrical Operators

Conform Electrical components and installation to the requirements of NFPA 70. Provide the partition manufacturer's standard drive and control components required to operate the partition properly. Power source is as indicated.

3.1.3 Adjustment

Adjust manually operated partitions to open and close from any position with a maximum horizontal force of 30 pounds applied to pendant pull, box or handle. Adjust drive components and limit switches of electrically operated partitions to ensure the partitions operate properly upon

activation of the control switch.

3.2 FIELD TESTS

3.2.1 Operational Test

Operate partition at least three times to demonstrate that partition is capable of being moved from the stored position to the fully extended position smoothly and quietly and without overloading the drive components. Activate the emergency release mechanism and demonstrate proper operation of the partition in the manual mode. Adjust partitions which do not operate properly and retest.

3.2.2 Visual Test

Conduct visual field tests for light leakage with all room lights turned on in the space on one side of the partition. Darken space on the other side of the partition. Light leakage from the lighted space to the darkened space is not acceptable. If light leakage does occur, adjust the partition to correct the problem and retest.

3.2.3 Acoustical Test

Field sound performance: provide partition testing by an independent certified acoustical consultant in accordance with ASTM E336, and achieve a Noise Isolation Class (NIC) of 40 plus or minus two. Adjust and/or modify partitions which do not comply, and retest.

3.3 CLEANING

Clean any soiled parts of the partition according to manufacturer's instructions.

3.4 SUPPORT SERVICE

Equipment and component maintenance must be supported by a service organization which is reasonably convenient to the site of installation.

-- End of Section --

SECTION 10 22 39

FOLDING PANEL PARTITIONS
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.

ASTM INTERNATIONAL (ASTM)

ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM C423	(2009a) Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
ASTM E336	(2014) Measurement of Airborne Sound Insulation in Buildings
ASTM E413	(2010) Rating Sound Insulation
ASTM E557	(2012) Installation of Operable Partitions
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E90	(2009) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101	(2015) Life Safety Code
NFPA 252	(2012) Standard Methods of Fire Tests of Door Assemblies
NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	Scientific Certification Systems (SCS)Indoor Advantage

UL ENVIRONMENT (ULE)

ULE Greenguard	UL Greenguard Certification Program

UNDERWRITERS LABORATORIES (UL)

UL 10B	(2008; Reprint Feb 2015) Fire Tests of Door Assemblies

1.2 SYSTEM DESCRIPTION

a. No less than 30 calendar days prior to the scheduled commencement of installation, submit the following to the Contracting Officer:

Manufacturer's Qualifications
Manufacturer's Sample Warranty
Statement of Code Compliance
Statement of Standards Conformity
Verification of Field Measurements
Existing Electrical Data
Fabrication Drawings
Installation Instructions

b. Supply and install manual and electric operation, acoustical folding panel partitions, factory finished, supported from overhead track without floor guides, as shown on the drawings including all hardware, seals, track and rollers as needed to close the specified opening.

c. Submit drawings to demonstrate that the system has been coordinated and will properly function as a unit. Show layout of the work; track and jamb fastening methods; seal and installation details; and equipment relationship to other parts of the work including clearances for maintenance and operation.

1.2.1 Manual Operation

The manual operation shall be a force no greater than 20 lbf to start movement at the rate of 3.33 ft/s (200 ft/min). Use a removable handle to extend and retract the bottom operable seals; vertical movement of seals shall be 2 inches. Closure to the lead wall shall be by use of a flexible bulb; accomplish final closing by means of a lever exerting pressure against the wall.

1.2.2 Electric Operation

Design the pressure-sensitive leading edge so that a force of 4 lbf will stop the forward motion; system shall stop the partition movement if people or objects are in the path of the partition when it is being extended or in the pocket area when the panels are being folded. Provide a weight-sensitive floor mat in the storage pocket to prevent partition movement with as little as 5 lbs of weight applied. Wall mount the electric control.

1.2.3 Performance Requirements

1.2.3.1 Fire Endurance

For partitions more than 60 square feet in area, provide covering and

lining with flame spread rating of 25 or less, fuel contribution rating of 15 or less, smoke generation of 50 or less in accordance with NFPA 101 when tested in accordance with ASTM E84. 1 hour fire rating, UL 10B, or NFPA 252.

Submit flame and smoke development tests reports. Provide door and partition finishes with a Class A rating when tested in accordance with ASTM E84.

1.2.3.2 Laboratory Acoustical Requirements

Provide partitions tested in accordance with ASTM E90, by a laboratory accredited by the U.S. Bureau of Standards, that have attained a sound transmission class (STC) of not less than 45 in a fully extended position, with a Noise Reduction Coefficient (NRC) of 0.25-0.30 for napped, tufted or looped fabric, 0.65-0.75 for perforated steel in accordance with ASTM C423.

Partition tested shall be of the same construction, materials, and model number as the partition to be provided and be fully operable. Test specimen shall be not less than 126 square feet in area. Panel weight shall be a minimum of 5.5 psf for STC up to 40, 7.5 psf for STC up to 45, and 8.5 psf for STC up to 50, 10.0 psf for STC up to 53. Design panel thickness (4 inch nominal) and composition to provide the required STC rating in accordance with ASTM E90 and ASTM E413.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. 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 Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Manufacturer's Qualifications; G
Manufacturer's Sample Warranty
Statement of Code Compliance; G
Statement of Standards Conformity; G
Verification of Field Measurements; G
Existing Electrical Data

SD-02 Shop Drawings

Installation; G
Wiring Diagrams; G
Layouts; G
Fabrication Drawings; G

SD-03 Product Data

Folding Panel Partitions; G
Installation Instructions; G
Certification

SD-04 Samples

Folding Panel Partitions; G

SD-06 Test Reports

Acoustical Test; G
Flame and Smoke Development Tests; G

SD-07 Certificates

Materials; G
Folding Panel Partitions; G

SD-10 Operation and Maintenance Data

Folding Panel Partitions

1.4 SUSTAINABLE DESIGN CERTIFICATION

Product shall be third party certified in accordance with ULE Greenguard Gold, SCS Scientific Certification Systems Indoor Advantage Gold or equal. Certification shall be performed annually and shall be current.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the jobsite in the manufacturer's original, unopened, and undamaged packages with labels legible and intact. Provide labels to indicate the manufacturer, brand name, size, finish, and placement location. Store partitions and accessories in unopened packages in a manner that will prevent damage. Handle partition materials in accordance with manufacturer's instructions. Protect materials from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

1.6 WARRANTY

Provide Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period. In addition, provide guarantee of the pantographs, trolleys and tracks for 10 years from date of acceptance for beneficial use.

PART 2 PRODUCTS

2.1 MATERIALS

Provide material and equipment which are the standard products of a manufacturer regularly engaged in the manufacture of such products and essentially duplicate items that have been in satisfactory use for at least 2 year prior to bid opening. Submit Certificate attesting that the materials meet the requirements specified. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site. Provide heavy-duty type hardware standard with the manufacturer. Provide pulls and latches for all partitions. Provide partitions with keyed locks. Provide anodized aluminum clear finish hardware.

2.2 FOLDING PANEL PARTITIONS

Provide folding panel partitions using top hung ball bearing carriers which support modular panels.

a. Provide partitions made up of a series of rigid panels, each panel being a one-piece assembly. Unless otherwise specified, use the least number of panels. The mechanical seal of the panel shall actuate with

a single operating action.

b. Provide panels paired or single type as indicated.

2.2.1 Panels

Provide panels of steel skin, laminated to appropriate structural acoustical backing, mounted in full perimeter protective frame. Steel for the panel frames shall be a minimum of 18 gauge thick steel with minimum 22 gauge thick face panels spot welded to the frame. Frame shall enclose and protect all edges of the surface material. Panels shall be not more than 4 feet wide, except for end closure panels, and be full height to track. Panels shall lock in place to form a stable, rigid partition; low profile hinges may not project more than 1/4 inch maximum from panel edge. Panel surfacing shall wrap around the vertical panel edges without vertical trim.

2.2.2 Finish Covering

Finish material shall be minimum 54 inches wide, as indicated on the Finish drawings. Provide non-allergenic stain and mildew resistant fabric which will not rot or support growth of bacteria.

2.2.3 Track

Provide recess extruded aluminum track as shown. Conform aluminum to ASTM B221. Provide track that is the manufacturer's standard product designed for the weight of the finished partition, including door. Provide track sections in the maximum lengths practicable, and not less than 6 feet long except for narrow doors and at ends of runs where short length is required. Provide suitable joint devices such as interlocking keys at each joint to provide permanent alignment of track.

2.2.4 Suspension System

Provide a suspension system consisting of steel track connected to the structural support by threaded rods, and trolleys designed to support the weight of the partition. Provide steel track of 7 gage minimum, phosphate treated or painted. Provide 2 trolleys per panel with 2 ball bearing polymer or steel tired wheels.

2.2.5 Tackboard

Provide tackboard with aluminum frame. Provide minimum 1/4 inch thickness , tacking surface covered with self-sealing decorative vinyl. Tacking surfaces shall be laminated to rigid backing substrate.

2.2.6 Markerboards

Provide markerboards with aluminum frame with writing surface of porcelain steel. Markerboard shall not protrude more than 1/8 inch beyond panel face. Color: white.

2.3 ACCESSORIES

2.3.1 Doors

Provide non-fire rated, manually operated doors with vinyl sweep top seals which compress against the bottom of the top track.

2.3.2 Ceiling Guards

Furnish partitions with ceiling guards or integral track and ceiling guards as recommended by the manufacturer.

2.3.3 Metal Soffit

Provide soffit when steel track is recessed. Provide metal soffit of adequate thickness to protect the ceiling from damage by door operation and with the door manufacturer's standard neutral-color applied finish. Soffit on aluminum track shall be an integral part of the track

2.4 SEALS AND SWEEPSTRIPS

Provide perimeter seals or sound insulation, of manufacturer's standard product, to achieve the sound transmission class specified and to pass the visual field test specified, without crack or craze when subjected to severe usage. Provide mechanical seal top and bottom of the fire rated panel. Provide mechanical bottom seal that can be raised or lowered for positive control. Provide manufacturer's vertical seals between panels to ensure acoustical and fire rating. Bottom seals shall consist of a vinyl sweep mechanical seal which will expand in place, or provide panels which can be lowered by a removable operating device. Provide vertical seal between panels which is anodized, architectural grade, aluminum extrusion with vinyl sound seal. Sweep strips shall be vinyl or other material that will not crack or craze with severe usage. Provide sweep strip STC to the specified rating.

2.5 ELECTRICAL OPERATORS

Provide manufacturer's recommended standard electrical operator for partitions indicated. Submit wiring diagrams.

2.6 COLOR

Color as indicated and selected from manufacturers standard colors.

Submit three color samples of specified surfaces and finishes to match those specified. Finish and color requirements are not limited to manufacturer's standard selections in order to meet these requirements. Also submit certificate attesting that partitions have specified acoustical and flame retardant properties, as determined by test.

PART 3 EXECUTION

3.1 INSTALLATION

Install in accordance with the manufacturer's approved instructions.

3.1.1 Preparation Work

Verify dimensions and condition of openings scheduled to receive folding panel partitions. Install partitions in accordance with the approved partition layouts, manufacturer's directions, and ASTM E557. Provide structural support for the track support elements as indicated.

3.1.2 Electrical Operators

Conform electrical components and installation to the requirements of

NFPA 70 and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Provide the partition manufacturer's standard drive and control components required to operate the partition. Power source is as indicated.

3.1.3 Adjustment

Adjust manually operated partitions to open and close from any position with a maximum horizontal force as specified in paragraph Manual Operation applied to pendant pull, box or handle. Adjust drive components and limit switches of electrically operated partitions to ensure the partitions operate properly upon activation of the control switch.

3.2 FIELD TESTS

3.2.1 Operational Test

In the presence of the Contracting Officer, operate partition at least three times to demonstrate that partition is capable of being moved from the stored position to the fully extended position smoothly and quietly and without overloading the drive components. Activate the emergency release mechanism and demonstrate proper operation of the partition in the manual mode. Adjust partitions which do not operate properly and retest.

3.2.2 Visual Test

Conduct visual field tests for light leakage with all room lights turned on in the space on one side of the partition. Darken space on the other side of the partition. Light leakage from the lighted space to the darkened space is not acceptable. If light leakage does occur, adjust the partition to correct the problem and retest.

3.2.3 Acoustical Test

Field sound performance: provide partition testing by an independent certified acoustical consultant in accordance with ASTM E336, and achieve a Noise Isolation Class (NIC) of 40 plus or minus two. Adjust and/or modify partitions which do not comply, and retest. Submit test reports.

3.3 CLEANING

Clean any soiled parts of the partition in accordance with manufacturer's printed instructions.

3.4 MAINTENANCE

Submit six complete copies of maintenance instructions explaining routine maintenance procedures including inspection, adjustments, lubrication, and cleaning. List possible breakdown, methods of repair, and a troubleshooting guide. Include instructions for equipment layout and simplified wiring and control diagrams of the system as installed and also the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and operating features. Include a complete list of parts and supplies, with current unit prices and source of supply, and a list of the parts recommended by the manufacturer to be replaced after 1 year and 3 years of service.

Submit Data Package 1 for folding panel partitions, and Data Package 5 for electrical operators in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

-- End of Section --

SECTION 10 22 43

SLIDING PARTITIONS
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 NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1	(2009; Errata 2010) Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

ASTM INTERNATIONAL (ASTM)

ASTM A653/A653M	(2013) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM C1036	(2010; E 2012) Standard Specification for Flat Glass
ASTM C1048	(2012; E 2012) Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass
ASTM E336	(2014) Measurement of Airborne Sound Insulation in Buildings
ASTM E413	(2010) Rating Sound Insulation
ASTM E557	(2012) Installation of Operable Partitions
ASTM E90	(2009) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

Consumer Product Safety Commission (CPSC)

CPSC 16, CFR 1201	(2012) Safety Standard for Architectural Glazing Materials

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	Scientific Certification Systems

(SCS)Indoor Advantage

UL ENVIRONMENT (ULE)

ULE Greenguard UL Greenguard Certification Program

1.2 SYSTEM DESCRIPTION

a. Supply and install manual operation, acoustical sliding partitions, factory finished, supported from overhead track without floor guides, as shown on the drawings including all hardware, seals, track and rollers as needed to close the specified opening.

b. No less than 30 calendar days prior to the scheduled commencement of installation submit the following to the Contracting Officer:

Manufacturer's Qualifications
Manufacturer's Sample Warranty
Statement of Code Compliance
Statement of Standards Conformity
Verification of Field Measurements
Existing Electrical Data
Fabrication Drawings
Installation Instructions

c. Submit drawings to demonstrate that the system has been coordinated and will properly function as a unit. Show layout of the work; track and jamb fastening methods; seal and installation details; and equipment relationship to other parts of the work including clearances for maintenance and operation.

1.2.1 Manual Operation

For the manual operation provide a force no greater than 20 lbf to start movement at the rate of 3.33 ft/s (200 ft/min). Use a removable handle to extend and retract the bottom operable seals; vertical movement of seals shall be 2 inches. Closure to the lead wall shall be by use of a flexible bulb; accomplish final closing by means of a lever exerting pressure against the wall.

1.2.2 Performance Requirements

1.2.2.1 Laboratory Acoustical Requirements for Opaque Panel System

Provide partitions tested in accordance with ASTM E90, by a laboratory accredited by the U.S. Bureau of Standards, that have attained a sound transmission class (STC) of not less than 52 in a fully extended position. Partition tested shall be of the same construction, materials, and model number as the partition to be provided and be fully operable. Test specimen shall be not less than 126 square feet in area, with a panel weight minimum of 5.5 psf for STC up to 40, 7.5 psf for STC up to 45, and 8.5 psf for STC up to 50, 10.0 psf for STC up to 53. Opaque panel thickness (4 inch nominal) and composition designed to provide the required STC rating in accordance with ASTM E90 and ASTM E413.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control

approval. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Manufacturer's Qualifications; G
Manufacturer's Sample Warranty
Statement of Code Compliance; G
Statement of Standards Conformity; G
Verification of Field Measurements; G
Existing Electrical Data

SD-02 Shop Drawings

Installation; G
Layouts; G
Fabrication Drawings; G

SD-03 Product Data

Sliding Partitions; G
Installation Instructions; G
Certification

SD-04 Samples

Sliding Partitions; G
Finish and Color; G

SD-06 Test Reports

Acoustical Test
Flame and Smoke Development Test

SD-07 Certificates

Materials
Sliding Partitions

SD-10 Operation and Maintenance Data

Operating Instructions; G
Maintenance Instructions; G
Data Package 1; G

1.4 SUSTAINABLE DESIGN CERTIFICATION

Product shall be third party certified in accordance with ULE Greenguard, SCS Scientific Certification Systems Indoor Advantage or equal. Certification shall be performed annually and shall be current.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the jobsite in the manufacturer's original, unopened, and undamaged packages with labels legible and intact. Provide labels to indicate the manufacturer, brand name, size, finish, and placement location. Store partitions and accessories in unopened packages in a

manner that will prevent damage. Handle partition materials in accordance with manufacturer's instructions. Protect materials from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

1.6 WARRANTY

Provide Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period. In addition, provide guarantee of the pantographs, trolleys and tracks for 10 years from date of acceptance for beneficial use.

PART 2 PRODUCTS

2.1 MATERIALS

Provide materials and equipment which are the standard products of a manufacturer regularly engaged in the manufacture of such products and that essentially duplicate items that have been in satisfactory use for at least 2 year prior to bid opening. Submit Certificate attesting that the materials meet the requirements specified. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site. Provide heavy-duty type hardware standard with the manufacturer, pulls and latches for all partitions, and partitions with keyed locks and privacy latches. Provide anodized aluminum clear finish hardware.

2.2 SLIDING PARTITIONS

Provide sliding partitions using top hung ball bearing carriers which support modular panels:

a. Made up of a series of rigid panels, each panel being a one-piece assembly. Unless otherwise specified, use the least number of panels. Actuate the mechanical seal of the panel with a single operating action.

b. Single type as indicated.

2.2.1 Panels

2.2.1.1 Opaque Acoustic Panels

Provide panels of steel skin, laminated to appropriate structural acoustical backing, mounted in full perimeter protective frame. Steel for the panel frames shall be a minimum of 16 gauge thick steel with minimum 22 gauge thick face panels spot welded to the frame. Frame shall enclose and protect all edges of the surface material. Panels shall not be not more than 4 feet wide, except for end closure panels, and be full height to track. Panels shall lock in place to form a stable, rigid partition; low profile hinges may not project more than 1/4 inch maximum from panel edge. Wrap panel surfacing around the vertical panel edges without vertical trim.

2.2.1.1.1 Finish Covering

Finish material shall be minimum 54 inches wide, as selected from panel manufacturer's standard woven fabric options. Panel finishes are to meet the flame and smoke development test requirements of Class A materials meeting the requirements of the International Building Code.

2.2.1.1.2 Sound Seals

The vertical interlocking sound seals between panels are to consist of aluminum astragals with tongue and groove configuration in each panel edge, rigid plastic astragals are not acceptable. Horizontal top seals shall be automatic, manually operated top seals are not permitted. Horizontal bottom seals shall be manually activated seals providing a nominal 2 inch operating clearance with an operating range of +1/2 inch to -1-1/2 inches. Bottom seal shall be operable from panel edge or face. The extended seal shall exert a nominal 120 pounds downward force to the floor throughout operating range.

2.2.1.2 Movable Glass Wall Panels

Fabricate panels with concealed fasteners. Fabricate operable glass panel partitions with manufacturer's standard panel sizes to form an assembled system to dimensions indicated on Drawings, and verified by field measurements. Maximum panel width: 48 inches; standard rail thickness; 1-7/8 inches.

Top and bottom rails shall be continuous two-piece assemblies with removable end caps. The rails are to be fabricated from aluminum of the alloy and temper recommended by the aluminum producer, and finishers for the type of use, corrosion resistance, and finish indicated, ASTM B221 for extrusions, manufacturer's standard strength and thickness for the type of use. Rails are to be fastened together from alternate sides of the partition allowing for field adjustment to suit site conditions. Furnish snap-on covers to facilitate installation. The rail finish is to be clear satin anodized aluminum.

The glass shall comply with safety standards specified in ANSI Z97.1, CPSC 16, CFR 1201, ASTM C1036 and ASTM C1048. Glass thickness 1/2 inch; glass color to be clear.

2.2.2 Track

Provide recess enamel finish steel track as shown. Steel shall conform to ASTM A653/A653M. Track shall be manufacturer's standard product designed for the weight of the finished partition, including door. Provide track sections in the maximum lengths practicable, and not less than 6 feet long except for narrow doors and at ends of runs where short length is required. Provide suitable joint devices such as interlocking keys at each joint to provide permanent alignment of track.

2.2.3 Suspension System

Provide a suspension system consisting of steel track connected to the structural support by threaded rods, and trolleys designed to support the weight of the partition. Provide steel track of 7 gage minimum, phosphate treated or painted. Provide 2 trolleys per panel with 2 ball bearing polymer or steel tired wheels.

2.2.4 Tackboard

Provide natural cork tackboard with aluminum trim only on horizontal edges and no trim on vertical edges; a minimum 1/4 inch thickness , tacking surface covered with self-sealing decorative vinyl and tacking surfaces laminated to rigid backing substrate. Trim to have no exposed fasteners.

2.2.5 Markerboards

Provide markerboards with aluminum horizontal trim without exposed fasteners with writing surface of porcelain steel. Markerboard may not protrude more than 1/8 inch beyond panel face. Color: white. Trim is not acceptable on vertical edges.

2.3 ACCESSORIES

2.3.1 Doors

Provide non-fire rated, manually operated doors with vinyl sweep top seals which compress against the bottom of the top track.

2.3.2 Ceiling Guards

Furnish partitions with ceiling guards or integral track and ceiling guards as recommended by the manufacturer.

2.3.3 Metal Soffit

Provide soffit when steel track is recessed. Provide metal soffit of adequate thickness to protect the ceiling from damage by door operation and with the door manufacturer's standard neutral-color applied finish.

2.4 SEALS AND SWEEPSTRIPS

Provide perimeter seals or sound insulation, of manufacturer's standard product, to achieve the sound transmission class specified and to pass the visual field test specified, without crack or craze when subjected to severe usage. Provide mechanical bottom seal that can be raised or lowered for positive control. Provide manufacturer's vertical seals between panels to ensure acoustical rating. Bottom seals shall consist of a vinyl sweep mechanical seal which will expand in place, or provide panels which can be lowered by a removable operating device. Vertical seal between panels shall be anodized, architectural grade, aluminum extrusion with vinyl sound seal. Provide vinyl sweep strips or other material which will not crack or craze with severe usage. Provide sweep strip STC of the specified rating.

2.5 COLOR

Color selected from manufacturers standard colors.

Submit three color samples of specified surfaces and finishes to match those specified. Finish and color requirements are not limited to manufacturer's standard selections in order to meet these requirements. Also submit Certificate attesting that partitions have specified acoustical and flame retardant properties, as determined by test.

PART 3 EXECUTION

3.1 INSTALLATION

Install in accordance with the manufacturer's approved instructions.

3.1.1 Preparation Work

Verify dimensions and condition of openings scheduled to receive folding panel partitions. Install partitions in accordance with the approved

partition layouts, manufacturer's directions, and ASTM E557. Provide structural support for the track support elements as indicated.

3.1.2 Adjustment

Adjust manually operated partitions to open and close from any position with a maximum horizontal force as specified in paragraph Manual Operation applied to pendant pull, box or handle.

3.2 FIELD TESTS

3.2.1 Operational Test

In the presence of the Contracting Officer, operate partition at least three times to demonstrate that partition is capable of being moved from the stored position to the fully extended position smoothly and quietly . Activate mechanical seals top and bottom. Adjust partitions which do not operate properly and retest.

3.2.2 Visual Test

Conduct visual field tests for light leakage with all room lights turned on in the space on one side of the partition. Darken space on the other side of the partition. Light leakage from the lighted space to the darkened space is not acceptable. If light leakage does occur, adjust the partition to correct the problem and retest.

3.2.3 Acoustical Test

Field sound performance: provide partition testing of one acoustical partition selected by the Contracting Officer by an independent certified acoustical consultant in accordance with ASTM E336, and achieve a Noise Isolation Class (NIC) of 44 plus or minus two. Adjust and/or modify partitions which do not comply, and retest.

3.3 CLEANING

Clean any soiled parts of the partition in accordance with manufacturer's printed instructions.

3.4 OPERATION AND MAINTENANCE

3.4.1 Operating Instructions

Submit six complete copies of operating instructions outlining the procedures required for electrically operated partitions. The instructions shall include the manufacturer's name, model number, service manual, parts list, brief description of all equipment and operating features, a complete list of parts and supplies, with current unit prices and source of supply, and a list of the parts recommended by the manufacturer to be replaced after 1 year and 3 years of service.

3.4.2 Maintenance

Submit six complete copies of maintenance instructions explaining routine maintenance procedures including inspection, adjustments, lubrication, and cleaning; list possible breakdown, methods of repair, and include a troubleshooting guide. Include instructions for equipment layout and simplified wiring and control diagrams of the system as installed.

Submit Data Package 1 for sliding partitions, and Data Package 5 for electrical operators in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

-- End of Section --

SECTION 10 26 13

WALL AND CORNER GUARDS
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 A167	(2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM D256	(2010) Determining the Izod Pendulum Impact Resistance of Plastics
ASTM D543	(2006) Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
ASTM D635	(2010) Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM G21	(2013) Determining Resistance of Synthetic Polymeric Materials to Fungi

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM AMP 500	(2006) Metal Finishes Manual

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	Scientific Certification Systems (SCS)Indoor Advantage

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE J1545	(2005) Instrumental Color Difference Measurement for Exterior Finishes, Textiles and Colored Trim

UL ENVIRONMENT (ULE)

ULE Greenguard	UL Greenguard Certification Program

1.2 SUSTAINABILITY REQUIREMENTS

Materials in this technical specification may contribute towards contract compliance with sustainability requirements. See Section 01 33 29 LEED DOCUMENTATION for project local/regional materials, low-emitting materials, and recycled content requirements

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Corner Guards; G
Wall Covering/Panels; G

SD-03 Product Data

Corner Guards; G
Wall Covering/Panels; G

SD-04 Samples

Finish; G

SD-06 Test Reports

Corner Guards
Wall Covering/Panels

SD-07 Certificates

Corner Guards
Wall Covering/Panels

SD-11 Closeout Submittals

LEED Documentation

1.4 SUSTAINABLE DESIGN CERTIFICATION

Product shall be third party certified in accordance with ULE Greenguard Gold, SCS Scientific Certification Systems Indoor Advantage Gold or equal. Certification shall be performed annually and shall be current.

1.5 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. Materials shall be stored at approximately 70 degrees F for at least 48 hours prior to installation.

1.6 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

To the maximum extent possible, corner guards and wall panels shall be the standard products of a single manufacturer and shall be furnished as detailed. Drawings show general configuration of products required, and items differing in minor details from those shown will be acceptable.

2.1.1 Resilient Material

Provide resilient material consisting of high impact resistant extruded acrylic vinyl, polyvinyl chloride, or injection molded thermal plastic conforming to the following:

2.1.1.1 Minimum Impact Resistance

Minimum impact resistance shall 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 Rating

Fire rating shall be Class 1 when tested in accordance with ASTM E84, having a maximum flame spread of 25 and a smoke developed rating of 450 or less. Material shall be rated self extinguishing when tested in accordance with ASTM D635. Material shall be labeled and tested by an approved nationally known testing laboratory. Resilient material used for protection on fire rated doors and frames shall be listed by the testing laboratory performing the tests. Resilient material installed on fire rated wood/steel door and frame assemblies shall have been tested on similar type assemblies. Test results of material tested on any other combination of door/frame assembly will not be acceptable.

2.1.1.3 Integral Color

Colored components shall have integral color and shall be 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

Materials shall be resistant to chemicals and stains reagents in accordance with ASTM D543.

2.1.1.5 Fungal and Bacterial Resistance

Materials shall be resistant to fungi and bacteria in accordance with ASTM G21, as applicable.

2.2 CORNER GUARDS

2.2.1 Stainless Steel Corner Guards, CG1

Stainless steel corner guards shall be fabricated of 16 gauge material conforming to ASTM A167, type 304. Corner guards shall extend to above

wall base to 8'-0" H. Corner guard shall be formed to dimensions shown.

2.2.2 Powder Coated Stainless Steel Corner Guards, CG2

Powder coated stainless steel corner guards shall be fabricated of 16 gauge material conforming to ASTM A167, type 304. Corner guards shall extend from above wall base of 8'-0" H. Corner guards shall be conformed to dimensions shown. Powder coated colors as indicated on finish drawings.

2.3 WALL COVERING/PANELS

Provide wall covering/panels consisting of high impact rigid acrylic vinyl or polyvinyl chloride resilient material. Panel sizes shall be as indicated on drawings. Submit fire rating and extinguishing test results for resilient material. Also submit statements attesting that the items comply with specified fire and safety code requirements.

2.3.1 Rigid Vinyl Acrylic Wall Covering

Wall covering thickness shall be 0.040 or 0.060 inch.

2.3.2 Diamond Plate Wall Coverings

Wall covering thickness shall be 1/8 inch thick Grade 3003-H22 aluminum diamond plate. Sheet size shall be 4'-0" by 8'-0" with a bright reflective finish.

2.4 TRIM, FASTENERS AND ANCHORS

Provide vinyl trim, fasteners, anchors and inside/outside corners as required for each specific installation as shown.

2.5 FINISH

Submit three samples indicating color and texture of materials requiring color and finish.

2.5.1 Stainless Steel Finish

Finish for stainless steel shall be in accordance with ASTM A167, Type 302 or 304; NAAMM AMP 500, finish number 4.

2.5.2 Resilient Material Finish

Finish for resilient material shall be stipple texture with colors in accordance with SAE J1545.

2.6 ADHESIVES

Adhesive for resilient material shall be in accordance with manufacturers recommendations.

2.7 COLOR

Color shall be as indicated on the drawings. Color listed is not intended to limit the selection of equal colors from other manufacturers.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Wall Panels

Surfaces to receive protection shall be clean, smooth, and free of obstructions. Adhesives shall be applied in controlled environment in accordance with manufacturer's recommendations.

3.1.2 Stainless Steel Guards

a. Mount guards on external corners of interior walls, partitions and columns as in accordance with manufacturer's recommendations.

b. 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.

3.1.3 Diamond Plate Mounting Method

Provide manufacturer's recommended adhesive or mechanical fasteners.

3.1.4 Diamond Plate Installation

a. Very absorbent/porous substrates require a sealer applied to the surface before panels are installed.

b. All electrical switches, power points should be first fix/installation state. All electrical equipment should only be moved/altered by a qualified electrician.

c. If fitting to door frames, these must be placed prior to panel installation.

-- End of Section --

SECTION 10 28 13

TOILET ACCESSORIES
07/06

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.

ASTM INTERNATIONAL (ASTM)

ASTM C1036	(2010; E 2012) Standard Specification for Flat Glass

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC	(2009) Leadership in Energy and Environmental Design(tm) New Construction Rating System

1.2 SUSTAINABILITY REQUIREMENTS

Materials in this technical specification may contribute towards contract compliance with sustainability requirements. See Section 01 33 29 LEED DOCUMENTATION for project LEED NC local/ regional materials, recycled content, and optimizing energy performance requirements.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Finishes; G
Accessory Items; G

SD-04 Samples

Finishes; G
Accessory Items; G

SD-07 Certificates

Accessory Items

SD-10 Operation and Maintenance Data

Electric Hand Dryer; G

SD-11 Closeout Submittals

LEED Documentation

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 standard performance guarantees or warranties that extend beyond a 1 year period.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

Provide toilet accessories where indicated in accordance with paragraph SCHEDULE. Provide each accessory item complete with the necessary mounting plates of sturdy construction with corrosion resistant surface.

2.1.1 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

2.2 ACCESSORY ITEMS

Conform to the requirements for accessory items specified below. Submit fasteners proposed for use for each type of wall construction, mounting, operation, and cleaning instructions and one sample of each other accessory proposed for use. Incorporate approved samples into the finished work, provided they are identified and their locations noted. Submit certificate for each type of accessory specified, attesting that the items meet the specified requirements.

2.2.1 Grab Bar (GB)-TA28, TA29, TA30

Provide an 18 gauge, 1-1/4 inch grab bar OD Type 304 stainless steel. Provide form and length for grab bar as indicated. Provide concealed mounting flange. Provide grab with peened non-slip surface. Furnish installed bars capable of withstanding a 500 pound vertical load without coming loose from the fastenings and without obvious permanent deformation. Allow 1-1/2 inch space between wall and grab bar. Refer to drawings for sizes of grab bars.

2.2.2 Mirrors, Glass (MG)-TA20, TA21

Provide Type I transparent flat type, Class 1-clear glass for mirrors. Glazing Quality q1 1/4 inch thick conforming to ASTM C1036. Coat glass on one surface with silver coating, copper protective coating, and mirror

backing paint. Provide highly adhesive pure silver coating of a thickness which provides reflectivity of 83 percent or more of incident light when viewed through 1/4 inch thick glass, free of pinholes or other defects. Provide copper protective coating with pure bright reflective copper, homogeneous without sludge, pinholes or other defects, of proper thickness to prevent "adhesion pull" by mirror backing paint. Provide mirror backing paint with two coats of special scratch and abrasion-resistant paint and baked in uniform thickness to provide a protection for silver and copper coatings which will permit normal cutting and edge fabrication. Refer to drawings for sizes.

2.2.3 Paper Towel Dispenser (PTD)-TA3

Provide paper towel roll dispenser constructed of a minimum 0.03 inch Type 304 stainless steel, surface mounted. Furnish tumbler key lock locking mechanism.

2.2.4 Sanitary Napkin Disposer (SND)-TA10

Construct a Type 304 stainless steel sanitary napkin disposal with removable leak-proof receptacle for disposable liners. Provide fifty disposable liners of the type standard with the manufacturer. Retain receptacle in cabinet by tumbler lock. Provide disposer with a door for inserting disposed napkins, surface mounted.

2.2.5 Shower Curtain (SC)-TA31

Provide shower curtain, size to suit conditions. Provide anti-bacterial nylon/vinyl fabric curtain. Furnish white color.

2.2.6 Shower Curtain Rods (SCR) and Rings-TA27

Provide Type 304 stainless steel shower curtain rods 1-1/4 inch OD by 0.049 inch minimum straight to meet installation conditions. Provide curtain rings as required for size of shower curtain.

2.2.7 Soap Dispenser (SD)-TA13

Provide soap dispenser surface mounted, liquid type consisting of a vertical Type 304 stainless steel tank with holding capacity of 40 fluid ounces with a corrosion-resistant all-purpose valve that dispenses liquid soaps, lotions, detergents and antiseptic soaps.

2.2.8 Soap Holder (SH)-TA32

Provide surface mounted Type 304 stainless steel soap holder. Provide stainless steel separate supports.

2.2.9 Hand Sanitizer Dispenser (HSD)-TA12

Provide hand sanitizer dispensers complete with mounting brackets, batteries as recommended by manufacturer, sanitizer solution, and one bottle of refill sanitizer solution for each dispenser installed. Dispenser properties and characteristics:

a. Wall mounted
b. Battery operated
c. Automatic, touchless type that dispenses sanitizer when a hand is placed in proximity of a sensor

d. Integral tray below the dispensing portal to catch wasted sanitizer
e. Operated using standard size batteries such as AA cells

2.2.10 Wall-Mounted Soap Dish - TA15

Provide a satin stainless steel surface mounted soap dish, Type-304 with concealed stainless steel mounting bracket. Soap dish to be drawn, one-piece, seamless construction welded to the support arm. A minimum of 2 drain holes and 2 ridges to support bar of soap.

2.2.11 Towel Pin (TP)-TA18

Provide towel pin with concealed wall fastenings, and a pin integral with or permanently fastened to wall flange with maximum projection of 4 inch. Provide satin finish.

2.2.12 Toilet Tissue Dispenser (TTD)-TA1

Furnish Type II - surface mounted toilet tissue holder with two rolls of standard tissue mounted horizontally. Provide stainless steel, satin finish cabinet.

2.2.13 Waste Receptacle (WR)-TA11

Provide Type 304 stainless steel waste receptacle, freestanding. Provide reusable liner, of the type standard with the receptacle manufacturer and removable top. Provide a minimum 32 cubic feet capacity.

2.2.14 Surface-Mounted Waste Receptacle - TA16

Provide Type 304 stainless steel surface mounted waste receptacle. Provide reusable liner of the type standard with the receptacle manufacturer. Provide a minimum of 6 gal. capacity.

2.2.15 Electric Hand Dryer (EHD)-TA-4

Provide wall mount and electric hand dryer designed to operate at 110/125 volts, 60 cycle, single phase alternating current with a heating element core rating of a maximum 2100 watts. Provide dryer housing of single piece construction and of manufacturer standard material/finish. Submit 4 complete copies of maintenance instructions listing routine maintenance procedures and possible breakdowns. Include repair instructions for simplified wiring and control diagrams and other information necessary for unit maintenance.

2.2.16 Diaper Changing Station (DCS)-TA23

Provide surface mounted diaper changing station fabricated of high impact plastic with no sharp edges. Provide fold down platform concave to the child's shape, equipped with nylon and hook and loop safety straps and engineered to withstand a minimum static load of 250 lb. Provide an integral dispenser for sanitary liners for each unit. Provide pictorial for universal use of safety graphics. Furnish color from manufacturer's full line of standard colors.

2.2.17 Folding Shower Seat (FSS)-TA25

Folding shower seat shall have a frame constructed of type-304 satin finish stainless steel, 16-gauge, 1-1/4 inch square tubing, and 18-gauge, 1 inch

diameter seamless tubing. Seat shall be constructed of one-piece, 1/2 inch thick water-resistant, ivory colored solid phenolic with black edge. Clearance between back of shower seat and wall shall be 1-1/2 inches to comply with ADA Accessibility Guidelines (ADAAG). Seat supports shall not come into contact with the floor. Seat shall be able to lock in upright position when not in use. Seat shall be attached to wall by two 3 inch diameter mounting flanges constructed of type-304, 3/16 inch thick stainless steel with satin finish. Manufacturer's service and parts manual shall be provided to building owner/manager upon completion of project.

2.2.18 Mop and Broom Holder (MH)-TA19

Stainless steel with grip jaw cam mechanism securing 4 mop or broom handles. Also includes storage shelf.

PART 3 EXECUTION

3.1 INSTALLATION

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 or polysulfide sealant) 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 Surface Mounted Accessories

Mount on concealed backplates, unless specified otherwise. Conceal fasteners on accessories without backplates. Install accessories with sheet metal screws or wood screws in lead-lined braided jute, PTFE or neoprene sleeves, or lead expansion shields, or with toggle bolts or other approved 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 solid wood blocking secured between wood studs, or to metal 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; FIRE EXTINGUISHER AND FIRE HOSE VALVE CABINETS
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.

INTERNATIONAL CODE COUNCIL (ICC)

ICC IFC	(2009) International Fire Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 1	(2012; TIA 11-1) Fire Code
NFPA 10	(2013) Standard for Portable Fire Extinguishers
NFPA 101	(2015; ERTA 2015) Life Safety Code
NFPA 505	(2013) Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations

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

29 CFR 1910.157	(2003) Portable Fire Extinguishers

UNDERWRITERS LABORATORIES (UL)

UL 2129	(2005; Reprint Mar 2012) Halocarbon Clean Agent Fire Extinguishers
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 Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Manufacturer's Data

SD-02 Shop Drawings

Fire Extinguishers

Accessories

Cabinets

SD-03 Product Data

Fire Extinguishers

Accessories

Cabinets

Replacement Parts

SD-04 Samples

Fire Extinguisher

Cabinet

Accessories

SD-07 Certificates

Fire Extinguishers

Manufacturer's Warranty with Inspection Tag

1.3 DELIVERABLES

1.3.1 Samples

Provide the following samples: One of each type of Fire Extinguisher being installed; one full-sized sample of each type of Cabinet being installed; three samples of Accessories of each type being used.

Approved samples may be used for installation, with proper identification and storage.

1.4 DELIVERY, HANDLING, AND STORAGE

Protect materials from weather, soil, and damage during delivery, storage, and construction.

Deliver materials in their original packages, containers, or bundles bearing the brand name and the name and type of the material.

Provide portable fire extinguishers in compliance with NFPA 505 for all ancillary vehicles where Fire Safety Standard for Powered Industrial Trucks, including type designations, special c conditions relating to areas of use, conversions, maintenance, or specific operations apply.

1.5 WARRANTY

Guarantee that Fire Extinguishers are free of defects in materials, fabrication, finish, and installation and that they will remain so for a period of not less than 6 years after completion.

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.

2.1 TYPES

Submit certificates that show Fire Extinguishers comply with local codes and regulations.

Provide Fire Extinguishers conforming to NFPA 10. Provide quantity and placement in compliance with the applicable sections of ICC IFC, Section 1414 and ICC IFC, Section 906, NFPA 1, NFPA 101, and 29 CFR 1910.157.

Provide dry chemical type fire extinguishers compliant with UL 299, typically.

Provide clean agent type fire extinguishers compliant with UL 2129, where indicated.

Submit Manufacturer's Data for each type of Fire Extinguisher required, detailing all related Cabinet, Wall Mounting and Accessories information, complete with Manufacturer's Warranty with Inspection Tag.

2.2 MATERIAL

Provide corrosion-resistant steel extinguisher shell.

2.3 SIZE

10-pound extinguishers.

2.4 ACCESSORIES

Forged brass valve

Fusible plug

Safety release

Antifreeze

Pressure gage

2.5 CABINETS - FIRE EXTINGUISHER AND FIRE HOSE VALVE

2.5.1 Material

Provide enameled steel cabinets.

2.5.2 Type

Provide semi-recessed cabinet for a 4-inch wall.

2.5.3 Size

Dimension cabinets to accommodate the specified fire extinguishers, fire hose valves and a combination of the two.

PART 3 EXECUTION

3.1 INSTALLATION

Install Fire Extinguishers and fire hose valves where indicated on the drawings. Verify exact locations prior to installation.

Comply with the manufacturer's recommendations for all installations.

Provide extinguishers which are fully charged and ready for operation upon installation. Provide extinguishers complete with Manufacturer's Warranty with Inspection Tag attached.

3.2 ACCEPTANCE PROVISIONS

3.2.1 Repairing

Remove and replace damaged and unacceptable portions of completed work with new work at no additional cost to the Government.

Submit Replacement Parts list indicating specified items replacement part, replacement cost, and name, address and contact for replacement parts distributor.

3.2.2 Cleaning

Clean all surfaces of the work, and adjacent surfaces which are soiled as a result of the work. Remove from the site all construction equipment, tools, surplus materials and rubbish resulting from the work.

-- End of Section --

SECTION 10 51 13

METAL LOCKERS
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.

ASTM INTERNATIONAL (ASTM)

ASTM A1008/A1008M	(2015) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened
ASTM A653/A653M	(2013) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A924/A924M	(2014) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B456	(2011; E 2011) Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium
ASTM D6386	(2010) Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS AA-L-00486	(Rev J) Lockers, Clothing, Steel

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Types; G

Location; G

Installation

Numbering system

SD-03 Product Data

Material

Built-in Locks

Handles

Finish

Locker components

Assembly instructions

SD-04 Samples

Color chips; G

1.3 DELIVERY, HANDLING, AND STORAGE

Deliver lockers and associated materials in their original packages, containers, or bundles bearing the manufacturer's name and the name of the material. Protect from weather, soil, and damage during delivery, storage, and construction.

1.4 FIELD MEASUREMENTS

To ensure proper fits, make field measurements prior to the preparation of drawings and fabrication. Verify correct location

1.5 QUALITY ASSURANCE

1.5.1 Color Chips

Provide a minimum of three color chips, not less than 3 inches square, of each color indicated.

Government may request performance-characteristic tests on assembled lockers. Tests and results must conform to FS AA-L-00486. Lockers not conforming will be rejected.

PART 2 PRODUCTS

2.1 TYPES

Locker must have the following type and size in the location and quantities indicated. Locker finish colors will be as indicated.

2.1.1 Single-tier Lockers

Single-tier lockers shall be as follows:

Type STS-1: Single tier sports locker 24 inches wide, 24 inches deep and 72 inches high with a fixed shelf, a coat rod, three (3) wall hooks,

solid sides and back, fully ventilated door, padlock eye and door latch, sloped top and without a base.

Type STS-2: Single tier sports locker 12 inches wide, 15 inches deep and 72 inches high with a fixed shelf, a coat rod, three (3) wall hooks, solid sides and back, fully ventilated door, padlock eye and door latch, sloped top and without a base.

2.1.2 Double-Tier

Double-tier locker types shall be as follows:

Type DTL-1: Double-tier corridor locker 12 inches wide, 15 inches deep, and 72 inches high, three (3) wall hooks, solid sides, back and door, padlock eye and door latch, flat top and without a base.

2.1.3 Multi-Tier

Multi-tier locker types shall be as follows:

MTL-1: Five tier locker 12 inches wide, 15 inches deep and 72 inches high with solid sides and back, fully ventilated door, padlock eye and door latch, sloped top and without a base.

2.1.4 Locker Benches

Provide locker benches fabricated by same manufacturer as metal lockers:

2.1.4.1 Bench Tops

Manufacturer's standard one piece units, of the following material, minimum 9-1/2 inches wide by 1-1/4 inches thick, with rounded corners and edges. Bench top shall be laminated maple with one coat of clear sealer on all surfaces, and one coat of clear lacquer on top and sides.

2.1.4.1.1 Fixed Pedestals

Manufacturer's standard supports, with predrilled fastener holes for attaching bench top and anchoring to floor, complete with fasteners and anchors. Pedestals shall be tubular steel 1-1/4 inches in diameter steel tubing, with baked enamel finish; anchored with exposed fasteners. The color is to be as selected, see Finish Schedule.

2.2 MATERIAL

2.2.1 Steel Sheet

Provide steel sheet for lockers located in areas other than locker rooms, including hall lockers, ASTM A1008/A1008M, commercial quality, minimized spangle material. Prepare material surfaces for baked enamel finishing in accordance with FS AA-L-00486. Fabricate locker bodies from not less than 0.0239-inch thick steel sheet.

2.2.2 Galvanized Steel Sheet

Provide galvanized steel sheet for lockers located in locker room areas, ASTM A653/A653M and ASTM A924/A924M, commercial quality, minimized spangle, galvanized steel sheet with not less than G60 zinc coating. Prepare surface of sheet for painting in accordance with ASTM D6386, Method A.

Minimum uncoated sheet thickness as specified above.

2.2.3 Chromium Coating

Nickel and chromium electrodeposited on the specified base metal. Conform to ASTM B456, SC-3, as applicable to the base metal.

2.2.4 Finish

FS AA-L-00486.

2.2.4.1 Color

As selected, see Finish Schedule.

2.3 COMPONENTS

2.3.1 Built-In Locks

FS AA-L-00486. Provide locking devices as a padlock eye in the door latching mechanism.

2.3.2 Coat Hooks

FS AA-L-00486, chromium plated, one hook on each side of the locker and one on the back for a total of 3 per locker..

2.3.3 Hanger Rods

FS AA-L-00486, one each in locker types STS-1 and STS-2 only.

2.3.4 Door Handles

FS AA-L-00486. Provide zinc alloy or steel handles with a chromium coating.

2.3.5 Doors

FS AA-L-00486, not less than 0.0598 inch thick steel sheet.

2.3.5.1 Hinges

In addition to the requirements of FS AA-L-00486, provide 5-knuckle hinges, minimum 2 inches high. Fabricate knuckle hinges from not less than 0.0787 inch thick steel sheet. A full height piano hinge may be provided if standard with the manufacturer. Weld or bolt hinges to the door frame. Weld, bolt, or rivet hinges to the door.

2.3.5.2 Latching Mechanisms

FS AA-L-00486.

2.3.6 Latch Strikes

FS AA-L-00486. Fabricate from not less than 0.0787 inch thick steel sheet, except latch strike may be continuous from top to bottom and fabricated as part of the door framing.

2.3.7 Silencers

FS AA-L-00486.

2.3.8 Back and Side Panels, Tops, and Bottoms

FS AA-L-00486, not less than 0.0474 inch thick steel sheet.

2.3.9 Sloping Locker Tops

Provide sloping locker tops in addition to the locker-section flat tops. Sloping tops must be continuous in length. Provide fillers or closures at the exposed end of sloping tops. Fabricate sloping tops from not less than 0.0478-inch thick steel sheet.

2.3.10 Shelves

FS AA-L-00486. Fabricate from not less than 0.0598 inch thick steel sheet.

2.3.11 Base Panels

FS AA-L-00486.

2.3.12 Legs

Provide lockers without legs, as indicated.

2.3.13 Number Plates

FS AA-L-00486. Aluminum. Provide consecutive numbers for each type of locker.

2.3.14 Fastening Devices

Provide bolts, nuts, and rivets as specified in FS AA-L-00486.

PART 3 EXECUTION

3.1 ASSEMBLY AND INSTALLATION

Assemble lockers according to the locker manufacturer's instructions. Align lockers horizontally and vertically. Secure lockers to wall and base with screws as indicated. Bolt adjacent lockers together. Adjust doors to operate freely without sticking or binding and to ensure they close tightly.

3.1.1 Fixed Locker Benches

Install fixed locker benches with not less than 2 pedestals for each bench, uniformly spaced not more than 72 inches apart. Securely fasten top of pedestals to undersides of bench tops, and anchor bases to floor.

3.2 NUMBERING SYSTEM

Install number plates on lockers consecutively with odd numbers on top and even numbers on bottom.

3.3 FIELD QUALITY CONTROL

3.3.1 Testing

Government may request performance-characteristic tests on assembled lockers in accordance with FS AA-L-00486. Lockers not conforming will be rejected.

3.3.2 Repairing

Remove and replace damaged and unacceptable portions of completed work with new.

3.3.3 Cleaning

Clean surfaces of the work, and adjacent surfaces soiled as a result of the work, in an approved manner. Remove equipment, surplus materials, and rubbish from the site.

-- End of Section --

SECTION 10 56 13

STEEL SHELVING
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.

ASTM INTERNATIONAL (ASTM)

ASTM D2794	(1993; R 2010) Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D3359	(2009; E 2010; R 2010) Measuring Adhesion by Tape Test
ASTM D522	(1993a; R 2008) Mandrel Bend Test of Attached Organic Coatings

MATERIAL HANDLING INDUSTRY OF AMERICA INC (MHI)

MHI MH28.1	(1997) Specification: Industrial Steel Grade Shelving

1.2 DEFINITIONS

For the purposes of this specification the shelf category, "medium weight," "heavy weight," will be as follows. Load is given per shelf in pounds for evenly distributed load. This does not limit the shelf size, only the shelving category.

Minimum Evenly Distributed Load Per Shelf in Pounds		
Shelf Size	Type Medium Duty	Type Heavy Duty
18 by 36 in.	700	1300
18 by 48 in.	500	900

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Shelving Units

SD-03 Product Data

Shelving Units

Accessories

Installation instructions

SD-04 Samples

Finish

SD-06 Test Reports

Shelving Units

Finish

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials in original packages, containers or bundles bearing the brand name and identification of the manufacturer. Store inside under cover. Protect surfaces from damage.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

MHI MH28.1. Provide shelving units indicated. Provide shelving units designed for full dead and live load, designated heavy duty. Provide units with base plates for floor anchorage indicated. Provide wall connections for units over 8 feet 3 inches to top shelf.

2.2 ACCESSORIES

a. Drawers, 400 pound capacity, and mounting brackets

b. Partitions and dividers

c. Label holder 3 by 5 inches.

2.3 FINISH

Provide the shelving units in the manufacturer's standard colors as chosen by the Contracting Officer. Clean metal by multiple stage phosphatizing and sealing process, for rust resistance and paint adhesion. Provide electrostatically applied enamel finish coats, baked hard for a minimum of 30 minutes at 300 degrees F.

2.4 SOURCE QUALITY CONTROL

a. MHI MH28.1, for tests of shelf capacity, lateral stability and shelf connections.

b. Finish flexibility, ASTM D522, Method A, 1/8 inch diameter, 180 degree bend, no evidence of fracturing to the naked eye.

c. Finish adhesion, ASTM D3359, Method B. There shall be no film removed

by tape applied to 11 parallel cuts space 1/8 inch apart plus 11 similar cuts at right angles.

d. Impact resistant finish, ASTM D2794, no loss of adhesion after direct and reverse impact equal to 1.5 times metal thickness in mm, expressed in inch pounds.

PART 3 EXECUTION

3.1 EXAMINATION

Before installation, examine shelving units for dents and scratches. Replace damaged shelving.

3.2 INSTALLATION

Install shelving according to manufacturer's installation instructions. Make wall and floor connections as indicated.

3.3 PROTECTION

Cover and protect shelving from damage during the completion of construction. Remove prior to acceptance of project.

3.4 SCHEDULE - REFER TO DRAWINGS

-- End of Section --

SECTION 11 05 40

COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT
08/08

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ANSI/ASHRAE 15 & 34	(2013; Addenda A 2014; ERTA 1 2014; ERTA 2 2015; INT 1 2015; ERTA 3 2015) ANSI/ASHRAE Standard 15-Safety Standard for Refrigeration Systems and ANSI/ASHRAE Standard 34-Designation and Safety Classification of Refrigerants

AMERICAN WELDING SOCIETY (AWS)

AWS A5.8/A5.8M	(2011; Amendment 2012) Specification for Filler Metals for Brazing and Braze Welding
AWS D1.1/D1.1M	(2010; Errata 2011) Structural Welding Code - Steel
AWS D10.4	(1986; R 2000) Recommended Practices for Welding Austenitic Chromium-Nickel Stainless Steel Piping and Tubing
AWS D9.1M/D9.1	(2012) Sheet Metal Welding Code

ASME INTERNATIONAL (ASME)

ASME A112.19.3/CSA B45.4	(2008; R 2013) Stainless Steel Plumbing Fixtures
ASME B16.15	(2013) Cast Copper Alloy Threaded Fittings Classes 125 and 250
ASME B16.18	(2012) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.22	(2013) Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.26	(2013) Standard for Cast Copper Alloy Fittings for Flared Copper Tubes

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2013) 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 A240/A240M	(2015a) Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM A269	(2013) Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
ASTM A270/A270M	(2010) Standard Specification for Seamless and Welded Austenitic Stainless Steel Sanitary Tubing
ASTM A276	(2013a) Standard Specification for Stainless Steel Bars and Shapes
ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A653/A653M	(2013) 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 B32	(2008; R 2014) Standard Specification for Solder Metal
ASTM B43	(2014) Standard Specification for Seamless Red Brass Pipe, Standard Sizes
ASTM B88	(2014) Standard Specification for Seamless Copper Water Tube
ASTM C1330	(2002; R 2013) Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants
ASTM C920	(2014a) Standard Specification for Elastomeric Joint Sealants
ASTM D520	(2000; R 2011) Zinc Dust Pigment

CSA GROUP (CSA)

CSA Directory	(updated continuously online) Product Index

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA LD 3	(2005) Standard for High-Pressure Decorative Laminates
NEMA 250	(2014) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA ICS 2	(2000; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 6	(1993; R 2011) Enclosures
NEMA MG 1	(2014) Motors and Generators
NEMA MG 2	(2001; Rev 1 2007) Safety Standard for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 54	(2015) National Fuel Gas Code
NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code

NSF INTERNATIONAL (NSF)

NSF Food Equipment	(2005) NSF Product Listings of Food Equipment and Related Products, Components and Materials
NSF/ANSI 14	(2014) Plastics Piping System Components and Related Materials
NSF/ANSI 169	(2012)Special Purpose Food Equipment and Devices
NSF/ANSI 2	(2012) Food Equipment
NSF/ANSI 35	(2012) High Pressure Decorative Laminates for Surfacing Food Service Equipment
NSF/ANSI 37	(2012) Air Curtains for Entranceways in Food and Food Service Establishments
NSF/ANSI 51	(2012) Food Equipment Materials
NSF/ANSI 59	(2012) Mobile Food Carts
NSF/ANSI 6	(2012) Dispensing Freezers
NSF/ANSI 7	(2009) Commercial Refrigerators and Freezers

NSF/ANSI 8	(2012) Commercial Powered Food Preparation Equipment

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

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

29 CFR 1910-SUBPART D	Walking - Working Surfaces
29 CFR 1910.144	Safety Color Code for Marking Physical Hazards
29 CFR 1910.145	Accident Prevention Signs and Tags
29 CFR 1910.212	Safety Standard for Machinery and Machine Guarding
29 CFR 1910.306	Specific Purpose Equipment and Installations

UNDERWRITERS LABORATORIES (UL)

UL 1598	(2008; Reprint Oct 2012) Luminaires
UL 197	(2010; Reprint Sep 2013) Commercial Electric Cooking Appliances
UL 207	(2009; Reprint Jul 2013) Refrigerant-Containing Components and Accessories, Nonelectrical
UL 471	(2010; Reprint Jun 2013) Commercial Refrigerators and Freezers
UL 489	(2013; Reprint Mar 2014) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
UL 763	(2012; Reprint Nov 2013) Standard for Motor-Operated Commercial Food Preparing Machines
UL Elec Equip Dir	(2011) Electrical Appliance and Utilization Equipment Directory

1.2 GENERAL REQUIREMENTS

Provide detailed Food Service Equipment Schedule=.

Electrically powered equipment specified within this section must conform to EPA Energy Star requirements and labeling. Special purpose equipment must conform to NSF/ANSI 169, NSF/ANSI 59, and NSF/ANSI 8.

1.2.1 Mechanical General Requirements

Section 23 03 00.00 20 BASIC MECHANICAL MATERIALS AND METHODS, applies to

this section. Stainless steel plumbing fixtures must conform to ASME A112.19.3/CSA B45.4

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.

1.2.1.1 American Gas Association Laboratories Standards

Gas-burning equipment must be designed for operation with the type of gas specified and be approved by CSA. Acceptable evidence of meeting the requirements of the applicable CSA Directory standards must be either CSA mark on equipment, a photostatic copy of the CSA appliance certificate, a listing of the specific food service equipment or appliance in the CSA Directory, or a certified test report from a nationally recognized independent testing laboratory, indicating that the specified equipment has been tested and conforms to the requirements of the applicable CSA standards.

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.

Section 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS, applies to this section.

1.3 DESCRIPTION OF WORK

The work includes furnishing and and modifying existing 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 ordering equipment. 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. Review critical systems/components for application and capacities such as for exhaust hoods, refrigeration systems, fire suppression systems, gas, water, and steam/condensate line sizes and manifold configurations.

e. 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 accord 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.

1.3.1 Design Requirements

Submit detail drawings for all food service and storage equipment. Drawings must be 1/4 inch scale minimum.

Submit a complete Food Service Equipment Schedule, material data, and drawings as specified. Provide detail drawings showing complete wiring, piping, and schematic diagrams, and any other details required to demonstrate that the system is coordinated and properly functions as a unit. Drawings must show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work, including clearances for maintenance and operation.

a. Detail drawings by Contractor must be separate drawings and be the Contractor's standard sheet size, but not smaller than the contract drawings, indicating food service equipment and cold storage assemblies with itemized schedule, special conditions drawings indicating size and location of slab depressions, cores, wall openings, blockouts, ceiling pockets, blocking grounds, ceiling, access panels, rough-in plumbing/mechanical systems and rough-in electrical systems.

b. Prepare and submit detail drawings that show the size, type, and location of equipment drain lines, and floor drains. Indicate drain lines from equipment, distances of drain lines and floor drain receptacles from equipment and aisles, and elevation views of drain piping and floor drains.

c. Detail drawings by manufacturer must be separate drawings; manufacturer's standard size and indicate item number, name, and quantity, construction details, sections, and elevations, adjacent walls, columns, and equipment, plumbing and electrical schematics, and fabricated fixtures with single electrical or plumbing connection, and service access panels required for maintenance or replacement of mechanical or electrical components.

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-01 Preconstruction Submittals

Contractor's Field Verification Data; G
Manufacturer's Qualifications; G

SD-02 Shop Drawings

Detail Drawings; G
Food Service Equipment Schedule; G
Submit in the same format as the equipment schedule on the drawings. Include Energy Star qualified model label list.

Food Service Equipment Utilities Coordination Plan; G
Custom fabricated equipment; G
Installation Instructions and Diagrams; G

Detail drawings, as specified,including insulation and utility requirements.

SD-03 Product Data

Food Service Equipment
Food Preparation Equipment

SD-04 Samples

Exterior Panel Finish Material; G
Interior Panel Finish Material; G
Sample Warranty; G

SD-05 Design Data

Manufacturer's Descriptive And Technical Literature; G

SD-06 Test Reports

Manufacturer's Test Data; G
Field Test Reports; G

SD-07 Certificates

NSF Certification; G
UL Certification; G
Energy Star Qualified

SD-08 Manufacturer's Instructions

Manufacturer's Instructions; G for shipping, handling, storage, installation, and start-up.

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals; G
List of authorized local service and repair entities; G

SD-11 Closeout Submittals

Manufacturer's Warranty; G
Contractor's Warranty for Installation; G

1.5 QUALITY ASSURANCE

1.5.1 Energy Star Qualified Model List

Provide documentation for all Energy Star Qualified equipment. Custom fabricated items, which do not bear the Energy Star label must be accompanied by energy efficiency data and submitted to the Contracting Officer for review.

1.5.2 National Sanitation Foundation Standards

Provide acceptable evidence of meeting the requirements of the applicable National Sanitation Foundation (NSF) equipment standards as listed in NSF Food Equipment displaying the NSF seal for the year the equipment was manufactured, a certification issued for special or specific food service

equipment by NSF under their special one time contract evaluation and certification, or a certified test report from an independent testing laboratory, approved by the Office of the Surgeon General, indicating that the specific food service equipment has been tested and conforms to the applicable NSF standards.

1.5.3 Standard Products

Materials and equipment must be the standard products of manufacturer regularly engaged in the manufacture of the products and be essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Applications must be for equipment and materials under similar circumstances and of similar size. When two or more of the same products are supplied they must be products of one manufacturer. Equipment must be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

1.5.4 Nameplates

Provide each item of equipment bearing a stainless steel, aluminum, or engraved polyester nameplate, as standard with the manufacturer, located in a conspicuous position and permanently fastened to the equipment. Make name or identification plates the size standard with the manufacturer for the particular piece of equipment provided. Name plates must indicate the name of the manufacturer/trade name, serial number, make, and model number, pertinent ratings, operating characteristics, and other information as standard with the manufacturer, date of manufacture, electrical characteristics, and other applicable data, such as flow rate, temperature, pressure, capacity, and material of construction. Securely fasten separate equipment identification plates with the contract number marked thereon, to the surface of each piece of equipment.

1.5.5 Underwriters Laboratories Standards

Provide electrically operated equipment in accordance with applicable UL standards UL 489 and UL 763. Provide a UL label on the equipment as evidence of meeting the requirements, including a UL listing mark per UL Elec Equip Dir or a certified test report from a nationally recognized independent testing laboratory indicating that the specific food service equipment has been tested and conforms to the applicable UL standards or equivalent OSHA Nationally Recognized Testing Laboratory (NRTL) standard.

1.5.6 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
(2) Manufacturer's Qualifications

b. Shop Drawings, product data and installation instructions

(1) Detail Drawings
(2) Food Service Equipment Schedule
(3) Food service equipment utilities
(4) Custom fabricated equipment
(5) Installation Instructions and Diagrams

c. Product Data:

food preparation equipment

d. Samples

(1) Exterior panel finish material
(2) Interior panel finish material
(3) Sample Warranty

e. Design Data

(1) Manufacturer's descriptive and technical literature
(2) Manufacturer's Test Data

f. 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 field assembled fixed equipment integrated into structure to jobsite when required.

b. Deliver fixed equipment not integrated into structure to the jobsite after completion of finished ceilings, lighting, and acidizing of the finished floor and wall systems, including painting.

c. Deliver major movable equipment to inventory in a secured area for interim jobsite storage, or if secured area is not available, when fixed equipment installation/clean-up has been completed.

d. 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 with respective number as enumerated in approved Food Service Equipment Schedule.

1.6.3 Protection of Fixed/Fabricated Manufactured Equipment

Follow equipment manufacturer's recommendations to protect materials and equipment and prevent damage. Tape fiberboard or plywood to surfaces as required by equipment shape and installation access requirements. Do not use tape which may possibly damage finished surface.

1.6.4 Prohibited Use of Equipment

Do not use food service equipment as tool or material storage, work bench, scaffold, or stacking area.

1.6.5 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

2.1 MATERIALS

Food equipment must conform to OSHA standards 29 CFR 1910.144, 29 CFR 1910.145, 29 CFR 1910.212, 29 CFR 1910.306, and related NSF and UL standards

Floor areas adjacent to food preparation equipment point of operation, and working surfaces must conform to 29 CFR 1910-SUBPART D

Comply with EPA sustainable acquisition (SA) requirements in accordance with Section 01 62 35 RECYCLED/RECOVERED/BIOBASED MATERIALS; regarding insulation materials for all equipment designated within this section. Other materials must conform to the following:

2.1.1 Stainless Steel, Sheets and Formed, Nonmagnetic

ASTM A167 or ASTM A240/A240M: 18-8, 300 Series, austenitic, polished to No. 3 or No.4 finish on exposed surfaces.

2.1.2 Stainless Steel Pipe, Tubing and Bars

ASTM A269, ASTM A270/A270M, ASTM A666. Provide seamless or welded pipe and tubing , of the gauge specified, of true roundness, and of material as specified for stainless steel. Seamless tubing must be thoroughly annealed, pickled, and ground smooth. Welded tubing must be thoroughly heat-treated, quenched to eliminate carbide precipitation and then drawn true to size and roundness, and ground. Provide No. 3 or 4 finish tubing when exposed to view.

Provide bars conforming to ASTM A276, ASTM A666, Type 302 or Type 304 or Type 316.

2.1.3 Galvanizing Repair Compound

ASTM D520, Type I pigment.

2.1.4 Brazing and Braze Welding Material

AWS A5.8/A5.8M, class as applicable.

2.1.5 Steel Structural Shapes for Framing

ASTM A36/A36M. Provide uniform structural shapes, ductile in quality, and of hard spots, runs, checks, cracks and other surface defects. Galvanize sections by the hot-dip process, conforming to ASTM A123/A123M.

2.1.6 Coatings

Provide durable, nontoxic, nondusting, nonflaking, and mildew-resistant type coatings, suitable for use with food service equipment and in

conformance with NSF/ANSI 2. Application must be in accordance with the recommendations of the manufacturer.

2.1.6.1 Exterior Parts

Exterior, galvanized parts, exposed members of framework, and wrought steel pipe, where specified to be painted, must be cleaned, and free of foreign matter before applying a rust inhibiting prime and two coats of epoxy-based paint in accordance with Section 09 90 00 PAINTS AND COATINGS, unless otherwise specified. Color will be selected by the Contracting Officer from manufacturer's standard colors.

2.1.6.2 Chromium Plating

Apply chromium plating over nickel plating.

2.1.7 Zinc-Coated Steel

2.1.7.1 Sheets and Shapes

Provide zinc coated sheets conforming to ASTM A653/A653M, coating Class G90. Provide zinc coated shapes conforming to ASTM A36/A36M, in accord with ASTM A123/A123M.

2.1.8 Brass Piping and Fittings

Pipe must conform to ASTM B43. Fittings must conform to ASME B16.15.

2.1.9 Copper Tubing and Fittings

Provide copper tubing conforming to ASTM B88, Type K, annealed, for buried or embedded in concrete installation and Type L, hard drawn, for above grade installation. Fittings must conform to ASME B16.18, above grade, ASME B16.22 or ASME B16.26, above or below grade.

2.1.10 Solder Material

ASTM B32, Sn96.

2.1.10.1 Lead-Free Solder

ASTM B32, 95.5 tin-antimony solder or other "lead-free" solder. Use for all potable water copper tubing and fitting connections, and for solder joints in contact with food.

2.1.10.2 Tin-Lead Solder

ASTM B32, alloy grade 50B for temperatures up to 150 degrees F and alloy grade 95TA for temperatures over 150 degrees F.

2.1.10.3 Silver Solder

AWS A5.8/A5.8M, 15 percent silver base brazing alloy, melting point not less than 1000 degrees F.

2.1.11 Laminated Plastics

ANSI/NEMA LD 3 and NSF/ANSI 35.

2.1.12 Sealants

Sealants must conform to the requirements of ASTM C1330, ASTM C920.

2.2 CONSTRUCTION OF FABRICATED EQUIPMENT

2.2.1 Grinding, Polishing, and Finishing

Grind smooth all exposed welded joints and finish to match the adjoining material. Wherever materials have been depressed or sunken by welding operation, hammer and peen such depressions flush with the adjoining surface, and again grind to eliminate high spots. Polish and buff ground surfaces to match adjoining surfaces. Exercise care in the grinding operations to avoid excessive heating of the metal and metal discoloration. Abrasives, wheels, and belts used in grinding must be free of iron and not previously used on carbon steel. In all cases, the grain of rough grinding must be removed by several successively finer polishing operations. Final polishing operation must be uniform, smooth, and consistent. Make the grain direction of horizontal stainless steel surface longitudinal, including the splash back. Provide a mitered appearance when polishing at right angle corners. Provide close fit butt and contact joints not requiring solder as a filler. Wherever brake bends occur, the bends must be free of open texture or orange peel appearance. Where brake work does mar the uniform appearance of the material, remove such marks by grinding, polishing, and finishing. Make sheared edges free of burrs, projections, and fins. Where miters or bullnosed corners occur, finish such miters and corners with the underage of the material and grind to a uniform condition. Overlapping of material is not acceptable. Provide No.3 finish for all exposed stainless steel surfaces. Finishes of materials, other than stainless steel, must be comparable in appearance to commercial mill finish. Exposed surfaces include:

a. Exterior surfaces exposed to view.

b. Interior surfaces exposed to view in doorless cabinets.

c. Undersides of shelves with a ground finish of No. 90 grit or finer.

2.2.2 Fastening Devices

Provide fastening devices of the same material as the metal being joined when joint pieces are of similar metal. Fastening devices must be stainless steel, ASTM A666 when stainless steel is joined to dissimilar metal. Provide minimum 1/4-20 stainless steel stud bolts with length necessary to accept washers, and required nuts, and weld 9 inches on center maximum. Exposed surfaces of equipment must be free of bolts, screws, and rivet heads. Use stainless steel stud bolts to fasten tops of counters or tables to angle framing and trim to other surfaces. Such bolts must be the concealed type. Cap threads of stud bolts which are on the inside of fixtures and are either visible or might come in contact with a wiping cloth, with chrome plated washers, lock washers, and chromium-plated brass cap nuts. Wherever bolts are welded to the underside of trim or tops, uniformly finish the reverse side of the welds with the adjoining surface of the trim or the top. Dimples at these points are not be acceptable.

2.2.3 Welding

2.2.3.1 Welds

Use tungsten inert gas process. Use filler metal compatible with the material being welded. Do not use carbon arc welding on tops of counters, tables, drainboards, exposed shelving, or sinks. Make welds ductile and of same color as adjoining surfaces.

2.2.3.2 Welding Rods

Perform all welding with welding rods of the same composition as the sheets or parts welded. Factory weld long section components to the greatest lengths possible to minimize field welded joints.

2.2.3.3 Weld Quality

Weld quality must conform to the requirements of AWS A5.8/A5.8M, AWS D1.1/D1.1M, AWS D10.4 and AWS D9.1M/D9.1. Factory weld long section components to the greatest lengths possible to minimize field welded joint.

2.2.4 Built-in Equipment Lighting

Built-in lighting must conform to UL 1598.

2.2.5 Sound Deadening of Counters and Sinks

Provide sound deadening for counter tops and sinks with 1/2 inch wide rope sealant positioned continuously between all contact surfaces of the frame-members and the underside of counter top, overshelves and undershelves. Tighten stud bolts for maximum compression and trim any excess sealant.

2.2.6 Heat Lamp/Display Wiring

Conceal heat lamp/display wiring in corner post(s).

2.2.6.1 Heat Lamps

Provide heat lamp units with consolidated chassis of longest possible length for multiple sections. Include integral incandescent display light with warm white lamps and wire to a recess mounted infinitely adjustable heat control with pilot light for each separate section. Tightly secure heat lamps to the underside of the serving shelf and provide a "USDA" approved heat protector between the heat lamps and the shelf. Maximum allowable temperature at the top of a serving shelf must not exceed 120 degrees F.

2.2.6.2 LED Display Light Modules

Provide LED display light modules (when LED is not available and when not included with heat lamps) in 18 inch and 36 inch increments, each with color indexed full range white T-8 energy efficient lamps or lamps as indicated on the drawings. Wire display lamps to a single recess mounted master switch per serving shelf.

2.3 FACTORY TESTS AND CERTIFICATIONS

Submit number of copies as required per 01 33 00 SUBMITTAL PROCEDURES of

all Manufacturer's Test Data and certifications, including NSF Certification; UL Certification, and Energy Star Qualified data to the Contracting Officer prior to the commencement of any installation work.

PART 3 EXECUTION

3.1 INSTALLATION

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.

Flash food service cabinets located in wall openings to the walls with 20 gage stainless steel. Seal around equipment flashing and flanges, at walls, floor, and ceiling in accord with Section 07 92 00 JOINT SEALANTS. Fillers must be continuous, without opening.

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. Unless otherwise specified, provide chromium-plated copper alloy or stainless steel exposed piping. Provide access panels of sufficient size and so located that concealed items may be serviced and maintained or removed and replaced.

3.1.2 Backflow Preventers

Furnish and install backflow preventers as specified in Section 22 00 00 PLUMBING, GENERAL PURPOSE. The Contractor is responsible to install backflow preventers as shown on the contract drawings and at all other locations necessary to preclude a cross-connect or interconnect between a potable water supply and any source of nonpotable water, or other contaminant. Install backflow preventers at all locations where the potable water outlet is below the flood level of the equipment, or will be located below the level of the contaminant. Provide backflow preventers of sufficient size to allow unrestricted flow of water to the equipment, and preclude the backflow of waste or other contamination into the potable water system.

3.1.3 Gas Equipment

Installation of gas operated equipment must conform to NFPA 54. Fasten a heavy duty steel cable, 3 to 6 inch shorter than the equipment connector, to the equipment and the walls.

3.1.4 Electrical Work

Electrical systems, components and accessories must be certified to be in accordance with NFPA 70 and the following:

3.1.4.1 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.

3.1.4.2 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.

3.1.4.3 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 (heated cabinets, dish carts, etc.) and counter appliances mounted on mobile stands (mixers, food cutter, toaster, coffee makers, microwave ovens, etc.) must have cord/cap assembly with cord-hanger as provided by the manufacturer.

3.1.4.4 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.

3.1.4.5 Motors

Provide motors at 120, 240, 208/240 and 460/480 volts with starter, overload protection, and short circuit motor protection per manufacturer standards.

3.1.4.6 Heating Elements

Provide thermostatic controls for all electrically heated equipment. Equip water heating equipment with a positive low-water shut-off.

3.1.4.7 Receptacles and Switches

Install receptacles which are located in vertical panels of closed base bodies in 12 by 8-1/2 by 3 inch deep recessed mounting panel sloped on a 60-degree angle and turned up to the top of the opening. Prewire receptacles which are located in closed base fixtures to a junction box located within 6 inch from the bottom of the utility compartment. Horizontally mount receptacles which are installed in/on fabricated equipment in a metal box with a stainless steel cover plate.

3.1.4.8 Light Fixtures

Prewire light fixtures with lamps which are installed in/on fabricated or

field-assembled equipment to a junction box for final connection (fixtures must be continuous run when indicated). Install display light the full-length of the display stand and serving shelf with stud bolts or as indicated, and prewire through a support post to a recess-mounted switch. Install heat lamps to underside of serving shelf assemblies as specified. Heat lamp length for chassis must be sized per manufacturer or as indicated on the drawings. Electrically connect cold storage light fixtures through the hub fitting located on the top of the fixture. Horizontal conduit must be above the ceiling panels. Install plastic sleeves through ceiling panels for electrical conduit and seal all penetrations airtight at both sides of panel.

3.1.4.9 Final Electrical Connection Provisions

Tag final electrical connection points of equipment with item number, name (as indicated on FOOD SERVICE EQUIPMENT SCHEDULE) of devices on the circuit, total electrical load, voltage, and phase. Fabricated equipment containing electrically-operated components or fittings, indicated on utility connections drawings to be direct-connected, must have each component, fitting, or group thereof prewired to a junction box for final connection. Refer to the drawings for circuit loading.

Field-assembled equipment (example, prefabricated cold storage assemblies, conveyor systems, exhaust hoods) must have electrical components completely interconnected by this section for final connection as indicated on utility connection drawing. Prewire the following groups of cold storage assembly electrical devices to a top-mounted junction box for final connection per compartment grouping, unless otherwise indicated.

a. Light fixtures, switches, and heated pressure-relief vent.

b. Door/jamb heater and temperature monitors/alarms.

c. Evaporator fans, defrost elements, freezer fan door switch, and drain line heaters.

3.1.4.10 Lamps

Provide food service equipment containing light fixtures with standard appliance type bulbs or energy efficient appliance type bulbs as indicated on the drawings. Exposed lamps above or within a food zone must have plastic coated efficient lamps or standard lamps, sleeved in plastic tube with end caps.

3.1.5 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.

3.1.5.1 Steam Connection Provisions

Provide all steam-injected equipment with a steam inlet globe control valve with cold handle, relief valve, strainer, condensate gate valve, bucket steam trap, and swing check valve. Compartment steam cookers must have piping manifolded from all compartment exhaust valves to a floor drain, floor sink, or drain trench. Provide steam generators specified within this section with automatic boiler blowdown and a cold water condenser.

Separate equipment, devices or components indicated to be connected to a steam-generator, provided under this section, must be provided with all unions, ells, gate valves, nipples, brackets, clamps, etc., required for the complete operating system for final connection.

Steam supply piping must be insulated with 1 inch fiberglass insulation (3 pounds/cubic foot density) and have factory-applied fire retardant. Install a full-length 16 gauge stainless steel pipe enclosure with sloping top, washable jacket, and vapor barrier over steam lines.

3.2 MANUFACTURER'S FIELD SERVICES

Furnish manufacturer's representatives who are directly employed by the equipment manufacturers and trained to perform the services specified. The manufacturers representatives must provide advice and services on the following matters:

Starting equipment and training Government personnel as to its proper care, operation, maintenance and safety procedures.

3.3 LOCATIONS AND CLEARANCES

Locate equipment to provide working space for necessary servicing such as shaft removal, disassembling, replacing or adjusting drives, motors, or shaft seals, access to water heads and valves of shell and tube equipment, tube cleaning or replacement, access to automatic controls, lubrication, oil draining and working clearance.

3.4 IDENTIFICATION TAGS AND PLATES

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.

3.5 OPERATION AND MAINTENANCE MANUALS

Submit number of copies per Section 01 33 00 SUBMITTAL PROCEDURES of operating instructions outlining the step-by-step procedures required for equipment start-up, operation and shutdown. Include the manufacturer's name, model number, service manual, parts list, and a brief description of equipment and basic operating features.

Submit number of copies per Section 01 33 00 SUBMITTAL PROCEDURES of maintenance manuals listing routine maintenance procedures, possible breakdowns and repairs, trouble shooting guides, and containing the following:

a. Front and rear protective covers with labeled project name.

b. Index indicating item number, quantity, description, manufacturer's name, and model number.

c. Maintenance instructions for stainless steel and plastic laminate.

d. Manufacturer's catalog specification sheets and manufacturer's detail and control drawings.

e. Manufacturer's operation manual outlining the step-by-step procedures for equipment installation, startup, basic operation features, and

operation shutdown.

f. Manufacturer's maintenance manual listing routine maintenance procedures, possible breakdowns, repairs, and troubleshooting guides. Include simplified diagrams for the equipment as installed.

g. Manufacturer's list of parts and supplies with current unit price and address of manufacturer's parts supply warehouse.

Include simplified wiring diagrams in the instructions. Framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, must be posted where directed. Prepare in typed form, condensed operating instructions explaining preventative maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system, framed as specified above for the wiring and control diagrams, and posted beside the diagrams. Submit proposed diagrams, instructions, and other sheets, prior to posting. Post the framed instructions, including wiring and control diagrams, before acceptance testing of the systems.

3.6 INSTRUCTIONS TO GOVERNMENT PERSONNEL

Prepare and conduct a training course for the operating staff as designated by the Contracting Officer. The training must consist of a total 8 hours of normal working time and start after the system is functionally completed but prior to final acceptance tests. Cover in the field instructions the items contained in the operating and maintenance instructions, as well as demonstrations of routine maintenance operations. Notify the Contracting Officer at least 14 days prior to date of proposed conduction of the training course.

Submit a list of authorized local service and repair entities to the Contracting Officer 14 days prior to conducting the training course.

3.7 TESTS

Perform the tests including everything required. Notify the Contracting Officer, in writing, 10 days before performing tests. Perform tests in the presence of a manufacturer's representative and Contracting Officer.

3.7.1 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.

3.7.2 Test Reports

Submit the 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. Data must include: 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 or drilled and pinned as an integral part of device, include adjustment and setting data in test report.

3.7.3 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.

3.8 WASTE MANAGEMENT

Separate waste in accordance with the Waste Management Plan, placing copper materials, ferrous materials, cardboard and plastic, and galvanized sheet metal in designated areas for reuse. Close and seal tightly all partly used adhesives and solvents; store protected in a well-ventilated, fire-safe area at moderate temperature.

3.9 MANUFACTURER'S WARRANTY.

Submit all manufacturers' signed warranties to Contracting Officer prior to final commissioning and acceptance.

3.10 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
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.

NSF INTERNATIONAL (NSF)

NSF Food Equipment	(2005) NSF Product Listings of Food Equipment and Related Products, Components and Materials
NSF/ANSI 169	(2012)Special Purpose Food Equipment and Devices
NSF/ANSI 2	(2012) Food Equipment

U.S. DEPARTMENT OF DEFENSE (DOD)

DOD 4000.25-1-M	(2006) MILSTRIP - Military Standard Requisitioning and Issue Procedures

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

1.2 DEFINITIONS

Terms used in Paragraph "Food Service Equipment Schedule", are defined as follows:

a. Sheet Pan: Standard 18 by 26 by 1 inchdeep pan, unless otherwise noted.

b. Pan: Standard 12 by 20 by 6 inch deep pan.

c. Serving Tray: Cafeteria tray 14 by 18 inch, unless otherwise noted.

d. 115-60-1: 115-volt, 60-hertz, 1-phase electric service and connection.

e. 208-60-1: 208-volt, 60-hertz, 1-phase electric service and connection.

f. 208-60-3: 208-volt, 60-hertz, 3-phase electric service and connection.

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 "A", "B" and "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.

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 Contractor Quality Control approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Food Service Equipment Schedule; G
Submit in the same format as the equipment schedule on the drawings. Include Energy Star qualified model label list.

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 paragraphs, "Food Service Equipment Schedule" include the following information, when applicable:

a. Naval 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 LIST				
ITEM NO.	QTY.	DESCRIPTION	REMARKS	LOGISTICAL CLASS
1	1	COMBI OVEN		A
2	1	BRAISING PAN		A
3	1	BOILERLESS STEAMER		A

4	-	SPARE NUMBER		
5	1	EQUIPMENT STAND		A
6	1	TABLE TOP KETTLE		A
7	1	DOUBLE CONVECTION OVEN		A
8	1	MIXER 40QT		A
9	1	FLOOR TROUGH		A
10	1	EXHAUST HOOD		A
11	1	7FT WORK TABLE WITH SINK		A
12	1	9FT WORK TABLE		A
13	1	9FT WORK TABLE WITH SINK		A
14	3	7FT WORK TABLE		A
15	3	6FT WORK TABLE		A
16	3	HAND SINK		A
17	1	2 COMPARTMENT SINK		A
18	1	FOOD PROCESSOR		A
19	1	MICROWAVE OVEN		A
20	1	BLAST CHILLER		A
20.1	1	BLAST CHILLER REMOTE COMPRESSOR		A
21	1	ADA HAND SINK		A
22	-	SPARE NUMBER		
23	1	2 SECTION PASS THROUGH REFRIGERATOR	BY OTHER	C
24	1	PASS THROUGH MOBILE HOT HOLDING CABINET	BY OTHER	C
25	1	6 PAN HOT WELL		A
26	1	6 PAN COLD WELL		A
27	1	REFRIGERATED MILK MERCHANDISER		A
28	1	ICE CREAM CABINET		A
29	2	MOBILE CASHIER STAND	BY OTHER	C

30	2	CONDIMENT COUNTER	MILLWORK	A
31	-	SPARE NUMBER		
32	5	MOBILE POT AND PAN SHELVING UNIT		A
33	18	WALK-IN SHELVING UNIT		A
34	12	DRY STORAGE SHELVING UNIT		A
35	4	NON FOOD STORAGE SHELVING UNIT		A
36	1	MOP SINK/CAN WASH W/ MOP RACK		A
37	3	UTILITY CART		A
38	1	12x12 FLOOR DRAIN		A
39	4	TRASH CAN		A
40	3	THREE TIER LOCKERS		A
41	15	CORNER GUARD		A
42	1	MOBILE TRAY AND SILVERWARE DISPENSER		A
43	1	WALK-IN COOLER/FREEZER		A
44	1	HOSE REEL		A
45	2	CAN RACK		A
46	1	WASHER DRYER STACK	NOT IN CONTRACT	A
47	1	SLICER		A
48	1	SERVING COUNTER W/ TRAY SLIDE	MILLWORK	A
49	1	EVAPORATOR -10'F		A
50	1	EVAPORATOR 40'F		A
51	1	COMPRESSOR -10'F	REMOTE	A
52	1	COMPRESSOR 40'F	REMOTE	A
53	1	DISHWASHER		A
54	1	SOILED DISHTABLE		A
55	1	CLEAN DISHTABLE		A
56	1	3 COMPARTMENT POWERSOAK SINK		A

57	1	DISPOSER		A
58	1	FIRE SUPPRESSION SYSTEM		A

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 --

ITEM # 1 COMBI OVEN
Dimensions:
Quantity: One (1)
Manufacturer: Convotherm
Model: C4 ED 20.20GS
SIS No.:HOP046

One (1) Convotherm Combi Oven/Steamer, roll-in, gas, boilerless, (20) 18" x 26" full size sheet pan or (40) 12" x 20" x 2-1/2" hotel pan capacity, easyDial control panel with digital display 9-stage & 99 cooking recipes storage, (4) cooking modes: hot air, steam, combi-steam & retherm, multi-point core temperature probe, five-speed auto reversing fan, anti-microbial hygienic door handle, pull-out spray hose, stainless steel construction
One (1) Natural Gas
One (1) ConvoClean "Hands Free" automatic cleaning system, comes with: (1) 10 liter ConvoClean, (1) 1 liter ConvoCare and set of connectors and hoses
One (1) Door hinged right, standard
One (1) A water analysis is required for the proper selection of a water treatment system.
One (1) Claris Water Treatment System, includes (1) pre-filter, (1) Claris X-Large steam system, (1) Claris flow meter, and (1) water test kit (see water quality requirements on spec sheet)
One (1) Claris X-Large Filter Cartridge

ITEM # 2 BRAISING PAN
Dimensions:
Quantity: One (1)
Manufacturer: Vulcan
Model: VG40
SIS No.:HOP046

One (1) Braising Pan, Gas, 40-gallon capacity, 46" wide open base, manual tilt, 9" deep stainless steel pan with gallon markings, pouring lip & removable strainer, spring assist cover with drip edge, pan holder, thermostatic control, includes L faucet bracket, electric ignition, 12" stainless steel legs with adjustable flanged feet, 120,000 BTU
One (1) Natural gas (add -1 suffix) (specify elevation if over 2,000 ft.)
One (1) NOTE: Elevation kits are field installed
One (1) 120v/60/1-ph, 9.0 amps, standard
One (1) SINGLE Pantry Deck-Mount Faucet, 12" swivel spout, includes 4" and 12" riser, NSF and Lead Reduction Compliant

ITEM # 3 BOILERLESS STEAMER
Dimensions:
Quantity: One (1)
Manufacturer: Market Forge Industries
Model: ALTAIR II-8
SIS No.:HOP046

One (1) Altair II Convection Steamer, electric, (2) compartments, (4) 12" x 20" pan capacity per compartment, boilerless, auto water system, manual controls, 3-cook settings, includes super steam, 60 minute timer, aluminum cast cooking compartment, stainless steel exterior, preheated incoming water, clean water reservoir system, 6-9" legs, each compartment is 4 pans, UL/cUL listed

One (1) 4-pan: (2) 208v/60/3-ph, (2) 8.0 kW, (2) 22.0 amps
One (1) Drain Kit, flexible hose kit for non-stacked units (1 hose per kit)
One (1) Small Kleensteam, for all countertop steamers, includes 2 yr. boiler warranty, 4CB5 cartridge, SS-10 scale inhibitor cartridge, ScaleKleen (2) 7 oz. packets & dip tube
One (1) STSM, Mobile Stand, 16-5/8" high, stainless steel, lieu of 8" legs for any 6 or 8 pan models

ITEM # 4 SPARE NUMBER <Spare No.>

ITEM # 5 EQUIPMENT STAND
Dimensions:
Quantity: One (1)
Manufacturer: Cleveland Range
Model: ST55T
SIS No.:HOP046

One (1) Equipment Stand, open base with sliding drain drawer & splash screen, 55" x 20", 18" high, stainless steel top and legs, allows unit to be hard piped to a floor drain

ITEM # 6 KETTLE, ELECTRIC, COUNTERTOP
Dimensions:
Quantity: One (1)
Manufacturer: Cleveland Range
Model: TKET12T
SIS No.:HOP046

One (1) Kettle, electric, countertop , twin 12 gallon capacity, tilt type, center support console, two-thirds steam jacket, stainless steel construction
One (1) Standard wattage
One (1) 208v/60/3-ph, 19.6kW, 54.5 amp, standard
One (1) Kettle Markings, for countertop, 1 gallon increments
One (1) Kettle Lift-Off Cover Holder, for 12 gallon kettles, per each kettle
One (1) Lift-Off Cover, 12 gallon, per each kettle
One (1) Single Pantry Faucet, with swing spout & mounting bracket for tilting kettles

ITEM # 7 DOUBLE CONVECTION OVEN
Dimensions:
Quantity: One (1)
Manufacturer: Duke Manufacturing
Model: 613Q-G2XX
SIS No.:HOP046

One (1) Convection Oven, gas, double-deck, standard depth, with 8" stainless steel legs & adjustable stainless steel feet, 50/50 stainless steel independent doors, (2) windows, (6) racks, (13) rack positions, porcelain interior, solid state control (200°-500°F), 12 hr digital timer, cook & hold, pulse fan & (2) speed fan, ENERGY STAR®
One (1) Natural gas
One (1) 120v/60/1-ph, 3.5 amps, with cord & plug, per deck

ITEM # 8 MIXER 40 QT
Dimensions:
Quantity: One (1)
Manufacturer: Hobart
Model: HL400-1STD
SIS No.:HOP046

One (1) 200-240/50/60/3 Mixer; with bowl, beater, whip, and spiral dough arm; US/EXP configuration
Legacy Planetary Mixer, 1.5 hp, 40-qt. capacity, three fixed speeds, gear-driven transmission, 20 min. timer, #12 taper attachment hub, manual bowl lift, bowl guard, stainless steel bowl, "B" beater, "D" whip, "ED" dough hook
One (1) Extended warranty - 1 year parts and labor (net)
One (1) 40 QT BOWL SCRAPER

ITEM # 9 FLOOR TROUGH
Dimensions:
Quantity: One (1)
Manufacturer: IMC/Teddy
Model: ASFT-2430-SG
SIS No.:HOP046

One (1) ASFT Anti-Spill Floor Trough, 24" wide x 30" long x 6" deep, with drain & (SG) subway grating
One (1) Beehive strainer for box drain
One (1) ADA Compliant, add on to (SG) subway grating up to 30" wide (price per foot)

ITEM # 10 EXHAUST HOOD
Dimensions:
Quantity: One (1)
Manufacturer: Aqua-Matic Systems
Model: CUSTOM
SIS No.:HOP046

One (1) 10'-7" Long Left bank, 10'-8" Right bank exhaust canopy hood with front perforated supply plenum.
100% 304 Stainless Steel constuction
93% filter efficiency at 9 microns, LED lighting, Stainless steel enclosure panel to reach 10'-0" ceiling height. Balance dampers, Full length Hanging angles. Vertical end panel on right of hood bank. Ansul Fire Suppression system included and prepiped by Hood Manufacturer
One (1) Custom to match length of Item 10, Kitchen Exhaust Hood; Installation by GC with high temperature silicone and without screws or exposed
fasteners; 18 gauge type 304 s/s; Lengths over 8 feet shall have a hemmed edge between sheets; Provide cantilevered flange @ 45° down from wall, to cover area behind equipment to the wall above utility connections, 6" deep horizontal, turn down front edge and hem edge underneath; hang at 40" A.F.F., flange runs full length of wall panel

ITEM # 11 7FT WORK TABLE WITH SINK
Dimensions:
Quantity: One (1)
Manufacturer: Eagle Group
Model: PT 3084
SIS No.:HOP046

One (1) Spec-Master® Prep Table, 84"W x 30"D, 14/304 stainless steel top with 4-1/2" backsplash, front rolled edge & sides turned down 90 degrees, adjustable stainless steel undershelf, 16" x 19" x 8" stainless steel deep-drawn sink on left end with deck mounted gooseneck faucet, 1/2" thick polymer cutting board/sink cover, uni-lok® gusset system, 20" x 20" x 5" stainless steel drawer on right end, 1-5/8" diameter stainless steel legs with adjustable stainless steel feet, NSF
One (1) Fisher DrainKing Waste Valve, locking basket strainer, overflow body, 12 GPM drain rate, stainless steel ball, cast red brass body
One (1) Fisher Faucet, 8" c/c backsplash mount, with 12" swivel gooseneck spout, wrist handles

ITEM # 12 9FT WORK TABLE
Dimensions:
Quantity: One (1)
Manufacturer: Advance Tabco
Model: KMG-309
SIS No.:HOP046

One (1) Work Table, 30" wide top, with splash at rear only, 108" long, with adjustable undershelf, galvanized frame & shelf, 16 gauge 304 series stainless steel top, 5" backsplash
One (1) Side splash, 5" high (each)
One (1) Paint on sound deadening under top (supplements standard sound deadening under support channels) (each)
One (1) Work Table Undershelf, galvanized finish, 30" wide, 108" long
One (1) 12" wide
One (1) Shelf, table mounted, single deck with rear turn up, 12"W, 72"L, 18 gauge 430 series stainless steel, not adjustable, old style
One (1) Rear of table shelf location, 1" back splash is provided on table with splash
One (1) 15" wide

ITEM # 13 9FT WORKTABLE WITH SINK
Dimensions:
Quantity: One (1)
Manufacturer: Advance Tabco
Model: SS-309
SIS No.:HOP046

One (1) Work Table, 30" wide top, without splash, 108" long, with adjustable undershelf, stainless steel frame & shelf, 14 gauge 304 series stainless steel top, stainless steel bullet feet
One (1) 5" tall NSF partition
One (1) Fisher DrainKing Waste Valve, locking basket strainer, overflow body, 12 GPM drain rate, stainless steel ball, cast red brass body
One (1) Fisher Faucet, 8" c/c backsplash mount, with 12" swivel gooseneck spout, wrist handles
One (1) Sink Welded Into Table Top, 20"W x 20"D x 8" deep bowl, includes faucet (must specify sink location)
One (1) Support Bracket, for lever waste drain handle, (1) support required for each lever drain
One (1) Sink Cover, 20" x 20", stainless steel
One (1) Shelf, double tier, to span over existing equipment (supplied by others), 18"W x 72"L, 18 gauge type 430 stainless steel (must provide equipment model numbers that shelf is going over to clarify mounting provision)

ITEM # 14 7FT WORKTABLE
Dimensions:

Quantity: Three (3)
Manufacturer: Advance Tabco
Model: SKG-307
SIS No.:HOP046

Three (3) Work Table, 30" wide top, with splash at rear only, 84" long, with adjustable undershelf, stainless steel frame & shelf, 16 gauge 430 series stainless steel top, 5" backsplash, stainless steel bullet feet
Three (3) Paint on sound deadening under top (supplements standard sound deadening under support channels) (each)
Three (3) Drawer, 20"W x 20"D x 5" deep drawer pan insert, heavy duty, self-closing, stainless steel, NSF

ITEM # 15 6FT WORK TABLE
Dimensions:
Quantity: Three (3)
Manufacturer: Advance Tabco
Model: FMS-306
SIS No.:HOP046

Three (3) Work Table, 30" wide top with turned up edge at rear, 72" long, with adjustable undershelf, stainless steel frame & shelf, 16 gauge 304 series stainless steel top, 1-1/2" rear splash, stainless steel bullet feet
Three (3) Paint on sound deadening under top (supplements standard sound deadening under support channels) (each)
Three (3) Drawer, 20"W x 20"D x 5" deep drawer pan insert, heavy duty, self-closing, stainless steel, NSF

ITEM # 16 HAND SINK
Dimensions:
Quantity: Three (3)
Manufacturer: Advance Tabco
Model: 7-PS-62
SIS No.:HOP046

Three (3) Hand Sink, wall model, 14" wide x 10" front-to-back x 5" deep bowl, 20 gauge 304 series stainless steel, splash mounted gooseneck faucet, knee valve, basket drain, wall bracket, NSF, cCSAus
Three (3) Note: This faucet complies with 2014 Federal no lead standards
Three (3) Low-flow aerator 0.5gpm, fits 55/64-27 male or 15/16-27 female thread on spout, Conforms to California AB 1953
Three (3) P-trap, heavy duty, 1-1/2", 17 gauge
Three (3) Welded Side Splash, 7-3/4" tall, both sides, for hand sinks with 14" wide x 10" front-to-back bowl, splash mounted faucets

ITEM # 17 2 COMP SINK
Dimensions:
Quantity: One (1)
Manufacturer: Advance Tabco
Model: 94-22-40-36RL
SIS No.:HOP046

One (1) Regaline Sink, 2-compartment, with left & right-hand drainboards, 20" front-to-back x 20" wide sink compartment, 14" deep, with 11" high splash, stainless steel legs with welded front-to-rear and adjustable left-to-right cross rails, 36" drainboards, 1" adjustable feet, 14 gauge 304 series stainless steel, overall 27" F/B x 117" L/R, NSF
One (1) 12" spout
Two (2) Fisher DrainKing Waste Valve, locking basket strainer, overflow body, 12 GPM drain rate, stainless steel ball, cast red brass body
Two (2) Fisher Faucet, 8" c/c backsplash mount, with 12" swivel gooseneck spout, wrist handles
One (1) Note: This faucet complies with 2014 Federal no lead standards
Two (2) Support Bracket, for lever waste drain handle, (1) support required for each lever drain
One (1) Paint-on sound deadening under top (each)

ITEM # 18 FOOD PROCESSOR
Dimensions:
Quantity: One (1)
Manufacturer: Hobart
Model: FP100-1B
SIS No.:HOP046

One (1) Food Processor, angled continuous feed design, half-size hopper, 11 lb per/min production cap., 420 rpm, stainless steel cutting surfaces, planetary gear transmission, triple safety interlocks, aluminum housing, rubber feet, PLATE-6PACK, 120/60/1, 1/3 HP

ITEM # 19 MICROWAVE OVEN
Dimensions:
Quantity: One (1)
Manufacturer: Panasonic
Model: NE-2180
SIS No.:HOP046

One (1) Sonic Steamer® Microwave Oven, connectionless, rethermalizer, 2100 Watts, 1.6 cu ft. oven capacity, with removable shelf, 8 programmable memory pads, dial timer, 5 power levels, 4 heating elements, digital display, see-thru drop down door, stainless steel cabinet & cavity, cavity dimensions; 21-1/16"Wx13"Dx9-7/8"H, UL, ETL, NSF
One (1) 208v/60/1-ph, 20.0 amps, standard
One (1) NEMA 6-30P

ITEM # 20 ROLL-IN BLAST CHILLER/FREEZER
Dimensions:
Quantity: One (1)
Manufacturer: Delfield
Model: T40
SIS No.:HOP046

One (1) ConvoChill™ T Series Blast Chiller/Shock Freezer, roll-in, single section, 440 lbs blast chill or 385 lbs shock freeze capacity, auto hot gas defrost, electronic control with 99 program, HACCP memory, stainless steel exterior & interior, unit is set up for remote refrigeration, legs, field assembly required, KD, cUL, UL-EPH
One (1) 220-230v/60/1, 15 amp service, standard
One (1) Optional Remote Condensing Unit, for model T40
One (1) Condensing Unit Weatherproof Hood
One (1) Contact factory for electrical requirements for remote condenser

ITEM # 22 SPARE NUMBER <Spare No.>

ITEM # 21 ADA HAND SINK
Dimensions:
Quantity: One (1)
Manufacturer: IMC/Teddy
Model: ADA-WS
SIS No.:HOP046

One (1) ADA-WS Handicap Hand Sink, wall mounted, 19-1/4"W, 20-1/2" front-to-back, 16/304 s/s, soap dispenser, integrated backsplash and towel dispenser, non-drip marine edges, 14 gauge. s/s front apron w/rear flange & "Z" strip, deck-mount gooseneck faucet, ADA, NSF
One (1) Knee Valve
One (1) Eye Wash Station

ITEM # 23 2 SECTION PASS-THRU REFRIGERATOR
Dimensions:
Quantity: One (1)
Manufacturer: Traulsen
Model: RHT232NPUT-FHS
SIS No.:HOP046

One (1) Spec-Line Refrigerator, Pass-thru, two-section, self-contained refrigeration, stainless steel exterior and interior, standard depth, narrow full-height door or doors with Santoprene® EZ-Clean Gaskets, INTELA-TRAUL™ microprocessor controls, 6" adjustable stainless steel legs, 5/8 HP, cULus, NSF, ENERGY STAR®
One (1) 115v/60/1ph, 8.6 amps, with cord & NEMA 5-15P, standard
One (1) Left door hinged left/right hinged right, standard
One (1) Thermometer side: Left door hinged left/right hinged right, standard
One (1) Rear: Left door hinged left/right hinged right, standard
One (1) Stainless Steel shelf in lieu of standard plated
Six (6) Credit for standard plated shelf, deduct
One (1) Casters, 6" high (set of 4)

ITEM # 24 PASS-THRU MOBILE HOT HOLDING CABINET
Dimensions:
Quantity: One (1)
Manufacturer: Winston Industries
Model: HA4022
SIS No.:HOP046

One (1) CVap® Holding Cabinet, full size, 22 cu. ft., electric differential control, (14) adjustable universal wire rack supports, field reversible door hinges, magnetic door handle, fanless, water fill operated manually, full-perimeter insulated, load limit 65 lbs (29.25 kg) per rack, includes: (2) locking & non-locking heavy duty non-marking casters, stainless steel construction, supplied with 84" power cord & plug, UL, cUL, UL Sanitation, NSF
One (1) 120v/60/1, 2112 watts, 17.6 amps, 20 MCA, (US) NEMA 5-20P
One (1) Right-hand
One (1) H5 5" swivel casters (2) with locking

ITEM # 25 HOT FOOD SERVING COUNTER
Dimensions:
Quantity: One (1)
Manufacturer: Delfield
Model: KH-6
SIS No.:HOP046

One (1) Shelleyglas® Hot Food Serving Counter, Electric, 6-pan size, 14 gauge stainless steel top, fiberglass enclosed base with heated storage unit, 5" swivel casters, cUL, UL, NSF
One (1) 36" standard height
One (1) 120/208-230v/60/1-ph, 37.0 amps, NEMA 14-50P, standard
One (1) Drains from food wells, plumbed to common valve
One (1) Black
One (1) Tray Slide, 12", V fold-down, 14 gauge stainless steel
One (1) Glass front counter protector
One (1) Incandescent light fixture
One (1) Heat Lamp, bullet-style

ITEM # 26 COLD PAN SERVING COUNTER
Dimensions:
Quantity: One (1)
Manufacturer: Delfield
Model: KCI-96
SIS No.:HOP046

One (1) Shelleyglas® Cold Food Serving Counter, 96" long, 6-pan size iced cold pan 78" x 21-5/8" x 6" deep with 1" H perforated false bottom, 14 gauge stainless steel counter top, fiberglass storage base, 5" swivel casters, NSF, UL
One (1) Black
One (1) Tray Slide, 12", V fold-down, 14 gauge stainless steel
One (1) Glass front counter protector
One (1) Incandescent light fixture

ITEM # 27 MILK COOLER
Dimensions:
Quantity: One (1)
Manufacturer: Delfield
Model: SCFM-50
SIS No.:HOP046

One (1) Shelleysteel™ Milk/Ice Cream Counter, (126) 1/2 pint cartons or (210) cups, self-leveling elevators, divider trays, 18 gauge stainless steel interior with drain, 14 gauge stainless steel top, (2) hinged lids, stainless steel base, 5" casters, self-contained refrigeration, cUL, UL, NSF, 1/4 hp
One (1) 115v/60/1-ph, 7.1 amps, NEMA 5-15P, standard
One (1) Tray Slides, 12" extended stainless steel V fold down style (per inch, add to tray slide price)

ITEM # 28 ICE CREAM & MILK DISPENSER
Dimensions:
Quantity: One (1)
Manufacturer: Delfield

Model: NSCF-48
SIS No.:HOP046

One (1) Shelleymatic® Free Standing Milk and Ice Cream Dispenser, 48" long, 0° - 40°F storage, (126) half pint carton or (210) ice cream cup capacity, with self leveling milk and ice cream platforms, drain, insulated lid, 6" adjustable legs, 1/4 hp, cUL, UL, NSF
One (1) 115v/60/1-ph, 7.1 amps, NEMA 5-15P, standard
One (1) 4" dia. heavy duty polyurethane casters (set of 4) with corner bumpers, adds 1-3/4" to L & D

ITEM # 29 MOBILE CASHIER'S STAND
Dimensions:
Quantity: Two (2)
Manufacturer: Duke Manufacturing
Model: TCS-30SS
SIS No.:HOP046

Two (2) Thurmaduke™ Cashier Stand, mobile, 30"L, 32"W, 36"H, 16ga stainless top, 20ga stainless steel body & partial undershelf, stainless steel tube foot rest, 5" dia. gray poly swivel casters (2 with brakes)
Two (2) with drawer, stainless steel face & frame, 24.375" x 20" x 3-1/2" deep stainless steel liner, roller slides, & black pull handle (TCS-DR)
Two (2) Cylinder lock & keys (TCS-LK)
Two (2) Veneer plastic laminate on body (NOTE: manufacturer's standard colors only, metallics, color-core & raised textures may incur additional cost)
Two (2) Veneer on customer's side (TSS-2P)
Two (2) Veneer on end, each (TSS-9P)
One (1) Solid stainless steel trayslide, 16ga stainless steel, (2) rubbing tracks, on (2) stainless steel fixed brackets
One (1) For stainless steel hinged bracket in lieu of standard bracket, each bracket

ITEM # 30 MOBILE CONDIMENT COUNTER <by Other>
Dimensions:
Quantity: Two (2)
Manufacturer: Custom
Model: CUSTOM
SIS No.:HOP046

Two (2) MILLWORK

ITEM # 31 SPARE NUMBER <Spare No.>

ITEM # 32 POT & PAN SHELVING RACK
Dimensions:
Quantity: Five (5)
Manufacturer: IMC/Teddy
Model: UP-3624-5L
SIS No.:HOP046

Five (5) Pot & Pan Utility Shelving System, 24" wide x 36" long x 72" high, (5) tier, louvered, brushed satin, 16 gauge 304 stainless steel, NSF
Five (5) Caster Set, 5", (2) with brakes, heavy duty, 300# load capacity, poly (4 per set) (N/A for dunnage racks)
Five (5) Brakes on all casters

ITEM # 33 WALK-IN SHELVING UNIT
Dimensions:
Quantity: Seventeen (17)
Manufacturer: Metro
Model: 5A447K3
SIS No.:HOP046

Seventeen (17) Super Adjustable Super Erecta® Starter Shelving Unit, 42"W x 21"D x 74"H (5) wire shelves & (4) posts, Metroseal 3™ epoxy-coated corrosion-resistant finish with Microban® antimicrobial protection (shipped unassembled)

ITEM # 34 DRY STORAGE SHELVING UNIT
Dimensions:
Quantity: Twelve (12)
Manufacturer: Metro
Model: 5A557C
SIS No.:HOP046

Twelve (12) Super Adjustable Super Erecta® Starter Shelving Unit, 48"W x 24"D x 74"H (5) wire shelves & (4) posts, chrome-plated finish (shipped unassembled)

ITEM # 35 NON FOOD STORAGE SHELVING UNIT
Dimensions:
Quantity: Four (4)
Manufacturer: Metro
Model: 5A437C
SIS No.:HOP046

Four (4) Super Adjustable Super Erecta® Starter Shelving Unit, 36"W x 21"D x 74"H (5) wire shelves & (4) posts, chrome-plated finish (shipped unassembled)

ITEM # 36 MOP SINK WITH CAN WASH AND MOP RACK
Dimensions:
Quantity: One (1)
Manufacturer: IMC/Teddy
Model: DL20-1
SIS No.:HOP046

One (1) Combo Sink & Utensil/Can Washer, 16 gauge #304 stainless steel construction., one piece wash basin, 1" OD stainless steel tubing wash supports, fully welded, removable. scrap drawer, integr.12" backsplash, double foot pedal valve, return-mounted faucet, w/48" flexible stainless steel hose & spray head
One (1) Mop/Broom Holder, 4-position

ITEM # 37 UTILITY CART

Dimensions:
Quantity: Three (3)
Manufacturer: Lakeside Manufacturing
Model: 244
SIS No.:HOP046

Three (3) Utility Cart, (3) shelf, open base, shelf size 33"W x 21"D, stainless steel tubular frame with (2) push handles, 500 lb. capacity, NSF
Three (3) Casters, 5" all swivel, No-Mark, cushion tread, std.

ITEM # 38 12X12 FLOOR DRAIN
Dimensions:
Quantity: One (1)
Manufacturer: IMC/Teddy
Model: FMT-1212-FMG
SIS No.:HOP046

One (1) Flush Floor Trough, 12" x 12", 16/304 stainless steel, with surface flange, waste strainer and rod grating

ITEM # 39 TRASH CAN
Dimensions:
Quantity: Four (4)
Manufacturer: Rubbermaid
Model: FG265500GRAY
SIS No.:HOP046

Four (4) BRUTE® Container, without lid, 55 gallon, 26-1/2"D x 33"H, round, reinforced rims, built in handles, double rimmed base, high-impact plastic construction, gray, NSF
Four (4) BRUTE® Quiet Dolly, 18-1/4"D x 6-5/8"H, non-marking blue casters, black

ITEM # 40 THREE TIER LOCKERS
Dimensions:
Quantity: Three (3)
Manufacturer: Nexel
Model: PT129AS
SIS No.:HOP046

Three (3) Paramount Locker, triple tier, (9) doors, 12"Wx15"Dx24"H opening, 36"W O.A., 16 gauge steel doors, 5-knuckle hinges with welded door frame, chrome door latch, extra wide louvers, powder coat finish, 6" legs, assembled

ITEM # 41 CORNER GUARD
Dimensions:
Quantity: Fifteen (15)
Manufacturer: Advance Tabco
Model: CG-96
SIS No.:HOP046

Fifteen (15) Corner guards, 96" long x 2" x 2", 16 gauge 304 series stainless steel, includes: adhesive tape backing

ITEM # 42 MOBILE TRAY RACK DISPENSER
Dimensions:
Quantity: One (1)
Manufacturer: APW Wyott
Model: CTRD-1014
SIS No.:HOP046

One (1) Lowerator® Dispenser, Tray, cantilever style, mobile design, dual self-elevating tray platforms, for 10" x 14" trays, stainless steel construction
One (1) Standard unit with extra 5" polyurethane casters & 2 brakes packed in box (mobile units)

ITEM # 43 WALK-IN COOLER/FREEZER
Dimensions:
Quantity: One (1)
Manufacturer: Master-Bilt Products
Model: CUSTOM
SIS No.:HOP046

One (1) 20'-2" long, 17'-6" wide, 8'-6" high 4" thick urethane foam walk-in. NSF construction Tested per ASTM E84-03 Cooler/Freezer in 2 compartments. Freezer at -10'F with insulated floor, Cooler at 35'F with insulated floor. Interior wal and ceiling to be .040" min Smooth white aluminum. Exterior wall to be 20 Ga. Min Stainless steel at exposed locations and 26 Ga. Galvanized with acrylic stucco finish at all enclosed exterior walls. .080" Minimum thickness of Textured Aluminum panel for floor surface. LED Lighting. Hinged doors with digital thermometer and alarms heated peep windows, spring loaded cam lift hinges. 48" high aluminum diamond plate kickplates on both sides of doors. heavy duty 10 Ga. Stainless steel thresholds. 6" Diameter Dial thermometer, Locking bars. Reverse Cycle defrosting on Freezer.

ITEM # 44 HOSE REEL
Dimensions:
Quantity: One (1)
Manufacturer: Fisher
Model: 1801
SIS No.:HOP046

One (1) Reel Rinse Control Unit, valves, gauges and connections are completely enclosed within a stainless steel cabinet, dual check backflow preventer, water hammer silencer, 90° panel lock, padlock hasp & finger latch, 1/2" NPT female inlets & outlets

ITEM # 45 CAN RACK
Dimensions:
Quantity: Two (2)
Manufacturer: New Age
Model: 1251
SIS No.:HOP046

Two (2) Can Storage Rack, stationary design with adjustable feet, sloped glides for automatic can retrieval, aluminum construction, holds 352- #2-1/2 or 484- #303 cans, NSF

ITEM # 47 SLICER

Dimensions:
Quantity: One (1)
Manufacturer: Hobart
Model: HS9-1
SIS No.:HOP046

One (1) Heavy Duty Meat Slicer, automatic, 13" CleanCut™ removable knife with removal tool, anodized finish with (6) interlocks, (3) stroke lengths & (4) stroke speeds, removable meat grip assembly, removable ring guard cover, single action top mounted sharpener with Borazon™ stones, manual lift lever, 1/2 hp motor, 120v/60hz/1-ph NSF cETLus

ITEM # 48 SERVING COUNTER WITH TRAY SLIDE <by Other>
Dimensions:
Quantity: One (1)
Manufacturer: Custom
Model: CUSTOM
SIS No.:HOP046

One (1) MILLWORK

ITEM # 49 EVAPORATOR -10'F <Included>
Dimensions:
Quantity: One (1)
Manufacturer: Master-Bilt Products
Model: E1LZ0141B
SIS No.:HOP046

One (1) Evaporator with reverse cycle defrost Fan Motor 1.4 Amps, Drain Pan Heater 6.5 Amps 115/60/1, See Master-Bilt Shop Drawings AP8313

ITEM # 50 EVAPORATOR 40'F <Included>
Dimensions:
Quantity: One (1)
Manufacturer: Master-Bilt Products
Model: E1HZ0090A
SIS No.:HOP046

One (1) Evaporator, Fan Motor 1.8 Amps 115/60/1, See Master-Bilt Shop Drawings AP8313

ITEM # 51 COMPRESSOR -10'F <Included>
Dimensions:
Quantity: One (1)
Manufacturer: Master-Bilt Products
Model: MSLZ0151C
SIS No.:HOP046

One (1) 30"L x 31"W x 26"H Compressor, located remotely, 208-230/60/3 4HP RLL 1/2" RSL 7/8"
see Master-Bilt Shop Drawing AP-8313

ITEM # 52 COMPRESSOR 40'F <Included>

Dimensions:
Quantity: One (1)
Manufacturer: Master-Bilt Products
Model: MHHZ0111C
SIS No.:HOP046

One (1) 22"L x 27"W x 18"H Compressor, located remotely, 208-230/60/3 1HP RLL 3/8" RSL 5/8"
see Master-Bilt Shop Drawing AP-8313

ITEM # 53 DISHWASHER, CONVEYOR TYPE
Dimensions:
Quantity: One (1)
Manufacturer: MEIKO
Model: K-54ET
SIS No.:HOP046

One (1) K Series Rack Conveyor Dishwasher, high temperature sanitizing, 54" single-tank design without prewash, 8" higher hood for 26" vertical clearance, 239 racks/hour capacity, 0.43 gallons/rack, fully automatic operation, 3 HP wash pumps, double wall top, front & rear panels, stainless steel construction, connection for external vent fan control, chemical hook-ups, vent cowls with extra curtains, electric tank heat, NSF, cETLus
One (1) Extended warranty, second year (first year included) (net)
One (1) Right to left operation
One (1) 208v/60/3 ph, 63.9 amps, standard
One (1) Internal electric booster heater, 70 degree rise, 21.6/28.8kw (requires dedicated electrical connection)
One (1) Water hammer arrestor comes standard with this booster heater
One (1) Drain water tempering kit, reduces drain water temperature to below 140 F
One (1) Water hammer arrestor
Two (2) Vent cowl collars, 4"x 16"x 7" high with adjustable & locking dampers, each

ITEM # 54 SOILED DISHTABLE
Dimensions:
Quantity: One (1)
Manufacturer: Duke Manufacturing
Model: SCSD-72R
SIS No.:HOP046

One (1) Supreme Soiled Dishtable, corner design, 72"W x 30"D x 44"H, right-to-left operation, 14/300 series stainless steel top, 10"H backsplash, 20-1/2" x 20-1/2" x 5" deep pre-rinse sink, dish machine lip-in, raised rolled edges on front & side, 16 gauge stainless steel legs & side bracing, adjustable stainless steel bullet feet, NSF (specify machine make & model)
One (1) Fisher DrainKing Waste Valve, with vandal resistant flat strainer, overflow body, 12 GPM drain rate, stainless steel ball, cast red brass body
One (1) Fisher Pre-Rinse Unit, 8" c/c backsplash mount, with spring action flexible gooseneck, wall bracket, Add-On-Faucet with 10" swing spout
One (1) Table top options
Four (4) Extra table length, price is per lineal foot, add for longer than standard table top & round up to next foot, 300 series stainless steel (SK-10)
One (1) Sound deadening, price is per lineal foot, 1/8" coat of gray latex sheet metal resonance dampening material (SK-52)
One (1) Faucet options

One (1) Splash mount pre-rinse sprayer assembly with wall bracket, standard, Encore KN53-1000BR (385011)

ITEM # 55 CLEAN DISHTABLE
Dimensions:
Quantity: One (1)
Manufacturer: Advance Tabco
Model: DTC-S30-84L
SIS No.:HOP046

One (1) Dishtable, clean, straight design, right-to-left operation, 10-1/2"H backsplash, 3" rolled front & side rims, stainless steel legs & crossrails, 83"W x 30"D x 34"H, 14/304 stainless steel
One (1) SPECIFY DISH MACHINE BRAND & MODEL to ensure proper fit, refer to attached document (AQ only) or consult www.advancetabco.com for compatibility listing. Certain dish machines require modifications at additional cost not shown here
One (1) Paint-on sound deadening under top (each)

ITEM # 56 3 COMPARTMENT POWERSOAK SINK
Dimensions:
Quantity: One (1)
Manufacturer: Power Soak
Model: 200PSD - 210L CUSTOM
SIS No.:HOP046

One (1) 480/60/3,11.6 AMPS (15amp service reqd), 100% 304 S/S Construction, Tanks, Drain Boards, Splashes And Channel Rims 14ga, S/S Self Draining Pump Housing And Impeller, 7000 Watt Heater Located In Wash Tank, Povye:Red Utensil Basket, Angled Pre-Rinse Spray Assemblies, Rear-Exit S/S Ball Valve Drains, P250 Solid State Controller And Control Components, Including High And Low Water Sensors, Conforms To Ansi/Nsf Standard 2 For Food Equipment, Wash Tanks Supported By 1-5/8" s/s Diameter Legs With s/s Cross Members And Adjustable s/s Bullet Feet, Sheet Pan System, Intergrated Chemical Dispensor, Stainless Steel Chemical Under Shelf, Stainless Steel Back Splash Extensions
Three (3) Fisher DrainKing Waste Valve, locking basket strainer, overflow body, 12 GPM drain rate, stainless steel ball, cast red brass body
Two (2) Fisher Faucet, 8" c/c backsplash mount, with 12" swivel gooseneck spout, wrist handles

ITEM # 57 DISPOSER
Dimensions:
Quantity: One (1)
Manufacturer: InSinkErator
Model: SS-200-5-AS101
SIS No.:HOP046

One (1) SS-200™ Complete Disposer Package, sink mount system, with #5 adaptor for 3.5" to 4" sink opening, 2 HP motor, stainless steel construction, includes syphon breaker, (2) solenoid valves, (2) flow control valves, programmable AquaSaver® control center AS-101, automatic water saving function, auto reversing, timed run, post flush, adjustable leg kit
One (1) Standard height disposer body
One (1) 208v/60/1-ph, 7.7 amps
One (1) Syphon breaker standard, 1/2" (11477)

ITEM # 58 FIRE SUPPRESSION SYSTEM

Dimensions:
Quantity: One (1)
Manufacturer: Ansul Fire Protection
Model: CUSTOM
SIS No.:HOP046

One (1) Ansul 102 system enclosed wall mounted agent tanks. Remote pull stations located as required.

SECTION 11 13 10

DOCK LEVELERS
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.

AMERICAN WELDING SOCIETY (AWS)

AWS C2.18	(1993; Errata 1993; R 2001) Guide for the Protection of Steel with Thermal Sprayed Coatings of Aluminum and Zinc and Their Alloys and Composites

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A143/A143M	(2007; R 2014) Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
ASTM A153/A153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM D2000	(2012) Standard Classification System for Rubber Products in Automotive Applications

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 2	(2000; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 6	(1993; R 2011) Enclosures
NEMA MG 1	(2014) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 943 (2006; Reprint Jun 2012) Ground-Fault Circuit-Interrupters

1.2 DEFINITIONS

1.2.1 Industrial Dock Leveler

A manufactured structure designed to span and compensate space and height differentials between a loading dock and freight carrier to facilitate safe, efficient, freight transfer.

1.2.2 Adjustable Loading Ramp

Synonym for Fixed Type Industrial Dock Leveler.

1.2.3 Fixed Type Industrial Dock Leveler

A dock leveler that is permanently affixed to the dock structure, and usually incorporating an electro-hydraulic system to position the dock leveler with respect to the freight carrier at the lip end while being fixed at the opposite hinged end.

1.2.4 Velocity Fuse

A valve or similar device that goes into the hydraulic line. If the dock leveler becomes inadvertently or accidentally unsupported, this fuse will freeze the movement of dock leveler within 4 inches of the dock leveler original position.

1.2.5 Carrier

A wheeled, enclosed trailer or container that, when attached to a heavy-duty truck or van, is used to carry bulk freight over long distances.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G

SD-03 Product Data

Loading Dock Levelers; G
Dock Bumpers; G
Restraining Device; G

SD-04 Samples

Dock Bumpers

SD-07 Certificates

Fastening Materials

SD-10 Operation and Maintenance Data

Loading Dock Levelers, Data Package 3; G
Restraining Device, Data Package 2; G

SD-11 Closeout Submittals

Record Drawings; G

1.4 QUALITY ASSURANCE

1.4.1 Manufacturer's Representative

Furnish services of Fixed Type Industrial Dock Leveler technicians, experienced in installation and operation of the type of system being provided, to supervise installation, testing, adjustment of system, and instruction to Government personnel.

1.4.2 Detail Drawings

Submit drawings depicting dimensions, tolerances, surface finishes, hardnesses, flush edge angles, method of mounting and anchoring, and control schematics and diagram. Show complete wiring, schematic diagrams, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Show proposed layout and anchorage of equipment and appurtenances in Drawing A500 Series. Show the concrete pit details including flush edge angles, dock bumpers including fastening materials in compliance with ASTM A123/A123M and ASTM D2000, and sloped pit bottom; method of mounting and anchoring; and location of control stations and disconnect switches on Drawing. Show all proposed dock bumper locations on drawings.

1.4.3 Record Drawings

Submit record as-built drawings depicting dimensions, tolerances, surface finishes, hardnesses, flush edge angles, method of mounting and anchoring, and control schematics and diagram, including mechanical and electrical components, testing and acceptance (one copy sepia transparency) for each industrial dock leveler.

1.5 DELIVERY, STORAGE, AND HANDLING

Matchmark and tag parts which are disassembled for shipment with metal tags. Provide waterproofed tags and markings. Protect the delivered equipment in storage from the weather, humidity and temperature variation, dirt and dust, or other contaminants.

1.6 EXTRA MATERIALS

After approval of the detail drawings, and not later than one month prior to the date of beneficial occupancy, provide spare parts data for each different item of material and equipment specified. Furnish a complete list of parts and supplies, with current unit prices and source of supply and a list of the parts recommended by the manufacturer to be replaced after 1 and 3 year(s) of service.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Standard Products

Submit data including a complete list of equipment and materials, manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, and installation instructions. Provide materials and equipment, which are the standard products of a manufacturer regularly engaged in the manufacture of the products, and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site. Section 23 03 00.00 20 BASIC MECHANICAL MATERIALS AND METHODS, applies to this Section, with the additions and modifications specified herein.

2.1.2 Exposed Surfaces

All exposed metal surfaces and fastening materials shall fully comply with the minimum requirements of ASTM A123/A123M, ASTM A143/A143M, and ASTM A153/A153M.

2.1.3 Nameplate

Attach corrosion-resistant metal plate securely and legibly on the exterior surface of the dock leveler. Include the following information indented or embossed on the plate:

a. Description of the equipment: Describe procedures for operating and services equipment, and warnings or cautions of hazardous procedures.

b. Name of the manufacturer.

c. Serial and model number.

d. Rated capacity in pounds.

e. Shipping weight.

f. Date of manufacture (month and year).

2.1.4 Toe Guards or Skirts

Provide sides or edges, except front and rear edges, of the ramps which rise above the surrounding loading dock with sheet carbon steel skirts or toe guards of minimum 14 U.S.S. gage nominal thickness. Furnish smooth faced toe guards or skirts and mount flush with the edges of the ramp surface. Ensure sufficient depth of toe guards or skirts to protect the full operating range of dock travel. Ensure the construction capable of resisting a minimum lateral force of 10 pounds with a maximum deflection of 1/2 inch.

2.2 LOADING DOCK LEVELERS

Provide permanent loading dock levelers with minimum performance characteristics based on the following:

a. Service Period:
   (1) Number of shift operations: 1.
   (2) Maximum number of trucks per shift opening: 1.
   (3) Maximum number of days per week: 5.

b. Fork Lift Loads:
   (1) Design levelers to accommodate pallet jacks.
   (2) Design levelers to handle 2500 pounds gross dynamic load.
   (3) Base load leveler design on number of cycles per loading/unloading operation per truck and of 3.

Provide loading dock leveler with electro-hydraulic type with electric motor and hydraulic pump operating a hydraulic cylinder that adjusts dock leveler board position . Coordinate a truck restraint system with the dock leveler via an interconnect function such that the restraint and dock leveler will engage with a single push-button, if a powered trailer restraint is selected to lock truck or trailer into position during loading and for overnight security. Incorporate a visual signal to inform dock operator and driver of locked or unlocked status. Make provision for maintenance access to understructure and lifting mechanism. Provide steel tread plate lip and platform, hinged and supported from beneath by steel framework that contains lifting, positioning, and lowering assembly. Ensure that platform surface is flush with surrounding floor surface of loading dock when not in service. Provide integral positive restraint when leveler is in maintenance position.

2.2.1 Design Requirements

Design, fabricate, and finish loading ramp to permit washing with water and detergents, and operating in an ambient temperature from 0 to plus 110 degrees F.

2.2.2 Dock Leveler Height Adjustment

Provide a ramp whose incline can be adjusted to suit the height of the freight carrier. Allow the loading ramp a minimum of 24 inches of vertical adjustment. Divide height adjustments 12 inches above and 12 inches below the dock level to provide coverage between 27 inches and 51 inches above grade.

2.2.3 Dock Leveler Extension and Retraction

Extend non-fixed end of the dock leveler from a retracted position behind the line of the loading dock platform bumpers to at least 12 inches beyond the forward edge of the dock platform bumpers so as to rest on the bed of the freight carrier. The difference in length of the platform from its fully retracted position to its fully extended position shall be practically constant throughout the ramp, including the ramp extension.

2.2.4 Loading Ramp Compensation

Provide automatic compensation with ramp platform loaded or unloaded for:

2.2.4.1 Freight Carrier Out of Level

Out of level freight carrier bed condition (difference in elevation from side to side at the rear of the carrier bed): Allow a minimum correction of one inch for each 18 inches and maximum 4 inch correction of ramp width

over the width of the ramp. Ensure the rear edge of the ramp parallel with the rear of the frame in order to prevent tripping or be a pinching hazard.

2.2.4.2 Loading and Unloading of the Freight Carrier

When the lip is extended so as to rest on the bed of motor truck or trailer, provide compensation of 4 inches for carrier spring deflection so that contact will be maintained between lip and carrier bed.

2.2.5 Safety Devices

2.2.5.1 Electro-Hydraulic System

Provide velocity fuse, ballcheck valve, or other device to automatically prevent a drop of more than 4 inches of the lip, should the freight carrier move away from the dock leaving the lip unsupported. Activate this device with a static, dynamic, or impact load exceeding 10 percent of the rated load on the lip and ramp.

2.2.5.2 Dock Bumpers

Submit certificates showing conformance with the referenced standards contained in this section. Provide ramp and load dock face with laminated rubber, tire-fabric, or equivalent dock bumpers recommended by the dock leveler manufacturer. Submit one typical Loading Dock Bumper completely assembled with supporting rods, end angles, bolts, and nuts. (This may be the smallest size bumper required.) One section of 8 inches wide by full depth and height of bumper including one end angle with the opposite end exposed for inspection. Solid rubber pieces conforming to ASTM D2000, Grade 4AA612A13B13F17 may be used instead of rubberized fabric.

2.2.6 Rated Capacity

Minimum 20,000 pounds roll over capacity.

2.2.7 Ramp Load Carrying Surface

The live load carrying surface of the ramp shall be 6 feet plus or minus 3 inch wide and 6 feet plus or minus 9 inch long with the dock leveler lip retracted.

2.3 OPERATION

2.3.1 Mechanical Control

Mechanical chain-activated, with extension-spring operation and counter-balance non-manual, raising and lowering system. Once the freight carrier has departed, manually return the platform to the stored, level position. Ensure the ramp, in its stored position capable of being lowered below dock platform level without extending the lip of the ramp.

2.3.2 Electro-Hydraulic Control

Provide each dock leveler with a pushbutton station to activate motor, pump, and valves.

2.3.2.1 Pushbutton

Heavy-duty dust tight and oil tight type rated in accordance with NEMA ICS 2,

Part ICS2-216 for alternating current. To prevent accidental operation and damage, ensure each button to be recessed in its station or be protected by a peripheral collar (ring) or shroud. Indelibly identify each pushbutton by means of cast or etched letters on the station. Provide emergency "STOP" button of momentary type with manual reset or continuous pressing (constant pressure) type. This stop button shall stop all dock leveler movement, regardless of the position of the ramp or lip at the time the "STOP" button is depressed.

2.3.2.2 Hinged Lip Ramp Movement

Apply continuous pressure on the "UP" button to raise the loading ramp, descend the lip onto the bed of the freight carrier. Once the freight carrier has departed, the lip shall automatically fall or retract to its down position, and the ramp shall return to its stored dock level position. The ramp, in its stored position, shall have the capability of being lowered below dock level without extending the lip of the ramp to service truck end loads which may be lower than loading dock surface position. Allow 4 to 6 seconds to fully extend or retract the lip.

2.4 CONSTRUCTION AND MATERIALS

Construct all load carrying parts of forged or welded steel. The entire live load carrying surface of the ramp and rear attachment shall be not less than 1/4 inch thick, 55 ksi minimum yield strength, low alloy, nonskid steel tread plate. Provide minimum 5/8 inch vertical projections on the live load carrying surface. Bevel the lip or ramp extension. Design load carrying surfaces to permit free movement of powered hand or platform trucks, low lift pallet trucks, and fork lift trucks. Fabricate lip hinge of not less than 1/4 inch wall seamless steel tubing.

2.5 ELECTRO-HYDRAULIC SYSTEM

Provide a separate and complete system for each dock leveler. Include an electric motor, motor drive, hydraulic pump, hydraulic ram, pressure relief valve, fluid reservoir, strainer, filter, hydraulic control-valve cylinders, hose, piping, fittings, and hydraulic fluid. Incorporate a means for filling and draining hydraulic fluid. Design cylinders, pump, and control valves to withstand not less than 150 percent of the design operating pressure. Provide hydraulic hose, fittings, pipe, and tubing with working pressures based upon a minimum 4 to 1 safety factor of bursting pressure.

2.6 ELECTRICAL REQUIREMENTS

NFPA 70, NEMA ICS 2, NEMA ICS 6 and NEMA MG 1. Provide 480 volt electrical characteristics, three phase, 60 Hz alternating current power supply. Provide all electrical equipment on the loading ramp. Provide interconnecting wiring for components of packaged equipment as an integral part of the equipment. Include motor, switches, junction box, conduit, wiring cables, panel enclosed control station, motor controller, heater coils, timer, transformer, terminal blocks, and fuses. Provide NEMA ICS 6, Type 4, electrical enclosures. Color code all wiring.

2.6.1 Motor

Conform to NEMA MG 1 and continuous duty or 60-minute time rated, industrial type, single speed rated for operating conditions. Provide electrical insulation systems conforming to NEMA MG 1, Class B. Provide

permanently lubricated antifriction ball or roller bearings. Equip each electrohydraulic loading dock leveler with a totally enclosed squirrel cage induction electric motor. Equip each air powered loading dock leveler with a 115v, single phase, 60 Hz, self cleaning, two stage, UL approved industrial fan motor, which will not exceed its rated capacity under full load conditions of the loading dock leveler.

2.6.2 Controls

NEMA ICS 2, size 0 controller for heavy industrial service. Provide an electrically operated, full magnetic, nonreversing type controller for the motor. Equip all control enclosures with locks and keys.

2.6.3 Transformer

Totally enclosed, self-cooled, dry type. Feed the transformer from the load side of the main disconnecting device. Incorporate circuit breakers with ground fault interrupting protection conforming to UL 943.

2.7 ACCESSORIES

2.7.1 Restraining Device

Self-aligning device. Mount this device as recommended by the manufacturer to engage the ICC bar of the truck/trailer with a positive restraining force of not less than 18,000 pounds. This device shall be able to service all truck or trailers having ICC bars located between 12 and 30 inch above ground level (when truck or trailer is unloaded) and recessed up to 9 inch from the rear of truck or trailer. Provide a means to protect the device from disabling damage in the event that more than 18,000 pounds of force is exerted by the restrained truck or trailer. Manually control activation and deactivation from inside the building. Submit data packages in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA for restraining device and loading dock levelers.

2.7.2 Dock Bumpers

Provide bumpers capable of sustaining repeated impacts from trucks or trailers without damage to the dock, dock levelers, or bumpers.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

3.2 INSTALLATION

Install and adjust in accordance with NFPA 70, manufacturer's approved detail drawings, and as-built system assembly drawings. Install controls so operator can see dock leveler while manipulating controls. Do not pour the pit for the adjustable loading ramp until the design and detail drawings have been approved. If the pit size is limited by construction conditions involved, alter the dock leveler equipment to fit the pit. Clearly indicate these alterations or modifications on the drawings. Check and verify the appropriate measurements at the building. Do not exceed 2 inch clearances between the ramp and pit.

3.3 CLEANING, TREATMENT AND PAINTING

In accordance with manufacturer's standard practice, shop clean, treat and paint ferrous surfaces including platform, lip, frame, motor, pump, cylinders, valves, and any other non-cadmium plated or non-galvanized surface (but not including bearings, gear contact surfaces, parts protected by lubrication, or other surfaces not usually painted or coated). Clean ferrous surfaces, shot pen, and protect the base metal with an application of 99.9 percent pure zinc coating with a thickness of 0.010 to 0.012 in accordance with AWS C2.18 and protect the base metal with an application of Rustoleum paint with a thickness of 2.5 to 3 mils followed by a final coat of standard primer with a thickness of 2.5 to 3 mils. Protect nonferrous parts against corrosion as necessary.

3.3.1 Workmanship

Conduct field touch-up work as to avoid damaging other surfaces and public property in the area. Do not apply field applied paint during foggy, damp, rainy weather, or the ambient temperatures below 45 degrees F and above 95 degrees F.

3.3.2 Dissimilar Metals Protection

Insulate control surfaces by electrolytically inactive materials.

3.3.3 Finish Coat Color

Brilliant yellow and black. Paint 3 inch wide black and yellow diagonal stripes on all vertical surfaces of pit, skirts, and platform edges exposed above adjacent surfaces at any ramp position. Paint similar stripes on top of ramp surfaces in 6 inch wide band around outside edges (except for fixed edge).

3.4 FIELD TESTS

Provide personnel, instruments, materials, and equipment, including test vehicles, for the administration and direction of the tests. Correct defects and repeat tests under the cognizance of the Contracting Officer and the dock leveler manufacturer. The Contracting Officer is responsible for certifying the test load.

3.4.1 Roll-Over Load Tests

Move roll-over load of 20,000 pounds over the dock leveler between the bed of a freight carrier and the building loading dock surface for 10 cycles. With the ramp extension retracted and the ramp platform leveled with the building loading dock surface, run a 20,000 pound roll-over load over the ramp in various directions for 20 cycles. Do not allow permanent deformation or hydraulic system leakage to occur subsequent to examination after these roll-over tests.

3.4.2 Drop Tests

Twice, drop test the dock leveler at the indicated rated capacity as follows: With the load on the platform and the lip resting on a vehicle carrier bed not less than 10 inches above loading dock surface, pull the carrier or pull away from the lip, leaving the loading ramp unsupported. Do not exceed 4 inch for the measured vertical drop of the dock leveler

taken at the point where the lip rests on the vehicle carrier during each of the drop tests. Inspect the loading ramp after each drop and ensure no damage or distortion to the mechanical, electrical or structural components. Do not allow leakage from the hydraulic system.

3.4.3 Acceptance Tests

Perform an acceptance test in the presence of the dock leveler manufacturer and the Contracting Officer subsequent to roll-over load tests and drop tests. Conduct operation of the equipment through all of its motions and specified checks as follows: (a) extend lip to rest on a variety of freight carriers with beds up 12 inch above and below dock level; (b) test 4 inch drop limitation with 7000 pound load on ramp, evenly distributed; (c) test level compensation with the ramp, loaded with a minimum of 7000 pounds; and (d) test proper compensation (float) for various compression of countersprings, with ramp loaded and unloaded.

3.5 INSTRUCTION TO GOVERNMENT PERSONNEL

Upon completion of the work and at a time designated by the Contracting Officer, provide the services of a competent Technician regularly employed or authorized by the manufacturer of the dock leveler to instruct Government personnel in the proper operation, maintenance, safety, and emergency procedures of the dock leveler. A minimum of one and no more than two eight-hour working days of instruction is required. Conduct the training at the job site or at any other location mutually satisfactory to the Government and the Contractor.

3.6 OPERATING MANUALS

Operating manuals shall detail the step-by-step procedures required for system startup, operation, and shutdown. Operating manuals shall include the manufacturer's name, model number, parts list, and brief description of all equipment and their basic operating features. List routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides in the maintenance manuals. Also include piping and equipment layout and simplified wiring and control diagrams of the system as installed.

-- End of Section --

SECTION 11 31 13

ELECTRIC KITCHEN EQUIPMENT
08/08

PART 1 GENERAL

1.1 REFERENCES

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

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 858	(2014) Standard for Household Electric Ranges

1.2 RELATED REQUIREMENTS

Section 23 03 00.00 20 BASIC MECHANICAL MATERIALS AND METHODS, applies to this section, with additions and modifications specified herein.

1.3 SUBMITTALS

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

SD-03 Product Data

Kitchen equipment

SD-08 Manufacturer's Instructions

Kitchen equipment

Range hood

SD-10 Operation and Maintenance Data

Kitchen equipment, Data Package 2; G

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

PART 2 PRODUCTS

2.1 KITCHEN EQUIPMENT

2.1.1 Materials

Except as modified herein, provide manufacturer's standard materials for kitchen equipment. Provide quantities, physical dimensions, colors, and electrical characteristics as indicated.

2.1.2 Ice Maker

2.1.2.1 Ice Maker, IM1

UL listed and NSF approved; self-contained, air-cooled model, minimum ice cube production of 300 pounds per 24 hours, and minimum bin storage capacity of 110 pounds of ice cubes. The energy efficiency of the ice machine shall be 8.5 kWh/100 lb. 90 degree F/70 degrees F or better as recommended by the FEMP/energy Star listing. 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.

2.1.2.2 Ice Maker, IM2

UL listed and NSF approved; self-contained, air-cooled model, minimum ice cube production of 893 pounds per 24 hours, and minimum bin storage capacity of 700 pounds of ice cubes. The energy efficiency of the ice machine shall be 4.7 kWh/100 lb. 90 degree F/70 degrees F or better as recommended by the FEMP/energy Star listing. 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. Size: 48" W. x 34" D x 44" H.

2.1.3 Range Hood

UL 858, nonvented, 30 inches wide, with two-speed fan, permanent washable filter, top or rear exhaust dependent on location, and eye level controls. See drawing 17/A643 configuration. Provide all necessary accessories required to produce indicated configuration.

2.1.4 Range

UL listed, a combination of cooking top range and oven. Four coil surface heating elements of minimum 4,500 total watts at 208 volts, infinite upfront controls switches and range indicator "on" lights. Equip oven with one minimum 2,000-watt tubular broil element and one minimum 700-watt tubular bake element top and bottom respectively, dual element bake with upper and lower elements producing an even heat, oven is to be self-cleaning without the need for scrubbing, oven indicating light, automatic oven heat control and a removable full-width storage drawer; finish: stainless steel; size: 30" W x 26-1/4" D x 47" H. with 5.0 cubic foot oven capacity.

2.1.5 Dishwasher

UL listed, with detergent dispenser. The energy efficiency of the dishwasher shall meet or exceed federal guidelines or better as recommended

by the FEMP/energy Star listing. Provide automatic control to cycle machine through wash, rinse, dry or heat, and stop phases. Include manual setting to repeat or skip phases of cycle. Equip machine with safety switch which automatically stops spraying action when door is open. For medium duty dishwasher, provide household grade, with minimum 450-watt input for drying dishes. Size: 24" W. x minimum 32-1/2" adjustable H. x 24" D. Power 120 VAC, 60 Hertz, 6.7 amps.

PART 3 EXECUTION

3.1 INSTALLATION

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.

-- End of Section --

SECTION 11 41 11

REFRIGERATED AND FROZEN FOOD STORAGE EQUIPMENT
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.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ANSI/ASHRAE 15 & 34	(2013; Addenda A 2014; ERTA 1 2014; ERTA 2 2015; INT 1 2015; ERTA 3 2015) ANSI/ASHRAE Standard 15-Safety Standard for Refrigeration Systems and ANSI/ASHRAE Standard 34-Designation and Safety Classification of Refrigerants

NSF INTERNATIONAL (NSF)

NSF Food Equipment	(2005) NSF Product Listings of Food Equipment and Related Products, Components and Materials
NSF/ANSI 2	(2012) Food Equipment
NSF/ANSI 6	(2012) Dispensing Freezers
NSF/ANSI 7	(2009) Commercial Refrigerators and Freezers

UNDERWRITERS LABORATORIES (UL)

UL 207	(2009; Reprint Jul 2013) Refrigerant-Containing Components and Accessories, Nonelectrical
UL 471	(2010; Reprint Jun 2013) Commercial Refrigerators and Freezers

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 furnishing and installing frozen food service equipment and related work. Verify all existing dimensions, contract drawings, product data and all related conditions prior to commencing rough-in work. Include coordination of delivery through existing finished opening and vertical handling limitations within the building. Advise the Contracting

Officer of all discrepancies prior to ordering equipment. Submit Contractor's Field Verification Data prior to the preconstruction meeting.

Provide rough-in and connect utilities to equipment in accord 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.

1.3.1 Design Requirements

Submit detail drawings as stated in section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT for refrigerated and frozen food and drink storage cases, and walk-in coolers and freezers. Drawings must be 1/4 inch scale minimum.

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. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contractor's Field Verification Data

SD-02 Shop Drawings

Detail Drawings
Custom fabricated equipment
Installation Instructions and Diagrams
Detail drawings, as specified,including insulation and utility requirements.

SD-03 Product Data

Frozen food and drink storage cases
Refrigerated food and drink storage cases
Walk-in refrigerators
Walk-in freezers

SD-05 Design Data

Manufacturer's descriptive and technical literature

SD-06 Test Reports

Manufacturer's Test Data
Field Test Reports

SD-07 Certificates

NSF Certification
UL Certification
Energy Star Qualified

SD-08 Manufacturer's Instructions

Manufacturer's Instructions for shipping, handling, storage, installation, and start-up.

1.5 QUALITY ASSURANCE

Refer to section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT.

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. Shop Drawings, product data and installation instructions

(1) Detail Drawings
(2) Custom fabricated equipment
Submit custom fabricated equipment drawings after approval of food service equipment drawings.
(3) Installation Instructions and Diagrams

c. Product Data:

(1) frozen food and drink storage cases
(2) refrigerated food and drink storage cases
(3) Walk-in refrigerators
(4) Walk-in freezers

e. Design Data

(1) Manufacturer's descriptive and technical literature
(2) Manufacturer's Test Data
(3) Energy Star Qualified

f. Manufacturer's Instructions

Manufacturer's Instructions for shipping, handling, storage, installation, and start-up.

PART 2 PRODUCTS

2.1 MATERIALS

Comply with EPA sustainable acquisition (SA) requirements in accordance with Section 01 62 35 RECYCLED/RECOVERED/BIOBASED MATERIALS; regarding insulation materials for all equipment designated within this section. Other materials must conform to the requirements as stated in section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT.

2.2 LIST OF EQUIPMENT

Submit detailed Food Service Equipment List as specified in section 11 06 40.13 FOODSERVICE EQUIPMENT SCHEDULE.

2.3 CONSTRUCTION OF FABRICATED EQUIPMENT

Construction and finish of fabricated equipment must conform to the specifications as stated in section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT.

2.4 PREFABRICATED WALK-IN REFRIGERATORS AND FREEZERS

Provide walk-in units manufactured for food service use conforming to NSF/ANSI 7 UL 207, and UL 471. Insulated floor panels with diamond plate steel as wear layer finish floor.

Prefabricated dispensing freezers must conform to the requirements of NSF/ANSI 6.

2.4.1 Panel Construction

Interchangeable, 4 feet maximum width, 4 inch thick, filled with insulation. Provide preformed corner panels extending not less than 12 inches in each direction. Panels to have tongue and groove edges or flush joints with double seal serrated neoprene rubber gaskets to assure air and vapor tight joints.

a. Insulation: 4 inch minimum foamed-in-place polyurethane with manufacturer's rated "K" factor of not more than 0.15, free rise density of not less than 1.7 pounds per cubic foot, or in-place density of not less than 2 pounds per cubic foot. Provide floor screeds with minimum of 2 1/2 inches of foamed insulation.

b. Closures: Close the exposed exterior of the walk-in unit adjacent to walls and ceiling with panels of same material as used for exterior of walk-in unit panels.

c. I-Beam Supports: Wherever compartment dimension exceeds the clear-span ability of ceiling panels, provide I-beam supports on the exterior of the ceiling or supported by spline-hangers. Install half inch diameter steel rods through beam/hangers and secure to the structure above. Beams or posts within compartments are not be acceptable.

d. Finish:

   (1) Exterior: Stainless steel on all exposed surfaces and doors, aluminum on unexposed surfaces. Aluminum with two coats of white, baked-on enamel paint. High impact reinforced fiberglass panels, color selected by Contracting Officer.

   (2) Interior: Aluminum with two coats of white, baked-on enamel paint.

2.4.2 Prefabricated Floor Panels

Provide prefabricated floor panels of the same construction as wall/ceiling except with 14 gauge galvanized skin, sealed watertight. Provide prefabricated floor panels which are panels flush with surrounding building floor. Furnish two sets of erection tools, compatible with fasteners, with each unit.

2.4.3 Doors

Provide one, with 4 inch thickness, filled with insulation. Provide vinyl hanging strips, able to be replaced individually and anchored at head. Provide each door panel with an outside pilot light, a light switch and a remote bulb sensor with exterior flush-mounted, waterproof thermometer for registering box inside temperature. Provide anti-condensing strip heaters around perimeter of door panel jambs. Provide top and each side of door with a resilient, non-magnetic or thermoplastic with magnetic steel core

gasket installed. On bottom edge of door, provide a replaceable, adjustable rubber or vinyl wiper gasket.

a. Hardware Polished Stainless Steel: Provide two self-closing, spring-loaded hinges for each door. Include plated steel pin and cam-lift type bearing. Provide door latch with cylinder lock and with provisions for padlock. Include safety-release handle to permit opening from inside when locked.

b. Door Stops: Provide door stops where necessary, to prevent walk-in refrigerator and freezer doors from striking adjacent walls, plumbing fixtures or food service equipment when door is open.

c. Protective Bumpers: Equip the exterior sides of refrigerator that are not installed against each other or against a wall with protective bumpers.

d. Gasket: Provide either natural or synthetic rubber gaskets and conform to NSF/ANSI 2. Where frames are used, the panels must fit together with gaskets that are designed for 50 percent compression.

2.4.4 Air-flow Inhibiting Strip Curtains

Provide transparent flexible vinyl reinforced strip curtains anchored at top and able to be replaced individually. Strips must be a minimum of 8 inch in width and 0.08 inch thick.

2.4.5 Lights

Provide LED light fixtures with enclosed safety cover, capable of operating in minus 10 degree F temperature. Lights must run full length of walk-in unit starting 2 feet from panel front and extending to within 2 feet of the back panel. Run between shelf rows. Lighting must provide a minimum of 50 Footcandles in all areas of the cooler.

2.4.6 Identification Signs

Mount engraved phenolic plastic compartment identification signs 12 by 2 inch high in selected color with 1 inch high letters on door above view window.

2.4.7 Pressure Relief Port

Provide pressure relief port in each section, heated electrically and insulated.

2.5 REFRIGERATION UNIT SYSTEMS

Conform to ANSI/ASHRAE 15 & 34. Provide pre-assembled remote condensing unit assembly with all necessary components factory-installed and wired including electrical box, time clock, drier, sight glass, winter control and crankcase heater, enclosed compressor housing, and compressor rack. Set meat chiller to operate at 30 degrees F and other refrigerators to operate at 33 degrees F; set freezers to operate at 0 degrees F. Mercury is prohibited for use in thermometers.

Refrigerant compressors, packaged compressors and condenser units, and refrigerant condensers must be as specified in Division 23.

Refrigeration system equipment for cold storage must be as specified under Section 23 69 00.00 20 REFRIGERATION EQUIPMENT FOR COLD STORAGE.

2.5.1 Monitoring Alarm System

Provide an electronic monitoring and alarm system for each unit. Alarm is to warn of abnormally low and high temperatures.

a. System components: Detecting thermostat, master control panel, interconnecting wiring, and defrost compensator. Provide dials showing temperatures and pilot lights, warning lights, switches, transformer, and buzzer, all as a part of the master control panel. Locate master control panel as indicated. Provide power fuse to protect system components.

b. System operation: Set alarms at 10 degrees Fabove and below specified operating temperatures.

2.5.2 Personnel Alarm

For each unit, provide separate audible alarm system operable from inside unit, for use of personnel unable to exit unit. Locate remote audible alarm where indicated.

2.6 FACTORY TESTS AND CERTIFICATIONS

Submit three (3) copies of all Manufacturer's Test Data and certifications, including NSF Certification; UL Certification, and Energy Star Qualified data to the Contracting Officer prior to the commencement of any installation work.

PART 3 EXECUTION

3.1 INSTALLATION

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 ANSI/ASHRAE 15 & 34, NSF Food Equipment and UL standards stated herein, and the manufacturer's instructions.

3.1.1 Equipment Connections

Complete equipment connections for all utilities. Unless otherwise specified, provide [chromium-plated copper alloy] [stainless steel] exposed piping.

3.1.2 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 and provide everything required. Notify the Contracting Officer, in writing, 10 days before performing tests. Perform tests in the presence of Contracting Officer and a manufacturer's representative when required to preserve warranty.

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. 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 the 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; defrost system timer and thermostat set-points; 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 or drilled and pinned 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 42 00

FOOD PREPARATION EQUIPMENT
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.

ASME INTERNATIONAL (ASME)

ASME A112.19.3/CSA B45.4	(2008; R 2013) Stainless Steel Plumbing Fixtures

NSF INTERNATIONAL (NSF)

NSF Food Equipment	(2005) NSF Product Listings of Food Equipment and Related Products, Components and Materials
NSF/ANSI 2	(2012) Food Equipment
NSF/ANSI 59	(2012) Mobile Food Carts
NSF/ANSI 8	(2012) Commercial Powered Food Preparation Equipment

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

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

29 CFR 1910-SUBPART D	Walking - Working Surfaces
29 CFR 1910.144	Safety Color Code for Marking Physical Hazards
29 CFR 1910.145	Accident Prevention Signs and Tags
29 CFR 1910.212	Safety Standard for Machinery and Machine Guarding
29 CFR 1910.306	Specific Purpose Equipment and Installations

1.2 GENERAL REQUIREMENTS

Refer to section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT for general requirements. Provide detailed schedule as specified in section 11 06 40.13 FOODSERVICE EQUIPMENT SCHEDULE.

1.3 DESCRIPTION OF WORK

The work includes furnishing and installing new 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. Include coordination of delivery through existing finished opening and vertical handling limitations within the building. Advise the Contracting Officer of all discrepancies prior to ordering equipment. Submit Contractor's Field Verification Data prior to the preconstruction meeting.

Provide rough-in and connect utilities to equipment in accord 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.

1.3.1 Design Requirements

Submit detail drawings as stated in section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT for food preparation equipment and related food processing equipment. Drawings must be 1/4 inch scale minimum.

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. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contractor's Field Verification Data

SD-02 Shop Drawings

Detail Drawings
Custom fabricated equipment
Installation Instructions and Diagrams
Detail drawings, as specified,including insulation and utility requirements.

SD-03 Product Data

food preparation equipment

SD-05 Design Data

Manufacturer's descriptive and technical literature

SD-06 Test Reports

Manufacturer's Test Data
Field Test Reports

SD-07 Certificates

NSF Certification
UL Certification

Energy Star Qualified

SD-08 Manufacturer's Instructions

Manufacturer's Instructions for shipping, handling, storage, installation, and start-up.

1.5 QUALITY ASSURANCE

Refer to section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT.

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. Shop Drawings, product data and installation instructions

(1) Detail Drawings
(2) Custom fabricated equipment
Submit custom fabricated equipment drawings after approval of food service equipment drawings.
(3) Installation Instructions and Diagrams

b. Product Data:

Food preparation equipment

c. Design Data

(1) Manufacturer's descriptive and technical literature
(2) Manufacturer's Test Data
(3) Energy Star Qualified

d. Manufacturer's Instructions

Manufacturer's Instructions for shipping, handling, storage, installation, and start-up.

PART 2 PRODUCTS

2.1 MATERIALS

Food preparation equipment must conform to OSHA standards 29 CFR 1910.144, 29 CFR 1910.145, 29 CFR 1910.212, 29 CFR 1910.306, NSF/ANSI 2, NSF/ANSI 59, NSF/ANSI 8, NSF Food Equipment, Energy Star and related UL standards as specified in section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT.

Floor areas adjacent to food preparation equipment point of operation, and working surfaces must conform to 29 CFR 1910-SUBPART D

Preparation equipment materials must conform to the requirements as stated in section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT.

2.2 LIST OF EQUIPMENT

Submit detailed Food Service Equipment List as specified in section 11 06 40.13 FOODSERVICE EQUIPMENT SCHEDULE. Include submittal of NSF Certification and UL Certification for individual food preparation

equipment components.

2.3 CONSTRUCTION OF FABRICATED EQUIPMENT

Construction and finish of fabricated equipment must conform to the specifications as stated in section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT.

2.4 HAND SINKS

2.4.1 Sink Body

Provide sizes and mountings as indicated; provide in accord with requirements of NSF/ANSI 2. Provide in accord with ASME A112.19.3/CSA B45.4. Fabricate of 14 gage stainless steel. Round vertical and horizontal corners with a radius of not less than 0.75 inch.

2.4.2 Mounting

2.4.2.1 Leg Mounting

Sink legs to be as specified for counters, except weld closed gussets to support channels.

2.4.2.2 Wall Mounting

Provide stainless steel mounting brackets.

2.4.2.3 Counter Mounting

Provide sink body undermounted to counter.

2.4.3 Faucets and Drain

Provide splashback or as indicated in cutsheet book. Provide gooseneck faucet spout, aerator, with two valves. Provide nozzle with anti-splash device without hose thread. Provide cleanout at location indicated on drawings.

PART 3 EXECUTION

3.1 INSTALLATION

Refer to section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT for detailed installation procedures, operation and maintenance manual requirements, training and project closeout procedures. Include all food service preparation Field Test Reports.

-- End of Section --

SECTION 11 44 00

FOOD COOKING EQUIPMENT
01/08

PART 1 GENERAL

1.1 GENERAL RELATED SECTIONS AND STANDARDS

a. Refer to section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT for general requirements. Provide detailed Food Service Equipment Schedule as specified in Section 11 06 40.13 FOOD SERVICE EQUIPMENT SCHEDULE.

b. Provide detailed Food Service Equipment Schedule conforming to DOD 4000.25-1-M.

c. Gas-burning equipment must be designed for operation with the type of gas specified and be approved by CSA, conforming to CSA C22.2 No. 109 and CSA Directory.

d. All electrical work must conform to NFPA 70.

e. Provide connections as part of building sprinkler system, Section 21 13 13.00 20 WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION.

f. Grease extracting type hoods that have an internal hood fire protection system do not require wet chemical fire extinguishing protection for those components of the exhaust system, and for cooking equipment protected by a UL listed internal hood fire protection system complying to NFPA 96.

1.2 REFERENCES

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

AMERICAN WELDING SOCIETY (AWS)

AWS A5.8/A5.8M	(2011; Amendment 2012) Specification for Filler Metals for Brazing and Braze Welding
AWS D1.1/D1.1M	(2010; Errata 2011) Structural Welding Code - Steel
AWS D10.4	(1986; R 2000) Recommended Practices for Welding Austenitic Chromium-Nickel Stainless Steel Piping and Tubing
AWS D9.1M/D9.1	(2012) Sheet Metal Welding Code

CSA GROUP (CSA)

CSA C22.2 No. 109	(1981; R 2013) Commercial Cooking Appliances

CSA Directory	(updated continuously online) Product Index

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10	(2013) Standard for Portable Fire Extinguishers
NFPA 54	(2015) National Fuel Gas Code
NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code
NFPA 96	(2014) Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1767	(2001) Kitchen Ventilation Systems & Food Service Equipment Fabrication & Installation Guidelines, 1st Edition
SMACNA 1966	(2005) HVAC Duct Construction Standards Metal and Flexible, 3rd Edition

U.S. DEPARTMENT OF DEFENSE (DOD)

DOD 4000.25-1-M	(2006) MILSTRIP - Military Standard Requisitioning and Issue Procedures

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

29 CFR 1910	Occupational Safety and Health Standards

UNDERWRITERS LABORATORIES (UL)

UL 197	(2010; Reprint Sep 2013) Commercial Electric Cooking Appliances
UL 489	(2013; Reprint Mar 2014) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
UL 710	(2012) Exhaust Hoods for Commercial Cooking Equipment
UL 763	(2012; Reprint Nov 2013) Standard for Motor-Operated Commercial Food Preparing Machines
UL Electrical Appliance	(2012) Electrical Appliance and Utilization Equipment Directory

1.3 SYSTEM DESCRIPTION

The work includes furnishing and installing food service cooking equipment

and related work. Verify all existing dimensions, contract drawings, product data and all related conditions prior to commencing rough-in work.

a. Protect each exhaust hood system that serves cooking equipment, associated exhaust hood system ducts, and all cooking equipment served by the exhaust hood system with a wet chemical fire extinguishing system.

b. Submit detail drawings, as specified,including insulation and utility requirements for all food cooking equipment, custom fabricated equipment, along with equipment schedule. Drawings shall be 1/4 inch scale minimum. Schedule in the same format as the equipment schedule on the drawings.

c. Include coordination of delivery through existing finished opening and vertical handling limitations within the building. Advise the Contracting Officer of all discrepancies prior to ordering equipment. Submit Contractor's Field Verification Data prior to the preconstruction meeting.

d. Provide rough-in and connect utilities to equipment in accordance with requirements specified in other sections of this specification and in accordance with the physical dimensions, capacities, manufacturer's instructions, and other requirements of the equipment furnished. Submit all installation instructions and diagrams.

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. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contractor's Field Verification Data

SD-02 Shop Drawings

Detail Drawings
Schedule
Energy Star qualified
Exhaust Hoods Over Cooking Equipment
Utilities
Custom Fabricated Equipment
Installation Instructions and Diagrams

SD-03 Product Data

Commercial food cooking equipment
Exhaust Hoods Over Cooking Equipment

SD-06 Test Reports

Field Test Reports
Exhaust Hood Air-Balance Report

SD-07 Certificates

NSF Certification
UL Certification
Energy Star Qualified

PART 2 PRODUCTS

2.1 EXHAUST HOODS OVER COOKING EQUIPMENT

Conform to NFPA 96 and UL 710. Conform to SMACNA 1966. Provide seismic restraints in accordance with SMACNA 1767. The hood shall not vary from design listing of air requirements or static pressure by more than five percent. Fabricate from 18 gage thick stainless steel. Run electrical wiring in conduit or raceways. When total hood length is more than 12 feet long, provide hoods individually complete in all respects, of approximately equal length less than 12 feet long, and mounted end to end.

2.1.1 Centrifugal Grease-Extracting Hoods

Fabricate in factory. Provide high-velocity type with average throat inlet air velocity of 1,000 fpm and duct velocity of 1,800 fpm. Provide air inlet above and parallel to equipment for full length of hood. Provide hood which will remove 95 percent of extraneous matter in air with non-removable grease-extracting baffles located in plenum chamber. The use of filters, cartridges, rotating parts, removable parts, or constantly running water is not acceptable.

2.1.1.1 Types of Hoods

Provide the following hood types as indicated:

2.1.1.1.1 Wall-Mounted, Free-Standing; Type 3

Provide over ranges, griddles,and ovens, located along wall. Mount at height indicated.

2.1.1.2 Features

Provide the following:

a. Fan control.

b. Damper controls.

c. Fan control station and plumbing enclosure.

d. Fire protection system for hoods.

f. Vapor-proof lights.

2.1.1.3 Fan Control

Locate in fan control station and plumbing enclosure. Provide delay-time starter on starter leg of exhaust fan so supply fan starts first and run 5 seconds before exhaust fan starts, to insure the required balance in exhausted and make-up air flow. Provide the following operations:

a. Interconnection with washdown system to effect shutoff.

b. Interconnection with fire dampers to effect shutoff of fans.

c. Operation by time clock.

d. Operation by manual push buttons labeled "start" and "stop".

2.1.1.4 Fire Damper

Provide mechanically driven damper and damper control. Activate by heat-sensing thermostat set to react to temperature of 350 degrees F in exhaust duct at hood. Activation of damper must cause the following additional actions:

a. Shut off exhaust and supply fans of hood.

b. Shut off fuel source and electric power to equipment under hood.

c. Initiate automatic washdown system.

2.1.1.5 Fan Control Station and Plumbing Enclosure

Provide flush-mounted enclosure. Wire and plumb in factory. Include the following:

a. Plumbing components of washdown system.

b. Components required for fan control, including manual push buttons and interlocks with other systems.

c. Components required to operate fire protection system.

d. Time clock capable of being programmed by the week to operate fan system and automatic washdown system and of maintaining time cycle after being overridden by manual push buttons.

e. Labeled light indicating when exhaust fan and supply fan are operating.

f. Labeled light indicating when automatic washdown system is operating.

2.1.1.6 Fire Protection Systems

Provide a pre-engineered wet liquid chemical with water continuation in accordance with NFPA 96. Include water spray in plenum of hood. Include micro-switch for electric power and fuel shut off to equipment under hood and a fuel shut-off and reset button. Exposed piping under hood and surface nozzles to be stainless steel or chrome plated. Paint exposed piping running to hood with rust-inhibiting aluminum paint. Provide electrical wiring, contactors, shunt breakers, electrical control for gas valves, and other electrical components required to install fire systems in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

2.1.1.6.1 Actuating Stations

Provide manual actuating station and remote manual actuating station as indicated. Clearly label actuating station as "Hood Fire Protection" and specific device protected.

2.1.1.6.2 Water Spray Fire System In Grease-Extracting Type Hood

Include wall-mounted control panel with pilot lights for indicating when system is operational, not operational, and on fire alert. Provide audible fire alarm, unions, hand valve, valve switch, and pressure switch. Include duct nozzles and plenum nozzles. Provide water pipe to control panel and from control panel to hood. Provide connections as part of building sprinkler system, Section 21 13 13.00 20 WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION.

2.1.1.6.3 Alarm Connection

Provide capability to signal operational readiness and to generate electronic signal when hood fire system is activated. Provide connection point for building alarm system. Provide system to connection point and connect in accordance with Section 28 31 74.00 20 INTERIOR FIRE ALARM SYSTEM.

2.1.1.7 Vapor proof Lights

Provide Vapor Proof Sealed and heat resistant LED Lighting at all hoods.

2.2 Commercial Food Cooking Equipment

a. All commercial cooking equipment shall conform to 29 CFR 1910, CSA, NSF, UL and other related standards as stated herein and in Section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT. Supply all gas fueled appliances with installed automatic shut-off device(s), as well as manual shut-offs device conforming to NFPA 96.

b. Electrical cooking appliances must conform to UL 197, UL 489, UL 763, and UL Electrical Appliance.

2.2.1 Gas Burners

In accordance with NFPA 54, equip burners and pilots located in enclosed compartments with automatic shut off of gas supply if burners fail to ignite, or pilot is extinguished.

2.3 PORTABLE FIRE EXTINGUISHER

Wall mount portable fire extinguisher conforming to NFPA 10, within 10 feet of cooking area.

PART 3 EXECUTION

3.1 INSTALLATION

Perform installation in accordance with the manufacturer's printed instructions. Refer to section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT for detailed installation, project closeout, and warranty requirements. Lay out work in advance to prevent damage to building, piping, wiring, or equipment as a result of cutting for installation.

3.1.1 Setting and Connecting

Install 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. Flash food service cabinets

located in wall openings to the walls with 20 gage thick stainless steel. Seal around equipment flashing and flanges, at walls, floor, and ceiling in accordance with Section 07 92 00 JOINT SEALANTS. Fillers shall be continuous, without opening.

3.1.2 Welding Field Joints

Weld stainless steel by the electric fusion method. Provide where required by and in accordance with AWS A5.8/A5.8M, AWS D1.1/D1.1M, AWS D10.4, AND AWS D9.1M/D9.1. Accomplish brazing with silver solder for joining copper tubing to brass and bronze connection fitting and for no other purpose.

3.1.3 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.

3.1.4 Installation of Hoods

Install hoods in accordance with NFPA 96 to remain free from vibration under all conditions of operation.

3.2 FIELD INSPECTIONS AND TESTS

Inspect equipment, fixtures, and material after installation for compliance with the applicable standards. Upon completion of inspection perform operational tests on each piece of equipment to determine that equipment and components, including controls, safety devices, and attachments, operate as specified and are properly installed and adjusted. Test all water, drain, gas, steam, oil, refrigerant, and liquid carrying components for leaks. Notify the Contracting Officer 14 calendar days prior to testing. Submit Field Test Reports and 3 copies of the Exhaust Hood Air-Balance Report to the Contracting Officer.

-- End of Section --

SECTION 11 46 00

FOOD DISPENSING EQUIPMENT
01/08

PART 1 GENERAL

1.1 GENERAL RELATED SECTIONS AND STANDARDS

Refer to section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT for general requirements, and Section 11 06 40.13 FOOD SERVICE EQUIPMENT SCHEDULE when preparing the Food Service Equipment List.

Floor areas adjacent to food dispensing equipment point of operation, and working surfaces shall conform to 29 CFR 1910-SUBPART D

d.

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.

ASME INTERNATIONAL (ASME)

ASME A112.19.3/CSA B45.4	(2008; R 2013) Stainless Steel Plumbing Fixtures

NSF INTERNATIONAL (NSF)

NSF 53A	(2012) Drinking Water Treatment Units - Health Effects
NSF/ANSI 14	(2014) Plastics Piping System Components and Related Materials
NSF/ANSI 169	(2012)Special Purpose Food Equipment and Devices
NSF/ANSI 18	(2012) Manual Food and Beverage Dispensing Equipment
NSF/ANSI 2	(2012) Food Equipment
NSF/ANSI 20	(2012) Commercial Bulk Milk Dispensing Equipment
NSF/ANSI 25	(2012) Vending Machines for Food and Beverage
NSF/ANSI 36	(2012) Dinnerware
NSF/ANSI 4	(2009; Addenda 2012) Commercial Cooking, Rethermalization and Powered Hot Food Holding and Transport Equipment

NSF/ANSI 42	(2012) Drinking Water Treatment Units - Aesthetic Effects
NSF/ANSI 51	(2012) Food Equipment Materials
NSF/ANSI 6	(2012) Dispensing Freezers

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

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

29 CFR 1910-SUBPART D	Walking - Working Surfaces
29 CFR 1910.144	Safety Color Code for Marking Physical Hazards
29 CFR 1910.145	Accident Prevention Signs and Tags
29 CFR 1910.306	Specific Purpose Equipment and Installations

1.3 SUMMARY

The work includes [furnishing and] [installing] [and modifying existing] food service dispensing equipment and related work. Verify all existing dimensions, contract drawings, product data and all related conditions prior to commencing rough-in work. Include coordination of delivery through existing finished opening and vertical handling limitations within the building. Advise the Contracting Officer of all discrepancies prior to ordering equipment. Submit Contractor's Field Verification Data prior to the preconstruction meeting.

Provide rough-in and connect utilities to equipment in accordance with requirements specified in other sections of this specification and in accordance with the physical dimensions, capacities, manufacturer's instructions, and other requirements of the equipment furnished.

1.4 PREINSTALLATION MEETING

[Thirty] [_____] days prior to the commencement of work, notify the Contracting Officer that the following items are prepared and ready for review at the Pre-Installation Meetings listed here as shown in the Submittals paragraph.

1.4.1 Detail Drawings

Submit Detail Drawings for food dispensing and related food processing equipment, as specified, including insulation and utility requirements, product data and installation instructions. Submit Custom fabricated equipment drawings after approval of food service equipment drawings. Submit Installation Instructions and Diagrams and food dispensing equipment. Provide Drawings at 1/4 inch scale minimum.

1.4.2 Design Data

Submit detailed Food Service Equipment List reflecting requirements in

Section 11 06 40.13 FOOD SERVICE EQUIPMENT SCHEDULE. Submit Design Data consisting of Manufacturer's literature, Manufacturer's Test Data, and Energy Star Qualified for individual food dispensing components

1.4.3 Manufacturer's Instructions

Submit Manufacturer's Instructions for shipping, handling, storage, installation, and start-up

1.4.4 Certifications

Submit [_____] copies of all Manufacturer's Test Data and certifications, including NSF Certification; UL Certification, and Energy Star Qualified data to the Contracting Officer prior to the commencement of any installation work.

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. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contractor's Field Verification Data[; G][; G, [_____]]

SD-02 Shop Drawings

Detail Drawings[; G][; G, [_____]]
Custom fabricated equipment[; G][; G, [_____]]
Installation Instructions and Diagrams[; G][; G, [_____]]

SD-03 Product Data

Food Service Equipment List
Food Dispensing Equipment

SD-05 Design Data

Manufacturer's literature[; G][; G, [_____]]

SD-06 Test Reports

Manufacturer's Test Data[; G][; G, [_____]]
Field Test Reports[; G][; G, [_____]]

SD-07 Certificates

NSF Certification[; G][; G, [_____]]
UL Certification[; G][; G, [_____]]
Energy Star Qualified

SD-08 Manufacturer's Instructions

Manufacturer's Instructions[; G][; G, [_____]]

PART 2 PRODUCTS

2.1 EQUIPMENT

Provide equipment conforming to the applicable requirements of the following reference standards: NSF/ANSI 14, NSF/ANSI 169, NSF/ANSI 18, NSF/ANSI 2, NSF/ANSI 20, NSF/ANSI 25, NSF/ANSI 36, NSF/ANSI 4, NSF/ANSI 42, NSF/ANSI 51, NSF 53A, NSF/ANSI 6, and Energy Star for powered equipment. Food dispensing equipment shall also conform to OSHA standards 29 CFR 1910.144, 29 CFR 1910.145, 29 CFR 1910.306, and related NSF and UL standards.

2.2 WATER FILTER

Provide a cartridge-type water filter on water supply lines to equipment as shown.

2.2.1 Cartridge Filter

The filter, conforming to NSF/ANSI 42, NSF/ANSI 51, and NSF 53A, shall remove dirt and off-taste items, such as chlorine and other medicinal items, and also reduce lime-scale problems when required by water conditions. Provide filter consisting of a stainless steel pressure vessel, which includes shell top, bracket check valve, fittings and accessories, and plastic disposable cartridge. Provide precoat filtration type cartridge in which a coating of particles is applied on a suitable fabric support. The filter shall contain not less than 90 percent activated carbon and 10 percent inert binders, and remove particles 2 microns and larger. Install the filter with [an inlet valve] [a three-position valve header], activation faucet, and by-pass valve which will be normally closed. In addition, provide an indication gauge which indicates when cartridge requires replacement.

2.2.2 Working Pressure and Flow Rate

Install the filter as recommended by the manufacturer. Provide filter suitable for 125 psig maximum working pressure at 100 degrees F water inlet temperature. Each filter shall have a nominal flow rate of [180] [90] [60] gph. Provide [1] [2] [_____] additional replacement cartridge[s] for each filter.

]2.3 HAND SINKS

2.3.1 Sink Body

Provide sizes and mountings as indicated; provide in accordance with requirements of NSF/ANSI 2. Provide in accordance with ASME A112.19.3/CSA B45.4. Fabricate of 14 gage stainless steel. Round vertical and horizontal corners with a radius of not less than 0.75 inch.

2.3.2 Mounting

2.3.2.1 Leg Mounting

Sink legs to be as specified for counters, except weld closed gussets to support channels.

2.3.2.2 Wall Mounting

Provide stainless steel mounting brackets.

2.3.2.3 Counter Mounting

Provide sink body [set in counter] [integral with counter].

2.3.3 Faucets and Drain

Provide [splashback] [counter top] [and] [ledge] mounted [as indicated]. Provide gooseneck faucet spout, aerator, with two valves. Provide nozzle with anti-splash device without hose thread. Provide cleanout at location indicated on drawings.

PART 3 EXECUTION

3.1 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 food service dispensing equipment in the Field Test Reports.

-- End of Section --

SECTION 11 47 00

ICE MACHINES
02/09

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.

NSF INTERNATIONAL (NSF)

NSF/ANSI 12	(2012) Automatic Ice Making Equipment
NSF/ANSI 14	(2014) Plastics Piping System Components and Related Materials
NSF/ANSI 169	(2012)Special Purpose Food Equipment and Devices

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Energy Star	(1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

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

29 CFR 1910-SUBPART D	Walking - Working Surfaces
29 CFR 1910.144	Safety Color Code for Marking Physical Hazards
29 CFR 1910.145	Accident Prevention Signs and Tags
29 CFR 1910.306	Specific Purpose Equipment and Installations

1.2 SUMMARY

The work includes furnishing and installing ice making equipment, including dispensing, production, storage 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. Equipment specified shall also conform to the applicable requirements of the following reference standards: NSF/ANSI 12, NSF/ANSI 14, NSF/ANSI 169, and Energy Star for powered equipment.

c. 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.

1.3 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-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-03 Product Data

Ice making equipment
Ice machine autocleaning equipment

SD-05 Design Data

Manufacturer's applicable literature; G

SD-06 Test Reports

Manufacturer's Test Data; G
Field Test Reports; G

SD-07 Certificates

NSF Certification; G
UL Certification; G
Energy Star Qualified

SD-08 Manufacturer's Instructions

Manufacturer's Instructions; G

1.4 ADMINISTRATIVE REQUIREMENTS

1.4.1 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:

1.4.1.1 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 shall be 1/4 inch scale minimum.

1.4.1.2 Product Data

Submit the product data for the following equipment, as well as the associated manufacturer's data:

a. ice making equipment

b. ice machine autocleaning equipment

c. Manufacturer's applicable literature

d. Manufacturer's Test Data

e. Energy Star Qualified

f. Manufacturer's Instructions for shipping, handling, storage, installation, and start-up.

1.4.2 LIST OF EQUIPMENT

Submit detailed Food Service Equipment List. Include submittal of NSF Certification and UL Certification for ice making equipment.

PART 2 PRODUCTS

2.1 MATERIALS

Provide ice making equipment conforming to OSHA standards 29 CFR 1910.144, 29 CFR 1910.145, 29 CFR 1910.306, and related NSF and UL standards. Floor areas adjacent to ice making equipment point of operation shall conform to 29 CFR 1910-SUBPART D. Ice making equipment materials shall conform to the requirements of Section 11 05 40 COMMON WORK RESULTS FOR FOOD SERVICE EQUIPMENT.

2.2 CONSTRUCTION OF FABRICATED EQUIPMENT

Construction and finish of fabricated equipment shall conform to the requirements of Section 11 05 40 COMMON WORK RESULTS FOR FOOD SERVICE EQUIPMENT.

2.3 FACTORY TESTS AND CERTIFICATIONS

Submit 3 copies of all Manufacturer's Test Data and certifications, including NSF Certification; UL Certification, and Energy Star Qualified data to the Contracting Officer prior to the commencement of any installation work.

PART 3 EXECUTION

3.1 EXAMINATION

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 equipment Field Test Reports..

-- End of Section --

SECTION 11 48 00

CLEANING AND DISPOSAL EQUIPMENT
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.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH-2092S	(2004) Industrial Ventilation: A Manual of Recommended Practice

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1009	(1990) Performance Requirements for Commercial Food Waste Grinder Units

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 2	(2000; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 6	(1993; R 2011) Enclosures

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code
NFPA 96	(2014) Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations

NSF INTERNATIONAL (NSF)

NSF Food Equipment	(2005) NSF Product Listings of Food Equipment and Related Products, Components and Materials
NSF/ANSI 13	(2012) Refuse Processors and Processing Equipment
NSF/ANSI 2	(2012) Food Equipment
NSF/ANSI 21	(2012) Thermoplastic Refuse Containers
NSF/ANSI 222	(2006e; R 2011) Ozone Generators
NSF/ANSI 3	(2012) Commercial Warewashing Equipment

NSF/ANSI 59 (2012) Mobile Food Carts

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1966 (2005) HVAC Duct Construction Standards Metal and Flexible, 3rd Edition

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Energy Star (1992; R 2006) Energy Star Energy Efficiency Labeling System (FEMP)

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

29 CFR 1910-SUBPART D Walking - Working Surfaces

29 CFR 1910.144 Safety Color Code for Marking Physical Hazards

29 CFR 1910.145 Accident Prevention Signs and Tags

29 CFR 1910.212 Safety Standard for Machinery and Machine Guarding

29 CFR 1910.306 Specific Purpose Equipment and Installations

UNDERWRITERS LABORATORIES (UL)

UL 1598 (2008; Reprint Oct 2012) Luminaires

UL 197 (2010; Reprint Sep 2013) Commercial Electric Cooking Appliances

UL 471 (2010; Reprint Jun 2013) Commercial Refrigerators and Freezers

1.2 GENERAL REQUIREMENTS

Equipment Item	NAVFSSO Dwg. File
1. Soiled Dishtable Assembly	541
2. Soiled Gear Scrapping Assembly	541
3. Utensil Wash Table	553
4. Service Stand	851

Refer to section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT for general requirements. Also refer to section 11 06 40.13 FOODSERVICE EQUIPMENT SCHEDULE.

1.3 DESCRIPTION OF WORK

The work includes furnishing and installing new food service cleaning and

disposal equipment, related accessories, and work. Verify all existing dimensions, contract drawings, product data and all related conditions prior to commencing rough-in work. Include coordination of delivery through existing finished opening and vertical handling limitations within the building. Advise the Contracting Officer of all discrepancies prior to ordering equipment. Submit Contractor's Field Verification Data prior to the preconstruction meeting.

Provide rough-in and connect utilities to equipment in accord 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.

1.3.1 Design Requirements

Submit detail drawings as stated in section 11 05 40 COMMON WORK RESULTS FOR FOOD SERVICE EQUIPMENT for food service cleaning and disposal equipment and related accessory equipment. Drawings must be 1/4 inch scale minimum.

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. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contractor's Field Verification Data

SD-02 Shop Drawings

Detail Drawings
Custom fabricated equipment
Installation Instructions and Diagrams
Detail drawings, as specified,including insulation and utility requirements.

SD-03 Product Data

food service cleaning and disposal equipment
GARBAGE DISPOSAL

SD-05 Design Data

Manufacturer's descriptive and technical literature

SD-06 Test Reports

Manufacturer's Test Data
Field Test Reports

SD-07 Certificates

NSF Certification
UL Certification
Energy Star Qualified

SD-08 Manufacturer's Instructions

Manufacturer's Instructions for shipping, handling, storage, installation, and start-up.

1.5 QUALITY ASSURANCE

Refer to section 11 05 40 COMMON WORK RESULTS FOR FOOD SERVICE EQUIPMENT.

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. Shop Drawings, product data and installation instructions

1. Detail Drawings
2. Custom fabricated equipment

Submit custom fabricated equipment drawings after approval of food service equipment drawings.

3. Installation Instructions and Diagrams

b. Product Data:

Food service cleaning and disposal equipment

c. Design Data

1. Manufacturer's descriptive and technical literature
2. Manufacturer's Test Data
3. Energy Star Qualified

d. Manufacturer's Instructions

Manufacturer's Instructions for shipping, handling, storage, installation, and start-up.

PART 2 PRODUCTS

2.1 MATERIALS

Food service cleaning and disposal equipment must conform to the following;

OSHA standards:

29 CFR 1910.144
29 CFR 1910.145
29 CFR 1910.212
29 CFR 1910.306

NSF standards:

NSF/ANSI 13
NSF/ANSI 2
NSF/ANSI 21
NSF/ANSI 222
NSF/ANSI 3
NSF/ANSI 59
NSF Food Equipment, and

EPA standard:
Energy Star

and other related standards as specified in section 11 05 40 COMMON WORK RESULTS FOR FOOD SERVICE EQUIPMENT.

Floor areas adjacent to food preparation equipment point of operation, and working surfaces must conform to 29 CFR 1910-SUBPART D

Preparation equipment materials must conform to the requirements as stated in section 11 05 40 COMMON WORK RESULTS FOR FOOD SERVICE EQUIPMENT.

2.2 LIST OF EQUIPMENT

Submit detailed Food Service Equipment List as specified in section 11 06 40.13 FOODSERVICE EQUIPMENT SCHEDULE. Include submittal of NSF Certification and UL Certification for individual food preparation equipment components.

2.3 CONSTRUCTION OF FABRICATED EQUIPMENT

Construction and finish of fabricated equipment must conform to the specifications as stated in section 11 05 40 COMMON WORK RESULTS FOR FOOD SERVICE EQUIPMENT.

2.4 CUSTOM-FABRICATED WORKCOUNTERS, DISHWASHER COUNTERS, AND SINKS

2.5 Counter Tops

Fabricate of 14 gage stainless steel, with all shop seams and corners welded, ground smooth, and polished.

2.5.1 Counter Edges

Miter and weld corners, grind smooth, and polish.

2.5.2 Work, Landing, and Dump Tables

Roll down counter edges on work, landing, and dump tables 1.75 inches at 180 degrees, with corners rounded and bullnosed.

2.5.3 Side and Back Splashes

Turn up counter edges to form side or backsplashes at 90 degrees on a 0.625 inch radius with top edge turned back 2 inches at 90 degrees with ends closed. Turn up 6 inches unless 10 inches is required.

2.5.3.1 Soiled Dish Tables, Vegetable, and Pot Sinks

Turn up counter edges on dishtables and vegetable and pot sinks 3 inches at 90 degrees on a 0.625 inch radius with top edge rolled1.75 inch at 180 degrees to form a rolled rim. Turn up back edge 10 inches at 90 degrees on a 0.625 inch radius with top edge turned back 2.2 inches at 45 degrees with ends closed.

2.5.3.2 Drain Plug and Overflow Fittings

Provide drain consisting of a 1-1/2 inch quick opening brass body valve with side outlet overflow connection with a stainless steel twist lever handle. Provide a removable perforated stainless steel strainer plate of not less than 3 inch in diameter. Provide 1-1/4 inch diameter chrome-plated brass tubing overflow fittings of not less than 0.036 inch thickness connected to an overflow head in the back of the sink compartment. Provide overflow head with a removable perforated chrome-plated brass or stainless steel strainer plate of not less than1-1/2 inch diameter. Install overflow head in die-stamped opening 1 inch below counter top.

2.5.3.3 Final Rinse Compartment

Equip the final rinse compartment of the pot washing sink with a booster heater for sanitizing.

2.5.3.4 Temperature Gauge

Provide temperature gauge with a 3 inch diameter face with stainless steel flange.

2.5.3.5 Mounting Valves, Temperature Gauge, and Controls

Mount valves, temperature gauge, and controls in a stainless steel recessed panel, ready for final connections. Provide a perforated stainless steel casing over the temperature bulb.

2.5.3.6 False Bottom

Provide false bottom constructed of 14 gauge stainless steel, 1/2 inch deep pan formed with a perforated top (1/2 inch holes punched 1-1/2 inches on center), with welded corners and finger rings. Fit false bottom with 2 inch high by 1-1/4 inch outside diameter tubular stainless steel feet with closed ends.

2.5.4 Cutlery and Excess Liquid Sinks

Provide cutlery and excess liquid sinks with a removable standpipe overflow, in lieu of an overflow in the back of the sink. Install the overflow in the corner of the sink compartment. Provide compartments with snug-fitting removable basket strainers. Arrange drain plug with quick-opening valve for operation from the work side of the counter.

2.5.5 Counter Top Support

Provide supports under all edges of counter tops and tables, and at cross members. Stud-weld counter top to supports. Provide either of following types.

2.5.5.1 Channels

1 by 1 inch, 12 gage galvanized steel channel. Space cross members 30 inches on-center.

2.5.5.2 Angles

1.5 by 1.5 by 0.125 inch galvanized steel angles. Space cross members at 2

feet on-center.

2.6 PASS-THROUGH WINDOWS

Except for sill of soiled dish counter, fabricate a mitered window frame of 14 gage stainless steel channel forming a 3.5 inch casing on each side of wall. Return flange 0.5 inch, to wall. Weld joints; join only at corners of opening. Seal in accord with Section 07 92 00 JOINT SEALANTS.

2.6.1 Windows for Endless Belt Conveyors

Locate and size opening to allow 0.5 inch clearance at each side and below conveyor and 12 inch space above conveyor.

2.6.2 Windows for Soiled Dish Counter

Fabricate sill as integral extension of counter. At face of wall opposite counter, turn sill 0.5 inch up, then down to form 4 inch wide mitered casing.

2.7 CLEANING, DISHWASHING, AND DISPOSAL EQUIPMENT

Commercial warewashing equipment must conform to NSF/ANSI 3. Thermoplastic refuse containers must conform to NSF/ANSI 21.

2.7.1 Dish Counters

Construct dish counters and sound deaden as specified for in section 11 05 40 COMMON WORK RESULTS FOR FOOD SERVICE EQUIPMENT. Fit and flange the dish counters into the dishwashing machine with a water-tight joint.

2.7.2 Dish Counter Support Channels

Provide 1 by 4 by 1 inch, 12 gauge stainless steel dish counter support channels. Provide channels under dish counter top between each pair of legs and close ends. Provide cross members, on the centerline, between legs. Stud bolt channels to counter top at 6 inch on center, maximum.

2.7.3 Dish Counter Components

2.7.3.1 Scupper Drain

Provide scupper drain the full width of dish counter with all corners coved, 6 inch wide by 2 inch deep, and integrally welded to the soiled/clean dish counter top at the entrance/exit of a rack-type dishwashing machine. Score and slope bottom of the scupper drain to 1-1/2 inch brass drain with tailpiece. Provide removable drainer 16 gauge stainless steel, flush-mounted, pan-formed, perforated top, with 1/2 inch holes punched 1-1/2 inches on center, and install in the scupper opening on 1/2 inch diameter stainless steel legs with closed ends.

2.7.3.2 Prewash Sink

Weld integral 20-1/2 by 20-1/2 inch prewash sink to the dish counter top with the corners rounded on 1/2 inch radius. Pitch the sink bottom to 16 gauge stainless steel disposer throat flange 1-1/2 inch brass drain. Provide a 20-1/2 inch square 16 gauge removable rack support/slide assembly, framed with two cross members. Weld two 1 by 1/8 inch stainless steel angle rack guides on top of the frame at 20 inch apart with ends

flared at 45 degrees.

2.7.3.3 Prerinse Spray

Mount a prerinse spray assembly on the backsplash of the dish counter with vertical tubing, wall bracket, flexible gooseneck hose, and self closing squeeze-type valve and spray.

2.7.3.4 Backsplash-Mounted Faucets

Provide combination fitting-type backsplash mounted faucets with concealed supply connections at the back of the sink. Provide fitting with a swinging spout of approximately 8 inches in length and inlets with 3/4 inch pipe thread. Faucets must have adjustable flanges. Provide valves with indexed metal lever handles and replaceable seats.

2.7.3.5 Hose Bib Faucet

Mount a hose bib faucet on a 12 gauge stainless steel flange or inverted gusset below top of counter, ground and polished to match counter top.

2.7.3.6 Undershelves

Provide solid type undershelves, constructed as specified for open base shelves.

2.7.3.7 Scraping Trough

Provide a 14 gauge stainless steel scraping trough in the soiled dish counter with all corners 3/4 inch coved, and integrally welded to the dish counter. Provide trough 8 inch wide minimum and sloped 1/8 inch per foot or from 4 inch depth to integral disposer or prewash sink. Form long sides of trough on a 60 degree angle with a 1/2 by 1/2 inch recessed shoulder at juncture of the dish counter. Provide with removable stainless steel trough covers 7-7/8 by 20 inch, 16 gauge, pan formed, with perforated top. Make perforations(1/2 inch diameter holes punched 1-1/2 inch on center). Provide one trough cover for each 36 inch of trough.

Provide and install one inlet fitting at the shallow end of the scraping trough, and intermediate inlet fittings at 48 inch on center. Pipe inlet fittings to a blending valve, vacuum breaker, solenoid valve, and provide a globe valve at each intermediate inlet.

Integral disposer sink must be 18 by 18 by 7-1/2 inch deep, 14 gauge stainless steel with all corners coved, welded to dish counter/scraping trough and fitted with a removable silverware-trap. Provide with removable stainless steel flush cover 16 gauge, 1/2 inch pan-formed, and perforated (1/2 inch holes punched at 1-1/2 inch on center) with welded corners. Provide a finger ring for the removal of the cover. Provide 1/4 inch diameter stainless steel rod support clips,2 inch long, formed at 45 degree angle with two 3/4 inch leg ends and 1/4 inch long threaded ends.

Insert rod-clips through tight clearance holes in sink corners, seal watertight, and secure with stainless steel acorn-nuts or tack-welded at exterior of sink wall. Set support clips for a flush cover position (approximately 1/2 inch below top). Interconnect a solenoid valve with the disposer delay-relay control to initiate the blended water flow when the disposer is activated. All inlet fittings must 1/2 inch copper, stainless steel or plated chrome tubing from blending valve to inlet fittings.

Chrome plate all exposed fittings.

2.7.4 Glass/Cup Rack Overshelf

Provide 14 gauge stainless steel glass/cup rack overshelf with a 1-1/2 inch deep "Vee" trough at free long sides with a 1 inch tight hem at inside of trough. Provide a 1/2 inch marine edge at free ends and a 4 inch high splash at the wall.

a. Suspend shelf with bottom edge at 18 inch above counter top.

b. Provide drain tubes at each end of trough through the backsplash to 3/4 inch above top of table.

c. Provide a horizontal rack rest of 1-5/8 inch outside diameter stainless steel tubing the full length of the shelf, supported 10 inch above the shelf on 1-1/4 inch outside diameter stainless steel tubing spaced at 60 inch on center.

2.7.5 Dish/Tray Return Shelf

Provide dish/tray return shelf as indicated on the drawings. Extend shelf through opening in wall to be flush with the wall at the deposit side. Turn down of shelf must be 1 inch at 90 degrees at the front with 3/4 inch return at bottom. Turn down rear long side 1 inch at 90 degrees, and integrate with dish counter whenever adjacent.

2.7.5.1 Dish/Tray Return Opening Frame

Provide 18 gauge stainless steel window shelf with the perimeter flange channel-formed, 1 by 3/4 inch at both sides of the wall. Weld corners of the frame. Install frame with concealed attachments. Aligned/abut jamb of frame with the end splash of dish counter, whenever adjacent.

2.7.5.2 Overhead Rolling Door

Provide and install an overhead rolling door into the dish/tray return. Coordinate enclosure and track installation with the splash/jambs, and partition bucks.

2.8 CONDENSATE HOODS AND EXHAUSTS

Provide hood and duct work systems conforming to ACGIH-2092S, SMACNA 1966, and NFPA 96. Unless otherwise specified, secure ducts and hoods to building so as to be level and free from vibrations under all conditions of operation. Supply and install exhaust fans for food service equipment and exhaust hoods as specified in cutsheet book.

2.8.1 Hood Exhaust and Supply Fans

Provide in accord with Section 23 00 00 AIR SUPPLY, DISTRIBUTION, VENTILATION AND EXHAUST SYSTEMS.

2.8.2 Hood Exhaust and Supply Duct

Provide in accord with Division 23, Section 23 00 00 AIR SUPPLY, DISTRIBUTION, VENTILATION AND EXHAUST SYSTEMS.

2.8.3 Condensate Exhaust Hood Connection Provisions

2.8.3.1 Exhaust Duct for Canopy or Noncanopy Condensate Hoods

Construct ducts with 18 gauge stainless steel. Weld all external seams liquid-tight to hood duct collar as required by NFPA 96. Duct size is based on a minimum air velocity of 800 fpm. Continuously weld duct, liquid tight, to hood duct collar as required by NFPA 96.

2.8.3.2 Hood Support

Support wall mounted or island type hoods from the ceiling structure with stainless steel mounting brackets provided with the hoods. Hanger rods must be 1/2 inch diameter stainless steel, threaded at the bottom and designed at the top to fit into inserts in building slats above or hanger attachments fastened to structural steel members. Space hanger rods 48 inch on center, maximum.

2.8.3.3 Make-Up Air Tempered and/or Untempered

Replace the air volume which is exhausted from a kitchen as required by NFPA 96. Air supplied upstream of the hood suction opening does not qualify as make-up air. The exhaust air flow rate of ventilation of dishwashing equipment must be drawn through the open area between the dishwashing machine and the perimeter entrance of the hood. Provide make-up air diffusers the full length of the front panels, at both sides of the hood producing a low velocity discharge. Provide a supply air plenum with 1 inch thick foil-faced fiberglass insulation at interior of plenum. The temperature differential between make-up air and the air in the conditioned space must not exceed 10 degrees F, except air that is part of the air conditioning system or air that does not decrease comfort conditions of the occupied space.

2.8.3.4 Vapor Proof Hood Lights and Wiring

Provide U.L. listed, recess mounted, gasketed vapor-proof LED lighting fixtures conforming to UL 1598, the full length of the hood as shown on the drawings. Provide, at Type 2 and Type 3 hoods, incandescent or fluorescent lights in accord with UL 1598. Prewire the light fixtures to junction box at a rear free corner. Use Cool white T-8 energy efficient lamps.

2.8.3.5 Closure Panels

Provide vertical corner mullions at removable closure panels, 2 by 2 inch wide, 16 gauge stainless steel, and weld integrally to furring and head channel. Provide exhaust hood closure panels 1/2 inch pan-formed 18 gauge stainless steel. Retain the upper edge of the panel in a 1 by 2 inch continuous 16 gauge stainless steel head channel secured to the hood superstructure. Mount the lower edge of the panels on perimeter furring cap, and turn back 1 inch for "zee" clip retention.

2.8.4 Ducts at Dishwashing Machines

Provide ducts at dishwashing machines consisting of two vertical ducts, one at each end of the dishwasher. Construct exposed, seamless, ducts of not less than 18 gauge stainless steel and size to accommodate the machine exhaust vent. The intake of each duct must be at the top edge of the dishwasher and extend to 6 inch above the finished ceiling for final connection. Trim the duct at the ceiling with a 16 gauge stainless steel

angle flange with corners welded. Connect the exhaust outlet to the exhaust system.

2.8.5 Duct Openings

Provide duct openings with collars of quantity/size as indicated, with a stainless steel louvered grille at the openings. Trim and seal all penetrations of the dishwashing machine duct risers through the hood body.

2.9 GARBAGE DISPOSAL MACHINES

Provide floor-mounted type disposer conforming to ASSE 1009, with cast alloy body supported on adjustable tubular legs. Attach waste chamber lid with quick-release clamps. Connect hopper to disposal with a flexible sleeve of molded neoprene, held in place with stainless steel clamps.

2.9.1 Disposal Cone

Fabricate with approximate diameters of 18 inches inside unit and 8 inches at throat. Provide neoprene silver trap at throat and water swirl inlet in cone to create counterclockwise rotation. Secure cone to disposer with flexible connector sleeve and stainless steel clamps.

2.9.2 Motor

Mount motor with 3 inch minimum clearance above floor. Provide with magnetic starter with overload and under-voltage protection timer for 0 to 5 minutes, panel cover interlock, fused disconnect, prewired solenoid, vacuum breaker, two water flow controls, and automatic reversing action. Provide cast alloy rotor carrying rigid impact bars and fixed directly onto motor shaft. Provide motors of the following minimum sizes on disposals at locations listed:

a. Pot and pan sink: 5 horsepower

b. Soiled dishtable: 7.5 horsepower.

2.9.3 Disposal Control Center

Include time delay relay, start and stop buttons, panel cover interlock with fused safety disconnect switch and circuit breaker, door locking feature that prevents opening door with power on, full voltage magnetic starter with both overload and under-voltage protection, and solenoid valve. Control center must be waterproof and fabricated using stainless steel and in accord with NEMA ICS 6. Provide controls conforming to NEMA ICS 2.

2.10 DRAINS

Provide cleanout for all drains. Locate drains so that drain lines from equipment are not located in any portion of a walking surface or produce a tripping or burn hazard.

2.11 DRAIN TRENCH LINER/GRATING

Provide 14 gauge stainless steel drain trench liner/grating in sizes as indicated with a 1 inch wide perimeter shoulder at the top, turned up flush and level with finished floor, tight-hemmed back down to the shoulder level and flanged out 2 inch for attachment to the slab.

2.11.1 Interior of the Liner

Interior of the liner must be 6 inch deep with corners coved on 3/4 inch radius; sloped and scored 1 inch to an integrally welded box pattern drain (drain housing only). Provide drains at 48 inch on center maximum and fit with 6 inch long welded tailpiece. Connect a safety chain to the basket strainer assembly and the top of the liner wall. Underside of sloping portion of liner must have 2 inch long "zee" clips.

2.11.2 Aluminum Grating

Provide aluminum grating, removable without the use of tools, with 1-1/2 by 3/16-inch bearing bars and a perimeter frame. Close bearing bars must have a 1-5/16 by 4 inch centerline to centerline grid. Provide section quantities and sizes as indicated on the drawings with a maximum of 24 inch long sections.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 General

Install in accord with the manufacturer's printed instructions.

3.1.2 Cutting and Patching of Construction

Lay out work in advance to prevent damage to building, piping, wiring, or equipment as a result of cutting for installation.

3.1.3 Setting and Connecting

Install 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. Flash food service cabinets located in wall openings to the walls with 20 gage stainless steel. Seal around equipment flashing and flanges, at walls, floor, and ceiling in accord with Section 07 92 00 JOINT SEALANTS. Fillers must be continuous, without opening.

3.1.4 Plumbing Work

Refer to section 11 05 40 COMMON WORK RESULTS FOR FOOD SERVICE EQUIPMENT.

3.1.5 Electrical Work

Electrical systems, components and accessories must be certified to be in accordance with NFPA 70 and the following:

3.1.5.1 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.

3.1.5.2 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.

3.1.5.3 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 (heated cabinets, dish carts, etc.) and counter appliances mounted on mobile stands (mixers, food cutter, toaster, coffee makers, microwave ovens, etc.) must have cord/cap assembly with cord-hanger as provided by the manufacturer.

3.1.5.4 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.

3.1.5.5 Motors

Provide motors at 120, 240, 208/240 and 460/480 volts with starter, overload protection, and short circuit motor protection per manufacturer standards.

3.1.5.6 Heating Elements

Provide thermostatic controls for all electrically heated equipment. Equip water heating equipment with a positive low-water shut-off.

3.1.5.7 Receptacles and Switches

Install receptacles which are located in vertical panels of closed base bodies in 12 by 8-1/2 by 3 inch deep recessed mounting panel sloped on a 60-degree angle and turned up to the top of the opening. Prewire receptacles which are located in closed base fixtures to a junction box located within 6 inch from the bottom of the utility compartment. Horizontally mount receptacles which are installed in/on fabricated equipment in a metal box with a stainless steel cover plate.

3.1.5.8 Light Fixtures

Prewire light fixtures with lamps which are installed in/on fabricated or field-assembled equipment to a junction box for final connection (fixtures must be continuous run when indicated). Install fluorescent display light the full-length of the display stand and serving shelf with stud bolts or as indicated, and prewire through a support post to a recess-mounted switch. Install heat lamps to underside of serving shelf assemblies as specified. Heat lamp length for chassis must be sized per manufacturer or as indicated on the drawings. Electrically connect cold storage light fixtures through the hub fitting located on the top of the fixture. Horizontal conduit must be above the ceiling panels. Install plastic sleeves through ceiling panels for electrical conduit and seal all penetrations airtight at both sides of panel.

3.1.5.9 Final Electrical Connection Provisions

Tag final electrical connection points of equipment with item number, name (as indicated on FOOD SERVICE EQUIPMENT SCHEDULE) of devices on the circuit, total electrical load, voltage, and phase. Fabricated equipment containing electrically-operated components or fittings, indicated on utility connections drawings to be direct-connected, must have each component, fitting, or group thereof prewired to a junction box for final connection. Refer to the drawings for circuit loading.

Field-assembled equipment (example, prefabricated cold storage assemblies, conveyor systems, exhaust hoods) must have electrical components completely interconnected by this section for final connection as indicated on utility connection drawing. Prewire the following groups of cold storage assembly electrical devices to a top-mounted junction box for final connection per compartment grouping, unless otherwise indicated.

a. Light fixtures, switches, and heated pressure-relief vent.

b. Door/jamb heater and temperature monitors/alarms.

c. Evaporator fans, defrost elements, freezer fan door switch, and drain line heaters.

3.1.5.10 Lamps

Provide food service equipment containing light fixtures with standard appliance type bulbs or energy efficient appliance type bulbs as indicated on the drawings. Exposed fluorescent lamps above or within a food zone must have plastic coated T-8 energy efficient lamps or standard lamps, sleeved in plastic tube with end caps.

3.1.6 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.

a. Light fixtures, switches, and heated pressure-relief vent.

b. Door/jamb heater and temperature monitors/alarms.

c. Evaporator fans, defrost elements, freezer fan door switch, and drain line heaters.

3.1.7 Installation of Hoods

Install in accord with NFPA 96. Install hoods to remain free from vibration under all conditions of operation.

3.1.8 Floor Screeds

Anchor, install, and seal in accord with the recommendations of the manufacturer of the walk-in unit.

3.2 FIELD INSPECTIONS AND TESTS

3.2.1 Inspections

Inspect equipment, fixtures, and material after installation for compliance with the applicable standards and as specified in section 11 05 40 COMMON WORK RESULTS FOR FOOD SERVICE EQUIPMENT.

3.2.2 Field Test Reports

Upon completion of inspection perform operational tests on each piece of equipment to determine that equipment and components, including controls, safety devices, and attachments, operate as specified and are properly installed and adjusted. Test all water, drain, gas, steam, oil, refrigerant, and liquid carrying components for leaks. Notify the Contracting Officer 14 calendar days prior to testing.

-- End of Section --

SECTION 11 53 00

LABORATORY EQUIPMENT AND FUMEHOODS
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-2092S	(2004) Industrial Ventilation: A Manual of Recommended Practice

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

Too many characters	Laboratory Ventilation Package

ASTM INTERNATIONAL (ASTM)

ASTM A1008/A1008M	(2015) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardened
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 C1048	(2012; E 2012) Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 45	(2015) Standard on Fire Protection for Laboratories Using Chemicals
NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 586	(2009; Reprint Sep 2014) Standard for High-Efficiency Particulate, Air Filter Units

1.2 RELATED WORK SPECIFIED IN OTHER SECTIONS

Provide final utility connections and utility service to equipment including waste, under Sections 23 03 00.00 20 BASIC MECHANICAL MATERIALS AND METHODS; 22 00 00 PLUMBING SYSTEMS; 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS; and 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

1.3 SUBMITTALS

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

SD-02 Shop Drawings

Laboratory equipment and fume hood layout; G

Laboratory equipment and hood schedules

SD-03 Product Data

Fumehood assembly; G

Include descriptive literature, technical data sheets, and diagrams.

SD-04 Samples

Exterior hood paint; G

SD-06 Test Reports

Fumehood test; G

Base cabinet test; G

SD-08 Manufacturer's Instructions

Fumehood assembly

SD-10 Operation and Maintenance Data

Fumehood assembly, Data Package 2; G

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.4 SUBMITTAL REQUIREMENTS

1.4.1 Hood Paint

Submit color chips of exterior hood paint. Submit at least five samples. Color is to match other metal casework within the space where fumehood is located.

1.4.2 Drawing Requirements

Show pertinent installation layout. Indicate details of construction and rough-in requirements.

1.4.3 Schedule

Include each type of equipment and hood and submit in accordance with Section 12 32 00 MANUFACTURED WOOD CASEWORK.

1.4.4 Tests

Submit fumehood test and cabinet test reports required by ACGIH-2092S.

PART 2 PRODUCTS

2.1 MATERIALS, COMPONENTS, AND SPECIAL DESIGN REQUIREMENTS

2.1.1 General

Fume hood is to comply with
ANSI/ AIHA/ ASSE Z9.5-2012 / ANSI/ASHRAE 110-1995. Hood to be pass-through type laboratory hood for installation in wall between two rooms.

2.1.2 Aluminum Alloy

ASTM B221 equivalent in ultimate tensile, yield, and shear strengths to Alloy 6063-T5 or 6063-T6.

2.1.3 Carbon Steel

ASTM A1008/A1008M, cold rolled sheets, commercial bright finish.

2.1.4 Stainless Steel

ASTM A167; No 4 satin finish including welds and fabricated surfaces. Provide Type 302, 304, or 316 alloy unless otherwise specified. Provide minimum thickness of U.S. Standard 16 gage, except 14 gage for working surface.

2.1.5 Safety Glass

ASTM C1048, fully tempered "FT," clear.

2.1.6 Casework Components

Conform with Section 12 32 00 MANUFACTURED WOOD CASEWORK for base cabinets, counter tops, service fittings and finishes.

2.1.7 High Efficiency Particulate Air (HEPA) Filter

Meet requirements of UL 586.

2.1.8 Fumehood Design

Design, calculate face velocities, and test fume hoods in accordance with ACGIH-2092S, Laboratory fume hoods, auxiliary systems, and associated equipment shall meet the requirements of NFPA 70 and NFPA 45.

2.1.9 Hood Static Pressure Loss

With one sash in full-open position the static pressure loss through the fumehood shall not exceed 0.33 inch water gage when operating at 100 feet per minute (fpm). For hoods equipped with bypass, the static pressure loss and exhaust volume shall remain relatively constant (within 5 percent) regardless of sash position.

2.1.10 Electrical Devices

Prewired at the factory to a common, integral junction box to provide easy exterior connection and disconnection.

2.2 UNITS

2.2.1 Fumehood Assembly, Constant Volume

Constant volume, bypass/airfoil configuration, enclosed unit mounted on base cabinet; exterior dimensions maximum 49 inches wide (across face) by 30 inches deep (front to back) by 96 inches high; interior working area at least 36 inches wide 24 inches deep by 47 inches high.

2.2.1.1 Base Cabinet Portion of Assembly

Carbon steel, modified to have recessed apron to contain electrical convenience outlets.

2.2.1.2 Hood Interior, Including Working Surface

Type 304 stainless steel, with interior vertical joints and intersections of vertical surface with working surface having an approximate 3/4 inch radius. Provide working surface with a raised rim around all sides to prevent spillage from running out face of hood.

2.2.1.3 Sash

Safety glass, 7/32 inch minimum thickness, counterbalanced, vertical sliding type, Type 304 stainless steel frame.

2.2.1.4 Baffle

Adjustable, with moving parts resistant to corrosion, removable for cleaning.

2.2.1.5 Lighting Fixtures

Vapor proof, fluorescent, with cool white lamps and switch, providing 75 foot candles on working area. Locate switch for fixture on exterior of hood frame, or in recess of base cabinet. Provide sealed safety glass window barrier between interior working and fixture spaces, and access for tube replacement exterior to hood interior working area.

2.2.1.6 Service Fixtures

Provide remote controls for piped services and locate on hood exterior frame. Provide serrated supply ends with nozzles arranged close to sash, precluding the need of reaching to interior back of hood to make connections to outlets. Base metal of fixtures shall be brass. Protect metal fixtures inside hood with chemical resistant coating of clear plastic

over polished chrome plate.

a. Cold water: Remote controlled valve, with vacuum breaker; hood wall mounted gooseneck faucet with serrated nozzle. Arrange faucet parallel to hood wall and over cup sink.

b. Gas, air and vacuum: Provide fixtures for each service, each fitting with remote controlled valve and supply end (inside hood) consisting of a serrated hose nozzle and escutcheon trim. Provide natural gas, air at 85 psig, and vacuum at 30 inches of HG.

c. Acid waste: Recessed cup sink, 3 by 6 inches or 3 by 9 inches, fabricated of Type 316 stainless steel, 2 liter capacity. Furnish with acid waste p-trap and locate under water faucet, integral with countertop. Provide acid vent.

d. Electrical convenience outlets: Two duplex, grounded, three-wire, 125 volt, 60 Hz, single phase, 20 ampere. Locate in recessed area of base cabinet or on side posts of hood. Provide stainless steel or chrome-plated cover plate. Provide 15 ampere circuit breaker protection.

2.2.1.7 Blower Switch

Single-pole, 115-volt, 60-Hz, with pilot light. Locate switch in hood frame or in recess of base cabinet.

2.2.1.8 Duct Stub

Collar size suitable for ductwork indicated. Finish of areas that may come in direct contact with fumes shall be same material and finish as hood interior.

2.2.1.9 Warning System

Ensure detection and alarm for insufficient air velocities caused by failure of exhaust system or by dirty filters. Audible alarm to sound to prevent simultaneous opening of both sashes on opposite sides of hood.

PART 3 EXECUTION

3.1 INSTALLATION

Install units at locations indicated. Conform to installation provisions of Section 12 32 00 MANUFACTURED WOOD CASEWORK and utility installation provisions of Section 23 11 25 FACILITY GAS PIPING; Section 33 51 15 NATURAL-GAS / LIQUID PETROLEUM GAS DISTRIBUTION; Section 22 00 00 PLUMBING, GENERAL PURPOSE; 22 15 14.00 20 GENERAL SERVICE COMPRESSED-AIR SYSTEMS, LOW PRESSURE; 22 66 53.00 20 LABORATORY CHEMICAL-WASTE AND VENT PIPING;and the ACGIH-2092S including provision for an adequate supply of tempered make-up air to meet the air flow requirements of fume hood(s). Provide interlocks for controls and alarms to maintain the required air balance between hood interiors and the room.

3.2 POSTED OPERATING INSTRUCTIONS

Provide in accordance with the requirements in Section 23 03 00.00 20 BASIC MECHANICAL MATERIALS AND METHODS.

3.3 FIELD QUALITY CONTROL

3.3.1 Inspection

Examine each unit for visual defects, operation and conformance to specifications.

3.3.2 Tests

Test each unit to ensure that the equipment is operational and conforms to specification requirements. Field tests for fume hood operation and performance shall meet the requirements of ACGIH-2092S.

-- End of Section --

SECTION 11 68 14.01

INDOOR ATHLETIC EQUIPMENT
06/08

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 B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM E84	(2015a) Standard Test Method for Surface Burning Characteristics of Building Materials

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 1	(2000; R 2008; E 2010) Standard for Industrial Control and Systems: General Requirements
NEMA ICS 2	(2000; R 2005; Errata 2008) Standard for Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 6	(1993; R 2011) Enclosures
NEMA MG 1	(2014) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code
NFPA 701	(2015) Standard Methods of Fire Tests for Flame Propagation of Textiles and Films

UNDERWRITERS LABORATORIES (UL)

UL 48	Electric Signs

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:ASTM B209

SD-03 Product Data

Basketball Equipment
Wall-Mounted Safety Pads
ROLL-UP GYM DIVIDER
SCOREBOARD
BLEACHERS

SD-07 Certificates

Basketball Equipment
Wall-Mounted Safety Pads
ROLL-UP GYM DIVIDER
SCOREBOARD
BLEACHERS

Prior to the delivery of equipment, certificates of compliance attesting that equipment meet the specified requirements. Certified copies of the material certificates shall include composition and tests to which the material has been subjected.

Installer Qualifications

The installer's company name and address, and training and experience certification.

SD-10 Operation and Maintenance Data

Basketball Equipment
Wall-Mounted Safety Pads
ROLL-UP GYM DIVIDER
SCOREBOARD
BLEACHERS

Data in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.3 DELIVERY, STORAGE AND HANDLING

Deliver athletic equipment in unopened cartons or bundles.

1.4 WARRANTY

Provide manufacturer's standard performance guarantees or warranties. All material and labor shall be warranted for two years.

1.5 MAINTENANCE

Clearly identify each package.

Submit maintenance data in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.6 PROJECT/SITE CONDITIONS

Environmental Limitations: Do not install athletic equipment until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for project when occupied for its intended use.

Field Measurements: Verify position and elevation of floor inserts and layout for athletic equipment. Verify dimensions by field measurements.

1.7 QUALITY ASSURANCE

Installer Qualifications: A qualified installer employing workers trained and approved by manufacturer.

Source Limitations: Obtain each type of athletic equipment through one source from a single manufacturer.

Electrical Components, Devices and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

Standards: Provide athletic equipment complying with or exceeding requirements of authority having jurisdiction.

PART 2 PRODUCTS

2.1 BASKETBALL SYSTEM

Provide a complete ceiling suspended forward folding, electrically operated basketball backstop system complete with backboard, goal, winch, height adjuster, backboard edge padding, and net. All components including framing, backboard, goals, electric winches, controls, and accessories for basketball backstop assemblies shall be products of a single manufacturer. Backstops shall be designed, fabricated, and installed to comply with National Collegiate Athletic Association (NCAA) and National Federation of State High School Associations (NFSH) regulations.

2.1.1 Basketball Equipment

1. General: Provide equipment complying with requirements in NCAA Basketball Rule Book. Protruding fasteners or exposed bolt heads on front face of backboards are not permitted.

2. Overhead-Supported Backstop OSB-1: Complete assembly spanning height indicated on Drawings, including primary and secondary superstructure support framing to building structure, pipe and cable bracing, adjustable hangers, clamps, cables, chains, pulleys, fittings, hardware, and fasteners.

a. Framing: Steel pipe, tubing, and shapes. Design framing to minimize vibration during play.

1) Center Mast: Welded and bolted or clamped construction with side sway bracing of pipe.

2) Dual-Mast

3) Finish: Manufacturer's standard factory-applied, baked powder-coating finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness; black.

b. Folding Type: Provide manufacturer's standard assembly for forward-folding, rear-braced, with hardware and fittings to permit folding.

c. Goal Height Adjuster: Adjuster from 8 to 10 feet with crank mechanism, locking in any position within adjustment range, with visible height scale and finish matching framing.

1) Operation: Motorized drive device, for plugging in to building power. Provide one drive device.

4. Backstop/Backboard Safety Device: Designed to limit free fall if support cable, support chain, pulleys, fittings, winch or related components fail; with mechanical automatic reset; 6000 pound load capacity; one per folding backstop.

a. Retractor Device: Spring-activated, reel type device designed to retract both support and safety cables, chains and straps away from play of the basketball when backstop is in playing position; one per folding backstop.

5. Electric Operator (EO-1): Provide factory-assembled electric operator for backstop designed for lifting and lowering basketball equipment of type, size, weight, construction, use and operation frequency indicated. Provide operation system, of size and capacity and with features, characteristics and accessories suitable for project conditions, recommended by gymnasium equipment manufacturer; complete with winch or hoist designed to move and hold backstop in any raised or lowered position, electric motor and factory-prewired motor controls with limit controls, remove control stations, remote control devices, power disconnect switch, enclosures protecting controls and all operating parts, and accessories required for proper operation. Include wiring from motor controls to motor. Coordinate operator wiring requirements and electrical characteristics with the building electrical system.

a. Comply with NFPA 70.

b. Control Equipment: Comply with NEMA ICS 1, NEMA ICS 2 and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24 V AC or DC.

c. Winch: Consisting of heavy-duty, fully enclosed worm gear reducer, belt and sprocket drive, cable drum, cable and fittings.

d. Electric Motor: UL approved or recognized, totally enclosed, insulated, capacitor-start motor, complying with NEMA MG 1, with thermal-overload protection, brake and permanently lubricated bearings; sized to start and operate size and weight of basketball equipment considering project's service conditions without exceeding nameplate ratings or considering service factor.

1) Service Factor: According to NEMA MG 1, unless otherwise indicated.

2) Motor Characteristics: Single phase, sized by gymnasium equipment manufacturer, 115 V, 60 Hz.

e. Operator Mounting: Wall, on equipment mounting pad.

f. Remote Controls: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting.

1) Control Stations: Dual keyed, one key for up and one for down, momentary-contact, three-position, switch-operated control

with up, down and off functions; one switch per each backstop. Provide two sets of dual key(s) per station.

2) Control Station Enclosure: Provide key-accessed, prime-painted metal enclosure for safeguarding control station. Provide two sets of keys per enclosure.

g. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop basketball equipment at fully retracted and fully lowered positions.

6. Basketball Backboard (BB-1): Provide predrilled holes or preset inserts for mounting goals.

a. Description: Rectangular, 72 inches by 42 inches width by height with rounded corners fabricated from the following:

1) Glass: Not less than 1/2 inch thick, transparent tempered glass complying with ASTM C 1048 Kind FT (fully tempered) and with impact testing requirements in 16 CFR 1201 Category II or ANSI Z97.1 Class A for safety glazing. Provide glass with impact-absorbing resilient rubber or PVC gasket around perimeter in a fully welded, brushed-natural-finish, extruded aluminum frame, with steel subframe, reinforcement, bracing, and mounting slots for mounting backboard frame to backboard support framing.

b. Target Area and Border Markings: Permanently etched in white color, marked in pattern and stripe width according to referenced rules.

c. Target Area and Border Markings: Marked in pattern, stripe width and color according to referenced rules.

d. Finish: Manufacturer's standard factory-applied, white background.

e. Rim-Restraining Device: Complying with NCAA and NFHS rules and designed to ensure that basket remains attached if glass backboard breaks.

7. Goal Mounting Assembly: Compatible with goal, backboard, and support framing, with 5 inches o.d. horizontally and vertically 5 inches o.c. horizontally and 4 inches o.c. vertically.

8. Basketball Goals (BG-1): Complete with flanges, braces, attachment plate and evenly spaced loops welded around underside of ring.

a. Single-Rim Basket Ring Competition Goal: Materials, dimensions and fabrication complying with referenced rules.

b. Mount: Rear mount.

c. Net Attachment: No-tie loops for attaching net to rim without tying.

d. Finish: Manufacturer's standard factory-applied, baked powder-coating finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking and minimum dry film thickness; orange.

9. Basketball Nets (BN-1): 12 loop mesh net, between 15 inches and 18

inches long, sized to fit rim diameter, and as follows:

a. Cord: Made from white nylon.

10. Safety Pads: Provide safety pads, complying with NCAA and NFHS, designed for backboard thickness indicated and extending continuously along bottom and up sides of backboard and over goal mounting and backboard supports as required by referenced rules.

a. Safety Pad Attachment: Hook and loop.

b. Color: As selected by Contracting Officer from manufacturer's full range.

2.1.2 Wall-Mounted Safety Pads

1. Safety Pad Surface-Burning Characteristics: Provide safety pads with flame-spread index of 25 or less and smoke developed index of 450 or less, as determined by testing identical products per ASTM E84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

2. Pad Covers: Provide safety pad fabric covers fabricated from puncture-and-tear-resistant, not less than 14 oz. PVC-coated polyester or nylon-reinforced PVC fabric treated with fungicide for mildew resistance, with the fire-test-response characteristics indicated, lined with fire-retardant liner.

a. Flame-Resistance Ratings: Passes NFPA 701.

3. Wall Safety Pads (WSP-1): Padded wall wainscot panels designed to be attached in a continuous row; each panel section consisting of fill laminated to backer board with visible surfaces fully covered by seamless fabric cover, free from sag and wrinkles and firmly attached to back of backer board.

a. Backer Board: Not less than 3/8 inch thick plywood, mat-formed, or composite panel.

b. Fill: Multiple-impact-resistant foam not less than 1-1/2 inch thick polyurethane, 3.5 lb. density.

c. Fire-Resistive Fill: Multiple-impact-resistant foam not less than 1-1/2 inch thick fire-resistive neoprene, 6 lb. density.

d. Size: Each panel section, 24 inches wide but not less than 60 inches long. Coordinate width with attachment conditions at windows.

e. Number of Panel Sections: As indicated on drawings, modular panel sections.

f. Installation Method: Typically, concealed mounting Z-clips and 1 inch bottom fabric attachment flange with exposed fasteners. At windows provide hook and loop type fasteners adhesive applied to mullions.

g. Fabric Cover Colors: Match school colors.

h. Graphics: Custom graphics as indicated on drawings.

4. Corner Wall Safety Pads (CWP-1): Wall corner pad consisting of not less than 1-1/4 inch thick, multiple-impact-resistant, closed-cell polyethylene-foam filler, covered both sides and all edges of pad by fabric cover with self-adhesive hook-and-loop attachment.

a. Length: Each pad matching length of wall safety pads.

b. Fabric Cover Colors: From manufacturer's standard colors.

5. Pads to cover all surfaces as delineated in the documents, including all wall projections at columns. Provide outside corners and single piece corners. Coordinate pad layout with all wall mounted devices including but not limited to switches, outlets, and controls. Provide factory sewn cutouts for all devices.

2.2 ROLL-UP GYM DIVIDER

A. Lower section of curtain shall be solid vinyl coated polyester (avg. 18 oz.or 22 oz. per square yard as required). Flammability rated as self extinguishing by the California State Fire Code. All seams to be electronically welded with a 1 inch full contact weld. Outer edge hems shall be triple turned with double welds. Curtain shall be rolled on a 3 1/2 inch diameter round batten which is secured to the bottom edge of curtain with an aluminum stop strip.

B. Upper section of curtain shall be avg. 9 oz. per square yard vinyl coated polyester. Flammability rated as self extinguishing by the California State Fire Code. Color shall be chosen from four standard (white, yellow, red, blue and black weave) as specified by the contracting officer. Use vinyl fabric, in triple thickness and double welded to the top edge of the mesh, to form a 6 inch wide pocket to accommodate a 1 5/8 inch diameter round batten for curtain support.

C. Suspension from roof support member must be accomplished with clamp type malleable lug fitting furnished by the manufacturer. Rolling action shall be achieved by belts being wound onto a rotating drive pipe. Hoist belts shall be 5 inches wide polyester webbing offering a high tensile strength per belt. Each belt is to be straight and true to insure proper wrapping of the belt onto the drive pipe. Belts shall be located approximately 15 feet on center. Lift belts are attached to the drive pipe, travel under the bottom batten and terminate at the top batten. Drive pipe shall rotate in drive pipe support assembly, located approximately 9 feet on center.

D. Drive pipe power mechanism shall consist of a 1 H.P., 110-120 volt, 60 cycle, single phase reversible capacitor motor with built-in thermal overload protection. The motor and load holding worm gear reducer shall provide speed reduction in the winch. remote control operation to include integral limit switch to control the upper and lower limit of the curtain travel.

E. Key lock, three position, momentary contact wall switch with safety delay included. Switch unit shall include a general purpose switch box with a polished wall plate.

2.3 SCOREBOARD

General Information:

A. Scoreboard is capable of timing and scoring for teams. 100 percent solid state electronics housed in an all aluminum cabinet.

B. Scoreboard comes complete and ready to install. Hanging brackets are supplied. Scoreboard shall be ETL listed, tested to UL 48 and CAN/CSA-C22, No. 207-M89.

C. Scoreboard shall be able to be controlled remotely by wireless signal.

D. Dimensions shall be 6 feet high, 10 feet wide, 6 inches deep. Weight shall not exceed 150 lb.

E. Power scoreboard shall be 120 VAC (100W; .83A and constructed of aluminum alloy 5052, conforms to ASTM B209.

F. Nominal digit size of all numbers is 15 inches high and 11 inches high. All digits are red in color with 180 degree viewing angle. HOME and GUEST captions are 8 inches high. All other captions are 5 inches high. All captions are in white vinyl and are applied directly to the display face.

G. Scoreboard shall be finished with powder coat manufacturer's standard color. As selected from manufacturer's standard colors.

H. Scoreboard: 22 deg to 122 deg F. Console: 32 deg to 122 deg F. The control console is stainless steel case. Console has a 40-character liquid crystal to recall and verify information being displayed on the scoreboard. The control console maybe operated on 120 VAC. The power cord is 6 feet long. Maximum power demand is 4 watts. A cover plate with a mounted connector and a standard 2 inch x 2 inch x 4 inch outlet box is factory pre-wired when two lengths of cable are ordered for a standard installation.

I. The horn sounds automatically when the period time counts down to zero or can be manually sounded by the operator. The horn is a vibrating type located behind the face of the scoreboard.

J. Warranty: Manufacturer must warranty scoreboard and control console for five years. Warranty includes cost of labor and parts when returned to manufacturer.

L. Accessories shall include:

a. Durable console carrying case
b. Visual horn indicator
c. Display
d. 2.4 GHz spread spectrum radio
e. Protective cage
f. Name message center
g. Panels

2.4 BLEACHERS (Bid Option 3)

Provide bench style fixed bleacher seating in configuration shown on drawings. Bleachers shall be 2 tiers with a minimum of 126 linear feet of seating total, and shall provide adequate egress as shown in the drawings. The system shall meet the following requirements:

A. Aisles shall be footrest level 4 feet 6 inches wide. Aisles at the footrest level shall have non-slip treads on the top front edge.

B. Aisles shall have fixed handrails.

C. Benches and risers shall be injection molded high density modular plastic construction. The benches shall have a profile including a moderate concave seat contour and a rounded front edge. Seats are to be textured on top to enhance comfort.

D. Bleacher end shall be closed off using accessories provided as part of the bleacher system by the same manufacturer.

E. Deck System Footboards shall be 3/4 inch plywood with top facing. All surfaces shall be thoroughly sealed. Top facing shall receive three coats of colored, opaque, catalyzed epoxy coating. Aluminum trim shall be installed on exposed edges. Adjacent foot boards shall be joined by means of extruded aluminum joiner beam sized for 3/4 inches footboards.

F. Provide thru-bolt fastening through galvanized steel riser beams at locations of splices in rear riser. Front deck connection shall be provided using front steel nose beams.

G. Row rise shall be a manufacturer standard, approximately 12 inches.

H. Bleacher systems to be manually operated.

PART 3 EXECUTION

3.1 EXAMINATION - PREPARATION

Examine substrates, areas and conditions, with installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.

1. Verify critical dimensions.

2. Examine supporting structure and below finished floor for subgrades, subfloors and footings.

3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements have been clearly marked for installers. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

General: Comply with manufacturer's written installation instructions and competition rules indicated for each type of athletic equipment. Complete equipment field assembly, where required.

Unless otherwise indicated, install athletic equipment after other finishing operations, including painting, have been completed.

Permanently Placed Athletic Equipment and Components: Rigid, level,plumb, square and true; anchored securely to supporting structure; positioned at

locations and elevations indicated on Shop Drawings; in proper relation to adjacent construction; and aligned with court layout.

Anchoring to In-Place Construction: Use anchors and fasteners where necessary for securing built-in and permanently placed athletic equipment to structural support and for properly transferring load to in-place construction.

Connection: Connect automatic operators to building electrical system.

3.3 ADJUSTING

Adjust movable components of athletic equipment to operate safely, smoothly, easily and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

3.4 CLEANING AND PROTECTION

After completing athletic equipment installation, inspect components. Remove spots, dirt and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.

Provide final protection and maintain conditions acceptable to manufacturer and installer that ensure athletic equipment is without damage or deterioration at time of Substantial Completion.

Replace athletic equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate and maintain athletic equipment. Refer to Section 01 78 23 OPERATION AND MAINTENANCE DATA.

-- End of Section --

SECTION 11 81 29

FACILITY FALL PROTECTION
06/16

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. The design shall comply with the edition in effect at the time of Contract Award.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC S342L	(1993) Load and Resistance Factor Design Specification for Structural Steel Buildings (including Supplement No.1)

ASME INTERNATIONAL (ASME)

ASME A120.1	(2008) Safety Requirements for Powered Platforms and Traveling Ladders and Gantries for Building Maintenance

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI/IWCA I-14.1	(2001) Window Cleaning Safety Standard

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.24	(2014) Roofing - Safety Requirements of Low-Sloped Roofs

ASTM INTERNATIONAL (ASTM)

ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A240/A240M	(2015b) Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM A325	(2014) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A490	(2014a) Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
ASTM A500/A500M	(2013) Standard Specification for

	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A666	(2015) Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar

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

29 CFR 1926	Safety and Health Regulations for Construction

U.S. ARMY CORPS OF ENGINEERS (USACE)

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

1.2 DESCRIPTION OF FALL ARREST SYSTEM WORK

The Fall Arrest Systems shall allow the user to walk uninterrupted the entire length of the system and provide secure anchorage to arrest a fall by the users. All components shall be included, so as to provide a complete and fully operational system.

a. This Section specifies design, manufacturing, supply and installation of window washing systems,suspended maintenance and fall protection equipment.

b. This Section includes fall arrest components and window cleaning fall protection items, but limited to the following:

Roof Anchors

Wall Anchors

Tie-Backs

Horizontal Cable Lifelines

Davits

Monorail Trolley

Monorail Channel

Guard Rails

Safety Harnesses and personal equipment

1.3 RELATED SECTIONS

Section 01 35 26	Governmental Safety Requirements
Section 05 50 13	Miscellaneous Metal Fabrications
Section 07 31 13	Asphalt Shingles
Section 07 31 26	Slate Shingles

Section 07 32 14	Clay Tile Roofing Replacement or Repair
Section 07 41 13	Metal Roof Panels
Section 07 41 13.16	Copper Roof Panels
Section 07 41 63	Fabricated Roof Panel Assemblies
Section 07 51 13	Built-Up Asphalt Roofing
Section 07 52 00	Modified Bituminous Membrane Roofing
Section 07 53 23	Ethylene-Propylene-Diene-Monomer Roofing
Section 07 54 19	Polyvinyl-Chloride Roofing
Section 07 55 00	Protected Membrane Roofing
Section 07 55 63	Vegetated Protected Membrane Roofing Assembly
Section 07 60 00	Flashing and Sheet Metal
Section 07 61 14.00 20	Steel Standing Seam Roofing
Section 07 61 15.00 20	Aluminum Standing Seam Roofing
Section 07 62 13	Copper Sheet Metal Flashing and Trim
Section 07 72 20	Gravity-Type Roof Ventilators
Section 07 92 00	Joint Sealants

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. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fall Arrest Protection System Fabrication Drawings; G

Drawings depicting loads, components and attachments to structural system.

Plans and details of entire fall protection layout, showing member sizes and part identification, fasteners, anchors, fittings and evidence of compliance with structural performance requirements.

Provide manufacturer's certifications that the ultimate strength of the fall protection system is equal to or greater than those specified.

Include data regarding installation and rigging as well as all necessary Restrictive and Non-Restrictive General Safety and Usage

Notes.Include data regarding installation and rigging as well as all necessary Restrictive and Non-Restrictive General Safety and Usage Notes.

Ensure Shop Drawings are reviewed and signed by a Licensed Engineer in jurisdiction where the project is located. Submit calculations and test reports.

SD-03 Product Data

Fall Arrest Protection System; G

Pre-Manufactured Accessories

Operating Procedures Outline Sheet (Opos); G

Submit an Operating Procedures Outline System (OPOS) including necessary elements in both pictorial and written form, to instruct employees in safe use of roof supported building maintenance equipment (fall protection) or window cleaning procedures.

SD-05 Design Data

Design Calculations; G, FIO

Submit all data required by this section. Include in calculations and test reports showing compliance with applicable codes and regulations for products and accessories provided.

SD-07 Certificates

Buy American; G

Provide evidence that products used within this specification are manufactured in the United States of America in accordance with Buy American Act.

Initial Engineer Certification Letter; G

Manufacturer's Qualifications

Installers' Qualifications

Manufacturer's Approval Of Installer

Certify that the Installer meets requirements specified under paragraph entitled "Qualification of Installer."

SD-10 Operation and Maintenance Data

Operations And Maintenance Instructions; G

Submit fall arrest protection equipment operating and maintenance instructions and procedures including necessary elements in both pictorial and written form, to instruct employees in safe use of fall protection equipment and system.

Include parts catalog with complete list of equipment replacement parts; identify each entry with equipment description and

identifying part numbers.

Include technical information for servicing equipment. Include legible as-built schematic of installed system. Include manufacturer's serial number, name and part number of each individual component used in the systems.

Include detailed operating procedures indicating proper use of equipment for safe operation of the system.

SD-11 Closeout Submittals

Warranty; G

Final Engineer Certification Letter; G

Submit "No-Dollar-Limit" warranty for labor and materials in accordance with Article 1.12.

Information Card; G

Instructions To Government Personnel; G

Include copies of Material Safety Data Sheets for maintenance/repair materials.

Provide manufacturer's maintenance instructions that include recommendations for annual inspection, re-certifications, periodic checking and adjustment of cable tension and periodic cleaning and maintenance of all railing and infill components.

1.5 PERFORMANCE DESIGN REQUIREMENTS

Provide Fall Protection System in compliance with OSHA, ANSI, and all applicable State and Federal regulatory requirements.

Anchor system shall provide independent fall arrest in addition to suspension line anchorages for descent location.

Design of fall arrest safety anchors, and equipment shall meet or exceed the following:

Fall Arrest Safety Anchors: design to a maximum fall arresting force of 1800 lbs (8.0 k) when wearing a body harness with a safety factor of 2 without any permanent deformation; and to 5000 lbs (22.24 k) against fracture or detachment.

Ensure design of primary support equipment is capable of sustaining without failure at least four times the maximum static working load applied or transmitted to the components.

Design supports for suspended platforms, davits, rigging sleeves and monorails for suspending a powered Platform from storage and rigging/working locations indicated in conformance with ASME A120.1. Design supports and the structures to which they are attached to a minimum of 1000 lbs (4.5 kN) vertical service load plus impact with a factor of safety as per AISC requirements, ACI or other applicable codes, and to 4 times the rated load against fracture or detachment.

1.6 QUALITY ASSURANCE

1.6.1 Design Data Required

Design Calculations: Design fall arrest system 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. Design calculation 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. Calculation Data submission must be concurrent with the submission of corresponding fabrication drawings. Fabrication drawings submitted without corresponding Calculations Design Data will be returned as "Not Reviewed", Calculations shall be submitted for information only.

1.6.2 Manufacturer's Qualification

Manufacturer of fall arrest protection equipment system is an entity specializing and capable of providing design, fabrication and installation; field service representation during construction and approving application method. Fall arrest protection system manufacturer must have a minimum of 10 years experience in manufacturing fall arrest protection products.

Welding to be executed by certified welders in accordance with AWS requirements.

1.6.3 Installer's Qualification

Installer must be part of the manufacturer's organization. If not, installer must be an experienced in performing work of this section who has specialized in installation of work similar to that required for this project, and approved, authorized, or licensed in writing by the fall arrest protection system manufacturer and have a minimum of five years experience as an approved, authorized, or licensed applicator with that manufacturer. The installer must supply the names, locations and client contact information of five projects of similar size and scope that the installation has constructed using the manufacturer's roofing products submitted for this project within the previous three years.

1.6.4 Certification Letters

A. Initial Engineer Certification Letter: Prior to the submission of shop drawings, product data, 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. Initial 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 fall arrest protection system with names and locations of five projects of similar size and scope for which he has provided calculations.
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 fall arrest protection system has been performed in accordance with the Professional Engineer's design.

B. Final Engineer Certification Letter: After construction of the fall arrest protection system is complete, submit a signed and sealed certification letter from the responsible design professional stating that the fabrication and installation of the fall arrest protection system has been performed in accordance with the Professional Engineer's design. Final certification letter shall be submitted for record only.

1.7 PRE-INSTALLATION CONFERENCE

1.7.1 Meeting Agenda

After approval of submittals and before starting installation of fall arrest protection system, roofing and insulation system installation work, hold a pre-installation conference to review the following:

Drawings, including Roof Plan, specifications and submittals related to the fall arrest protection work.

Field inspection and verification of all existing conditions, including all safety issues, existing structure, and any other work affected by the fall arrest protection system, which may require additional protection during installation.

Procedure for the fall arrest protection system manufacturer's technical representative's onsite inspection and acceptance of the roof structure, and distribution of copies of the inspection reports from the manufacturer's technical representatives to roof manufacturer.

Contractor's plan for coordination of the work of the various trades involved in providing the fall arrest protection system and other components secured to the roofing.

Quality control, (ARMA PMBRG98) plan for the fall arrest protection system installation.

1.7.2 Safety requirements

Coordinate pre-construction 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 fall arrest protection system,

Competent Person, Fall Protection as included in EM 385-1-1, and other trades interfacing with the roof work, designated safety personnel trained to enforce and comply with ASSE/SAFE A10.24, and representative of the fall arrest protection system manufacturer. Before beginning 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.

Contractor must also comply with safety requirements for as established in section 01 35 26 GOVERNMENTAL SAFETY REQUIREMENTS.

1.8 DELIVERY, STORAGE, AND HANDLING

1.8.1 Delivery

Deliver materials in manufacturers' original unopened containers with labels intact and legible. Mark and remove 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.

1.8.2 Storage

Protect materials from exposure to harmful weather conditions and temperatures conditions as recommended by the manufacturer. Protect against moisture and contamination or other damage. Avoid crushing or crinkling of materials. Store fall arrest protection system materials on appropriate 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. Provide sufficient ventilation to prevent condensation.

1.8.3 Handling

Prevent damage to fall arrest protection system materials. Provide new products and materials, and do not install any damaged components or materials in the work. Select and operate material handling equipment to prevent damage to materials or applied roofing.

1.9 PROPERTY PROTECTION

Take all precautions necessary to prevent damage to building during fall arrest protection system installation.

1.10 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 are installed as the work progresses. Ensure temporary protection measures are in place to preclude safety issues.

Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.

Ensure that products of this section are supplied to affected

trades in time to prevent interruption of construction progress.

1.11 PROJECT CONDITIONS

Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.12 WARRANTY

Provide fall arrest protection 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. Minimum manufacturer warranty shall have no dollar limit, cover full system operation as indicated on the following paragraphs.

Provide manufacturer's limited warranties as follows:

Anchors: 25 year limited warranty.

Monorail channel: Provide with manufacturer's 25 year limited warranty.

Monorail trolley: Provide with manufacturer's 10 year limited warranty.

Davits: Provide with manufacturer's 10 year limited warranty.

Other fall arrest components and materials: Provide manufacturer's 10 year limited warranty.

PART 2 PRODUCTS

2.1 FALL ARREST PROTECTION SYSTEM MATERIALS

Furnish a combination of specified materials that comprise the FALL ARREST PROTECTION manufacturer's standard system. Materials provided must be suitable for the service and climatic conditions of the installation. Fall arrest protection system must be visually free of broken pieces, particles of foreign matter, non-dispersed raw material, factory splices, or other conditions that might affect serviceability.

2.2 DESIGN PERFORMANCE REQUIREMENTS

2.2.1 General Requirements

Design fall arrest protection system (window cleaning and suspended maintenance system) to suit project requirements to AISC S342L and as indicated by Contracting Officer.

a. Ensure compatibility with industry standard equipment.

2.2.2 Design Requirements

Design system fall arrest safety anchors and equipment supports to AISC S342L (including supplement No.1)and ANSI/IWCA I-14.1, and as follows:

a. Comply with 29 CFR 1926, Subpart M.

b. Locate anchorages to suit suspension equipment specified.

c. Design anchor components for cleaning and suspended maintenance equipment to ASME A120.1.

d. Anchorage and anchor components: Designed by Engineer qualified in design of window cleaning and suspended maintenance equipment and licensed in the jurisdiction of project location.

2.2.3 Fall Arrest Safety Anchors

Design anchors in accordance with the following:

a. Fall arresting force safety factor of 2 to 1 without permanent deformation: 1800 lbs minimum.

b. Fall arrest force against fracture or detachment: 5,400 lbs minimum.

2.3 MATERIALS

a. Primary cable assembly components: Stainless steel type 316 in accordance with ASTM 240, ASTM A 666.

2.3.1 Exposed Structural Components:

a. Stainless Steel 316 and 316L, ASTM A240/A240M, ASTM A666.

2.3.2 Non-Exposed Structural Components Finish:

a. Hot Dip Galvanized Steel:

(1) Cold-Formed Steel: ASTM A500/A500M, Grade B.

(2) Carbon Steel: ASTM A36/A36M.

(3) Hot-Dip Galvanized Steel: ASTM A325, ASTM A490, ASTM A123/A123M.

2.3.3 Non-Structural Components:

Non-structural, non-exposed components may be stainless steel or hot dip galvanized steel.

a. Stainless Steel:

a. Stainless Steel 316 and 316L, ASTM A240/A240M, ASTM A666.

b. Hot Dip Galvanized Steel:

(1) Cold-Formed Steel: ASTM A500/A500M, Grade B.

(2) Carbon Steel: ASTM A36/A36M.

(3) Hot-Dip Galvanized Steel: ASTM A325, ASTM A490, ASTM A123/A123M.

2.3.4 Nuts, Bolts, Davit Pins, and Washers:

a. Stainless Steel:

(1) Stainless Steel 316 and 316L, ASTM A240/A240M.

PART 3 EXECUTION

3.1 EXAMINATION

Do not begin installation until substrates have been properly prepared and completed.

Examine project prior to installation and report in writing any defects or other site conditions that would cause problematic installation of Rooftop Anchor products or possible deficiency.

3.2 Dimensions

Confirm dimensions prior to begin work. If substrate preparation is the responsibility of another installer, notify General Contractor and Contracting Officer of unsatisfactory preparation before proceeding.

Ensure that the following conditions exist prior to installation of the fall arrest protection system/materials:

a. Cast-in-place substrates have been allowed to cure and the surface dryness requirements specified have been met.

b. Roof must be prepared for installation. Surfaces are rigid, clean, dry, smooth, and free from cracks, holes, and sharp changes in elevation.

c. Walls and vertical surfaces are constructed to receive fall arrest attachments, and will permit mechanical fastening of the supporting components materials.

3.3 FABRICATION

Fabricate work true to dimension, square, plumb, level, and free from distortion or defects detrimental to appearance and performance.

a. Grind off surplus welding material to ensure exposed surfaces are smooth so as not to abrade workers' ropes.

b. Coordinate anchorage system with supporting structure.

c. Welding shall be in accordance with the AWS Structural Welding Code D1.1/D1.

3.4 FIELD QUALITY CONTROL

Perform field tests in the presence of the Contracting Officer. Notify the Contracting Officer one day before performing tests.

3.5 Construction Monitoring

During progress of the roof work, Contractor must make visual inspections as necessary to ensure compliance with specified parameters. In addition, verify the following:

a. Materials comply with the specified requirements.

b. All materials are properly stored, handled and protected from moisture or other damages.

c. Components and equipment are in working order.

d. Substrates are in acceptable condition, in compliance with specification, prior to application of subsequent materials.

e. The proper number, type, and spacing of attachments and fasteners are installed.

3.6 INSTALLATION

Install components/materials as specified herein unless approved otherwise by the Contracting Officer. Keep fall arrest protection components/ materials dry before and during application. Complete installation of fall arrest protection system in an organized and continuous operation.

a. Install in accordance with Roof Fall Protection manufacturer's instructions and approved shop drawings.

b. Roof Fall Protection manufacturer shall supervise, inspect, and test installation of fall protection system.

c. Assure that all anchors are level, tightly fitted and flush with adjoining surfaces as required.

d. To prevent accidental removal, deform minimum of two threads of tail end of anchor studs after nuts have been tightened.

e. Isolate dissimilar materials as required to prevent electrolytic corrosion.

f. Coordinate with roofing specific sections for the installation of flashings to assure a watertight installation.

g. Capsule Adhesive Anchoring System:

(1) Install using an accredited installers using manufacturer's installation instructions.

(2) Load test each installed anchor assembly to 50 percent of its rated capacity.

(3) Test results shall be certified by a certified installer with experience in suspended access equipment and results submitted to the Contracting Office.

(4) Adjust and leave properly functioning equipment.

3.7 MANUFACTURER'S FIELD SERVICES

Manufacturer should provide the following services in project:

a. Testing and certification shall be provided under supervision of the fall protection manufacturer and original installer.

b. Repair or replace parts whenever required. Use parts produced by manufacturer of original equipment.

c. Provide emergency call back service at regular working hours for the entire installation period.

d. Perform maintenance work using competent and qualified personnel under supervision of the fall protection manufacturer or original installer.

3.8 CORRECTION OF DEFICIENCIES

Where any form of deficiency is found, additional measures will be taken as deemed necessary by the Contracting Officer to determine the extent of the deficiency and corrective actions must be performed as directed by the Contracting Officer.

3.9 CLEAN UP

Remove debris, scraps, containers and other rubbish and trash resulting from installation of the fall protection system from job site each day.

3.10 TRAINING TO GOVERNMENT PERSONNEL

Provide a minimum of 4 hours of operator training after system has been installed and tested. Training is to be for the users of the system conducted at the installation site.

3.11 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 all arrest protection manufacturer. Include a demonstration of how to correctly use fall arrest protection equipment/system, and give sources of required special tools. Furnish information on safety requirements during maintenance and operations.

3.12 PROTECTION

Protect installed products until completion of project.

Clean, touch-up, repair or replace damaged products before Substantial Completion.

Remove all loose materials, crating and packing materials from premises.

-- End of Section --

SECTION 12 21 00

WINDOW BLINDS
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 in the text by basic designation only.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 701	(2015) Standard Methods of Fire Tests for Flame Propagation of Textiles and Films

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	Scientific Certification Systems (SCS)Indoor Advantage

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)

UL ENVIRONMENT (ULE)

ULE Greenguard	UL Greenguard Certification Program

1.2 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 recycled content, low emitting materials, and LEED documentation requirements.

1.3 SUBMITTALS

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

SD-02 Shop Drawings

Installation

SD-03 Product Data

Window Blinds; G
Installation

Certification

SD-04 Samples

Window Blinds; G

SD-06 Test Reports

Window Blinds

SD-08 Manufacturer's Instructions

Window Blinds; G

SD-10 Operation and Maintenance Data

Window Blinds; G

SD-11 Closeout Submittals

LEED Documentation

1.4 SYSTEM DESCRIPTION

Provide window treatment, conforming to NFPA 701, complete with necessary brackets, fittings, and hardware. Each window treatment type shall be a complete unit provided in accordance with paragraph WINDOW TREATMENT PLACEMENT SCHEDULE. Mount and operate equipment in accordance with manufacturer's instructions. Windows to receive a treatment shall be completely covered.

1.5 SUSTAINABLE DESIGN CERTIFICATION

Product shall be third party certified in accordance with ULE Greenguard Gold, SCS Scientific Certification Systems Indoor Advantage Gold or equal. Certification shall be performed annually and shall be current.

1.6 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.

1.7 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period.

PART 2 PRODUCTS

2.1 WINDOW BLINDS

Provide each blind, including hardware, accessory items, mounting brackets and fastenings, as a complete unit produced by one manufacturer. All parts

shall be one color, unless otherwise indicated, to match the color of the blind slat. Treat steel features for corrosion resistance. Submit samples of each type and color of window treatment. Provide aluminum horizontal louver blind slats. Provide 6 inch sample of horizontal blind slats in each color specified. Also submit results of Fire resistance, Flame Spread, and Smoke contribution tests.

2.1.1 Horizontal Blinds

Provide horizontal blinds with 1 inch by 0.008 inch slats. Blind units shall be capable of nominally 180 degree partial tilting operation and full-height raising. Blinds shall be inside mount. Provide tapes for 2 inch slats with longitudinal reinforced vinyl plastic in 1-piece turn ladder construction. Tapes for 1 inch slats shall be braided polyester or nylon.

2.1.1.1 Head Channel and Slats

Provide head channel made of steel or aluminum with corrosion-resistant finish nominal 0.024 inch for 1 inch slats. Provide slats of aluminum, not less than 0.008 inch thick, and of sufficient strength to prevent sag or bow in the finished blind. Provide a sufficient amount of slats to assure proper control, uniform spacing, and adequate overlap. Enclose all hardware in the headrail.

2.1.1.2 Controls

The slats shall be tilted by a transparent tilting wand, hung vertically by its own weight, and shall swivel for easy operation. Provide a tilter control of enclosed construction. Provide moving parts and mechanical drive made of compatible materials which do not require lubrication during normal expected life. The tilter shall tilt the slats to any desired angle and hold them at that angle so that any vibration or movement of ladders and slats will not drive the tilter and change the angle of slats. Include a mechanism to prevent over tightening. Provide a wand of sufficient length to reach to within 5 feet of the floor.

2.1.1.3 Intermediate Brackets

Provide intermediate brackets for installation, as recommended by the manufacturer, of blinds over 48 inches wide.

2.1.1.4 Bottom Rail

Provide bottom rail made of corrosion-resistant steel with factory applied finish. Provide closed oval shaped bottom rail with double-lock seam for maximum strength. Bottom rail and end caps to match slats in color.

2.1.1.5 Braided Ladders

Provide braided ladders of 100 percent polyester yarn, color to match the slat color. Space ladders 15.2 slats per foot of drop in order to provide a uniform overlap of the slats in a closed position.

2.1.1.6 Hold-Down Brackets

Provide universal type hold-down brackets for sill or jamb mount where indicated on placement list.

2.2 COLOR

Provide color, pattern and texture selected from manufacturer's standard colors. Color listed is not intended to limit the selection of equal colors from other manufacturers.

PART 3 EXECUTION

3.1 EXAMINATION

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 WINDOW TREATMENT PLACEMENT SCHEDULE

All interior windows and sidelites to include window blinds. Refer to drawings for locations.

3.3 INSTALLATION

Submit drawings showing fabrication and installation details. Show layout and locations of track, direction of draw, mounting heights, and details.

3.3.1 Horizontal Blinds

Perform installation of Horizontal and Blinds in accordance with the approved detail 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, free window treatments from soiling, damage or blemishes; and adjust them 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. Include all hardware, brackets, anchors, fasteners, and accessories necessary for a complete, finished installation.

-- End of Section --

SECTION 12 22 00

CURTAINS AND DRAPES
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 A413/A413M	(2012) Standard Specification for Carbon Steel Chain
ASTM D3691/D3691M	(2009) Woven, Lace, and Knit Household Curtain and Drapery Fabrics

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code
NFPA 701	(2015) Standard Methods of Fire Tests for Flame Propagation of Textiles and Films

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	Scientific Certification Systems (SCS)Indoor Advantage

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-600-01	(2006; Change 3, 1 March 2013) Fire Protection Engineering for Facilities

UL ENVIRONMENT (ULE)

ULE Greenguard	UL Greenguard Certification Program

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Drawings; G

SD-03 Product Data

Certification

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.

Motor and Controller; G

Finished curtain

SD-06 Test Reports

Flame resistance

SD-08 Manufacturer's Instructions

Drapery hardware

Motor and Controller

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

Motor and Controller

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.3 QUALITY ASSURANCE

1.3.1 Drawings

Submit drawings indicating:

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.
indicate Motor and Controller location and any integrated components or accessories.

Show fabrication and installation details for stage curtains. Include plans, elevations, sections, details, attachments to other work, and the following:

a. Operating clearances.
b. Requirements for supporting curtains, track, and equipment. Verify capacity of each track and rigging component to support loads.
c. Locations of equipment components, switches, and controls. Differentiate between manufacturer-installed and field-installed wiring.
d. Include structural analysis data for rigging signed and sealed by the qualified professional engineer responsible for their preparation.

1.3.2 Finished Curtain

Provide finished samples of fabrication methods including: Seaming, backing and drapery hardware interface.

1.4 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, etc.). 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.

1.5 FIRE-TEST-RESPONSE CHARACTERISTICS

Provide stage curtains with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or a testing and inspecting agency acceptable to authorities having jurisdiction.

a. Flame-Resistance Ratings: Per requirements of UFC 3-600-01.

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

1.6 INSTALLER QUALIFICATIONS

A firm or individual experienced in installing stage curtains and rigging 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. Installer to provide list of completed projects with project names and addresses, names and addresses of .architects and owners, and other information specified.

1.7 STRUCTURAL PERFORMANCE

Provide rigging capable of withstanding the effects of the design loads and the weight of stage curtains as indicated.

1.8 SUSTAINABLE DESIGN CERTIFICATION

Product shall be third party certified in accordance with ULE Greenguard, SCS Scientific Certification Systems Indoor Advantage or equal.

Certification shall be performed annually and shall be current.

1.9 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 Cubicle Curtain

2.1.1.1 Fabric

ASTM D3691/D3691M. Provide fabric manufactured from man-made fibers. Fabric physical characteristics must be as indicated on Finish Schedule.

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.

2.1.1.3 Sewing Thread

Pre-shrunk mercerized cotton (50/3) or monofilament in equivalent size, except do not use monofilament in the heading.

2.1.2 Main Stage Curtain Fabrics

2.1.2.1 General

All curtains to meet performance testing for ASTM D3691/D3691M. Provide fabrics inherently and permanently flame resistant to comply with requirements of NFPA 701. Provide fabrics from the same dye lot that are colorfast and cleanable.

2.1.2.2 Face Fabric

Polyester Velour: Napped fabric of 100 percent polyester inherently and permanently flame resistant; 54-inch minimum width, weighing not less than 18 oz./linear yard, with pile height in thousands approximately 130, pile tufts per inch not less than 1658, pile ends and picks per inch not less than 51 and backing ends per inch not less 65.

a. Colors, Textures, and Patterns as indicated on Finish Schedule.

2.1.2.3 Lining Fabric

Polyester: Dense woven fabric of 100 percent trevira polyester inherently and permanently flame resistant; 72-inch minimum width weighing not less than 15 oz./linear yard with matte finish.

a. Colors, Textures, and Patterns as indicated on Finish Schedule.

2.1.3 Mid and Rear Stage Curtain and Border Fabrics

2.1.3.1 General

All curtains to meet performance testing for ASTM D3691/D3691M. Provide fabrics inherently and permanently flame resistant to comply with requirements of NFPA 701. Provide fabrics from the same dye lot that are colorfast and cleanable.

2.1.3.2 Face Fabric

Polyester Velour: Napped fabric of 100 percent polyester inherently and permanently flame resistant; 54-inch minimum width, weighing not less than 18 oz./linear yard, with pile height in thousands approximately 130, pile tufts per inch not less than 1658, pile ends and picks per inch not less than 51 and backing ends per inch not less than 65.

a. Colors, Textures and Patterns as indicated on Finish Schedule.

2.1.4 Stage Curtain Fabrics

2.1.4.1 General

All curtains to meet performance testing for ASTM D3691/D3691M. Provide fabrics inherently and permanently flame resistant to comply with requirements of NFPA 701. Provide fabrics from the same dye lot that are colorfast and cleanable.

2.1.4.2 Face Fabric

Polyester Velour: Napped fabric of 100 percent polyester inherently and permanently flame resistant; 54-inch minimum width, weighing not less than 18 oz./linear yard, with pile height in thousands approximately 130, pile tufts per inch not less than 1658, pile ends and picks per inch not less than 51 and backing ends per inch not less than 65.

a. Colors, Textures and Patterns as indicated on Finish Schedule.

2.1.4.3 Lining Fabric

Polyester: Dense woven fabric of 100 percent trevira polyester inherently and permanently flame resistant; 72-inch minimum width weighing not less than 15 oz./linear year with matte finish.

a. Colors, Textures and Patterns as indicated on Finish Schedule.

2.2 FABRICATION OF CUBICLE CURTAINS

Prior to cutting and fabrication, field measure each drapery location paying particular attention to field conditions affecting the work.

2.2.1 Panels

Make from full or half widths of fabric to give a minimum of 200 percent fullness. 200 percent fullness is defined as 2 times the rod width plus overlaps and returns. Floor length draperies must hang 1 inch above finish floors. Provide table-sized drapery panels with a plus or minus tolerance of 1/4 inch accurately laid-out before cutting. 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. Where variations in length or placement of windows occur in a room, match patterns horizontally. 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. Coordinate panels with cubicle track specification.

2.2.2 Seams

Join widths by serging, overlock, and safety stitch. Retain selvage when practical.

2.2.3 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.

2.3 FABRICATION OF MAIN STAGE CURTAINS

General: Affix permanent label, stating compliance with requirements of authorities having jurisdiction, in accessible location on curtain not visible to audience. Provide vertical seams, unless otherwise indicated. Arrange vertical seams so they do not fall on faces of pleats. Do not use fabric cuts less than one-half widths. Provide one finished curtain system for review and approval. Curtain can be included as part of finished work.

a. Vertical Hems: Provide vertical hems not less than 2 inches wide, and not less than 4 inches wide at borders, valance, and tormentors, with not less than a 1-inch tuck, and machine-sewn with no selvage material visible from front of curtain. Sew open ends of hems closed.

b. Leading Edge Turnbacks: Provide turnbacks formed by folding not less than 27 inches, one-half width, of face fabric back, with not less than a 1-inch tuck, and secured by sewing turnbacks vertically.

c. Top Hems: Reinforce top hems by double-stitching 3-1/2-inch-wide, heavy jute webbing to top edge with not less than 2 inches of face fabric turned under.

d. Pleats: Provide 50 percent fullness in curtains, exclusive of turnbacks and hems, by sewing additional material into 6-inch double-stitched box pleats spaced at 12 inches o.c. along top hem reinforcement.

e. Grommets: Brass, No. 3, centered on each box pleat and 1-inch from corner of curtain, for snaps or S-hooks.

f. Bottom Hems:

    1. For curtains that do not hang to the floor, provide hems not less than 3 inches deep with 3/4-inch weight tape.
    2. For floor-length curtains, provide hems not less than 6 inches

deep with 1-inch weight tape. Sew open ends of hems closed.

3. For floor-length curtains, provide hems not less than 6 inches deep with separate, interior, 100 percent cotton, heavy canvas chair pocket equipped with proof coil chair. Stitch chair pockets so chair will ride 2 inches above finished bottom edge of curtain.

   (a) Proof Coil Chain: Grade 30, No. 8, zinc plated, 3/16 inch, ASTM A413/A413M.

g. Velour Curtains: Fabricate with the fabric nap down.

h. Lining: Provide lining for each curtain in same fullness as face fabric, and finished 2 inches shorter than face fabric. Attach lining to face fabric along bottom and side seams with 4-inch-long strips of heavy woven color matched cotton tape.

PART 3 EXECUTION

3.1 CUBICLE CURTAINS

3.1.1 Examination

Ensure that work of other trades and cleaning operations are completed. Test completed installation to ensure smooth and continuous operation of all curtains, hardware and accessories.

3.1.2 Installation

Install curtains in rooms and areas indicated on Finish Plans. Include all material indicated, specified, or necessary for a complete finished installation. Contractor is responsible for the required quantities.

3.1.3 Cubicle Curtains

Install with a minimum clearance of 1/4 inch between the ceiling and top of drapery heading. Floor length curtains must hang 1 inch above finished floors. Press well before hanging. Remove incorrectly sized curtains and remake to correct size. Remove damaged, spotted, or otherwise defective fabric and repair to original state or replace with new material.

3.2 STAGE CURTAINS

3.2.1 Examination

Examine areas and conditions, with Installer present, for compliance with requirements for support members, blocking, installation tolerances, clearances, and other conditions affecting performance of stage-curtain work. Proceed with installation only after unsatisfactory conditions have been corrected.

Examine inserts, clips, blocking or other supports required to be installed by others to support tracks. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2.2 Installation, General

Install stage curtain system according to track manufacturer's and curtain fabricator's written instructions.

3.2.3 Track Installation

Ceiling-Mounted Tracks: Drill track at intervals not greater than manufacturer's written instructions for spacing, and fasten directly to structure.

a. Steel Track: 48 inches.

Install track for center-parting curtains with not less than 24-inch overlap of track sections at center, supported by special lap clamps.

3.2.4 Curtain Installation

Track Hung: Secure curtains to track carriers with track manufacturer's special heavy-duty S-hooks.

3.2.5 Demonstration

Engage a factory-authorized service representative to test system and to train Owner's personnel to rig, adjust, operate, and maintain stage curtains, tracks, and draw-curtain machines.

-- End of Section --

SECTION 12 24 13

ROLLER WINDOW SHADES
08/10

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

Provide roller window shades, complete with necessary brackets, fittings, and hardware as located in the drawings. Mount and operate equipment in accordance with manufacturer's instructions. Windows to receive a shade shall be completely covered.

a. Submit drawings showing plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to adjacent work. Include the use of same room designations as indicated on the drawings.

b. Provide manufacturer's data composed of catalog cuts, brochures, product information, and operating and maintenance instructions on each product to be used. Include styles, profiles and features.

c. Furnish samples of each type and color of roller shade fabric and roller shade channel. Shade material shall be minimum6 by 6 inch in size. Mark face of material to indicate interior faces.

d. Mock up: Install shade in area designated by Contracting Officer. Do not proceed with remaining work until the Contracting Officer approves workmanship and operation. Re-work mock-up as required to produce acceptable work. The approved shade can be used in installation.

e. Submit fire resistance data, flame spread and smoke contribution data.

1.2 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.

ASTM INTERNATIONAL (ASTM)

ASTM G21	(2013) Determining Resistance of Synthetic Polymeric Materials to Fungi

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 701	(2015) Standard Methods of Fire Tests for Flame Propagation of Textiles and Films

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED NC	(2009) Leadership in Energy and Environmental Design(tm) New Construction Rating System

UNDERWRITERS LABORATORIES (UL)

UL 325	(2013; Reprint May 2015) Door, Drapery, Gate, Louver, and Window Operators and Systems

1.3 SUSTAINABILITY REQUIREMENTS

Materials in this technical specification may contribute towards contract compliance with sustainability requirements. See Section 01 33 29 LEED DOCUMENTATION for project LEED NC recycled content, low emitting materials, light pollution reduction, optimize energy performance, controllability of systems - lighting, daylight, and views requirements.

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-02 Shop Drawings

Installation; G

SD-03 Product Data

Window Shades; G

SD-04 Samples

Window Shades; G

SD-06 Test Reports

Window Shades

SD-08 Manufacturer's Instructions

Window Shades

SD-10 Operation and Maintenance Data

Window Shades

SD-11 Closeout Submittals

LEED Documentation

1.5 QUALITY ASSURANCE

1.5.1 Qualifications

1.5.1.1 Manufacturer's Qualifications

Obtain motor-controlled roller shades through one source from a single manufacturer with a minimum of twenty years experience and minimum of three projects of similar scope and size in manufacturing products comparable to those specified in this section.

1.5.1.2 Installer's Qualifications

Installer trained and certified by the manufacturer with a minimum of ten years experience in installing products comparable to those specified in this section.

1.5.2 Flammability Requirements

Passes in accordance with NFPA 701 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.

1.5.3 Electrical Requirements

NFPA Article 100 listed and labeled in accordance with UL 325 or other testing agency acceptable to authorities having jurisdiction, marked for intended use, and tested as a system. Individual testing of components will no be acceptable in lieu of system testing.

1.5.4 Anti-Microbial Requirements

'No Growth' per ASTM G21 results for fungi ATCC9642, ATCC 9644, ATCC9645.

1.6 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.

1.7 WARRANTY

Provide 10 year minimum limited warranty.

PART 2 PRODUCTS

2.1 WINDOW SHADES

Roller tube shall operate smoothly and be of sufficient diameter and thickness to prevent excessive deflection. Provide brackets that are appropriate for inside mount. The shade cloth shall meet the performance described in NFPA 701, small scale test. Treat steel features for corrosion resistance.

2.1.1 Light Filtering Shades

Provide light filtering window shades to conform with the following:

a. Roller tube shall be extruded aluminum or steel. Diameter, wall thickness, and material to be selected by the manufacturer to accommodate the shade size. Provide roller idler assembly of molded nylon and zinc-plated steel pin. Sliding pin shall allow easy installation and removal of roller. Fabric shall be connected to the roller tube with double sided adhesive specifically developed to attach coated textiles to metal to eliminate horizontal impressions in fabric or attached with a spline lock system.

b. Fascia shall be 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. Fascia is needed for both sides of roller.

c. End caps shall be stamped steel with universal design suitable for mounting to window mullions. Provide size compatible with roller size. End cap covers shall match fascia/headbox finish.

d. Provide hardware that allows for field adjustment or removal of shade roller tube and other operable hardware component or adjustment of motor without requiring removal of brackets and end or center supports. Provide hardware system that allows for operation of multiple shade bands by a single operator. Connectors shall be offset to assure alignment from the first to the last shade band. Provide shade hardware constructed of minimum 1/8 inch thick plated steel or heavier as required to support 150 percent of the full weight of each shade.

e. Manual Operated Chain Drive Hardware shall provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change. Provide positive mechanical engagement of drive mechanism to shade roller tube. The drive bracket shall be fully integrated with all accessories. Drive chain shall be #10 stainless steel chain rated to 90 lb. minimum breaking strength.

f. Motors shall be hard-wired, wired into the building electrical system. The position of the motor and electrical connection shall be right side of roller, based on the hand of the user facing the shade from inside, unless otherwise indicated on drawings.

g. Activation Controls of Shades:

(1) Wall mounted controls: key pads or switches are able to electronically set and reconfigure shade open and close limits, shade preset positions, system groups and system subgroups at the control without rewiring and without access to the Electronic Drive Unit.

h. Switches that are adjustable and interlocked with motor controls and set to automatically stop the shade at fully raised and fully lowered positions shall be provided. Low voltage switching is required.

i. Operating function: Stop and hold shade at any position.

j. Provide the following options: Low Voltage System Capable of interface with audiovisual Override switch.

2.1.2 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. Roller tube shall be aluminum, controlled manually as indicated on drawings. Provide shop fabricated light traps, consisting of a head box to house the shade roller, 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. The legs of the channels shall be not less than 1-3/4 inches long and separated by the minimum distance that will permit free operation of the shade. Edges of light trap coming into contact with the shade cloth shall be smooth pile light seal. The exposed face of the head box shall be hinged or removable for access to the shade roller. The interior or unexposed surfaces of the light trap shall have a finish coat of flat black enamel. The exposed portions of the light trap shall have a factory-applied priming coat of gray paint.

c. Cloth shall be of type for blackout purposes as indicated on the drawings.

d. Fit the bottom edge of the shade with a steel operating bar. Shades will 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 and shade fabric as indicated on the drawings. Color listed is not intended to limit the selection of equal colors from other manufacturers. Openness factor of shade fabric shall be as indicated on drawings.

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 INSTALLATION

Perform installation in accordance with the approved detail 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.

3.3 CLEAN-UP

Upon completion of the installation, clean window treatments and adjust them 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, shall be contained inside the pocket. For shades installed outside the jambs and mullions, overlap each jamb and mullion 0.75 inch or more when the jamb and mullion sizes permit. Include all hardware, brackets, anchors, fasteners,

and accessories necessary for a complete, finished installation.

-- End of Section --

SECTION 12 32 00

MANUFACTURED WOOD CASEWORK
11/13

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

THE ENGINEERED WOOD ASSOCIATION (APA)

APA E30	(2011) Engineered Wood Construction Guide
APA EWCG	(2011) Engineered Wood Construction Guide: Building Requirements and Related Panel Systems
APA PS 1	(2009) Structural Plywood (with Typical APA Trademarks)

ASME INTERNATIONAL (ASME)

ASME B18.6.1	(1981; R 2008) Wood Screws (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM A325	(2014) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A325M	(2014) Standard Specification for Structural Bolts, Steel, Heat Treated, 830 MPa Minimum Tensile Strength (Metric)
ASTM C1036	(2010; E 2012) Standard Specification for Flat Glass
ASTM D4689	(2012) Standard Specification for Adhesive, Casein-Type
ASTM D4690	(2012) Standard Specification for Urea Formaldehyde Resin Adhesives
ASTM F594	(2009; E 2011) Standard Specification for Stainless Steel Nuts
ASTM F836M	(2002; R 2010) Standard Specification for Style 1 Stainless Steel Metric Nuts

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.9	(2010) Cabinet Hardware

COMPOSITE PANEL ASSOCIATION (CPA)

CPA A208.1	(2009) Particleboard
CPA A208.2	(2009) Medium Density Fiberboard (MDF) for Interior Applications

HARDWOOD PLYWOOD AND VENEER ASSOCIATION (HPVA)

HPVA HP-1	(2009) American National Standard for Hardwood and Decorative Plywood

KITCHEN CABINET MANUFACTURERS ASSOCIATION (KCMA)

KCMA A161.1	(2000) Performance & Construction Standards for Kitchen and Vanity Cabinets

U.S. DEPARTMENT OF COMMERCE (DOC)

DOC/NIST PS1	(1995) Construction and Industrial Plywood with Typical APA Trademarks

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS FF-B-588	(Rev E; Notice 1) Bolt, Toggle: and Expansion Sleeve, Screw
FS FF-S-325	(Basic; Int Amd 3; Notices 3, 4) Shield, Expansion; Nail, Expansion; and Nail, Drive Screw (Devices, Anchoring, Masonry)
FS MM-L-736	(Rev D; Notice 1) Lumber; Hardwood
FS TT-F-336	(Rev E; Notice 1) Filler, Wood, Paste

1.2 SUBMITTALS

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

SD-02 Shop Drawings

Fabrication; G

Installation Drawings; G

SD-03 Product Data

Cabinets; G

Medium Density Fiberboard (MDF); G

Hardwood; G

Hardwood Plywood

Glass

Adhesives; G

Accessories and Hardware; G

Plastic Laminate; G

Countertops; G

Fasteners

SD-04 Samples

Accessories and Hardware; G

Manufacturer's Standard Color Charts; G

SD-07 Certificates

Plywood; G

Hardwood; G

Glass; G

Adhesives; G

Accessories and Hardware; G

Filler Material

SD-08 Manufacturer's Instructions

Manufacturer's Instructions; G

1.3 MAINTENANCE MATERIAL SUBMITTALS

Submit manufacturer's instructions for wood and metal cabinet systems including special provisions required to install equipment components and system packages. Special notices to detail impedances, hazards and safety precautions.

1.4 QUALITY ASSURANCE

Submit manufacturer's standard color charts for wood and metal cabinets showing the manufacturer's recommended color and finish selections.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver, handle, and store cabinets in a manner that prevents damage or deformity. Provide temporary skids under units weighing more than 50 pounds.

PART 2 PRODUCTS

2.1 SYSTEM DESIGN

Provide wood cabinets, factory-fabricated and finished in the manufacturer's standard sizes and finishes of the type, design, and configuration indicated. Construct cabinets as specified meeting the requirements of KCMA A161.1. Wall and base cabinet assemblies to consist of individual units joined into continuous sections. Use fastenings that permit removal and replacement of individual units without affecting the remainder of the installation. Provide counters with watertight sink rim when indicated, and removable drawers equipped with position stops to avoid accidental complete withdrawals. Fix or adjust shelves as indicated.

2.2 FABRICATION

2.2.1 Wood Cabinet Fabrication

2.2.1.1 Hardwood Plywood

HPVA HP-1, Type II (Interior), five-ply, with face veneer of good grade (1) or better. Cover all exposed edges.

2.2.1.2 Hardwood

Provide hardwood for use in cabinet work, thoroughly seasoned or kiln-dried to 12-15 percent mc; without defects in any exposed parts or surfaces.

2.2.1.3 Softwood Plywood

Comply with DOC/NIST PS1.

2.2.1.3.1 Countertops

Epoxy resin produced to have a high chemical resistancy, tops shall be 1-inch thick with manufacturer's standard edge. Physical and mechanical properties:

a. Tensile strength, psi: 10,700 psi
b. Compressive strength, psi: 30,600 psi
c. Flexural strength, psi: 12,800 psi
d. Hardness, Rockwell "M": 105
e. Density, gr/cc: 2.03 G/cc

Provide smooth, clean, exposed tops and edges, in uniform plane free of defects. Splash and curbs shall be 4 inches high by 1-inch thick and shall be located at the backs of all countertops.

a. Top Sizes: Furnish tops in maximum practicable lengths, in configuration indicated on drawings. Seams to be kept to a minimum and sealed with manufacturer's standard products. All corners must be rounded where applicable.

2.2.1.4 Hardboard

In accordance with AHA A135.4, tempered.

2.2.1.5 Sinks, Lavatories and Fittings

Provide manufacturer standard "drop-in" flush-mount sinks in sizes indicated on drawings. Sinks to be molded epoxy resin. Provide ADA compliant "drop-in" sinks as noted on the drawings. All sides of tubs to be rounded for the users protection. Epoxy sinks furnished with polypropylene sink outlets.

2.2.2 Special Purpose Cabinets

Provide special-purpose cabinets, as indicated on drawings, of the same materials and construction as adjacent cabinets. This includes, but is not limited to, a combination eyewash/shower unit, blind cabinets and ADA sink units.

2.3 MANUFACTURED UNITS

2.3.1 Color, Texture, And Pattern

Provide color selected from manufacturers standard colors. Color listed is not intended to limit the selection of equal colors from other manufacturers.

2.4 MATERIALS

Provide Douglas-fir plywood conforming to APA E30,APA EWCG, and APA PS 1 exterior type, fully waterproof bond.

Provide Medium Density Fiberboard (MDF) for interior applications, fully waterproof bond conforming to CPA A208.1 and CPA A208.2.

Provide glass conforming to ASTM C1036, Type I, Class 1, Quality q3, 1/4-inch thick, for unframed sliding glass doors; other glass to conform to ASTM C1036, Type II, Class 1, Quality q8, 7/32 inch thick.

Provide adhesives for application of plastic laminate consisting of a thermosetting urea-resin Type II conforming to ASTM D4690 as recommended by the manufacturer of the laminate. Provide adhesive for wood members conforming to ASTM D4689.

Provide filler material conforming to FS TT-F-336.

Provide hardwood conforming to FS MM-L-736, standard hardwood lumber, S2S.

Provide hardwood plywood conforming to HPVA HP-1.

Provide accessories and hardware conforming to the following requirements, as applicable:

a. Extension drawer slides: ANSI/BHMA A156.9, Type B85071

b. Semiconcealed hinges: ANSI/BHMA A156.9, Type B81201, 1-1/2 inches

c. Full surface hinges: ANSI/BHMA A156.9, Type B81131, 1-1/2 inches

d. Knob pulls: ANSI/BHMA A156.9, 1-inch diameter, Type B12132

e. Bar type pulls: ANSI/BHMA A156.9, 4-inch overall length, Type B12012

f. Semiconcealed hinges: ANSI/BHMA A156.9, Type B81201, 40 millimeter

g. Full surface hinges: ANSI/BHMA A156.9, Type B81131, 40 millimeter

h. Knob pulls: ANSI/BHMA A156.9, 25 millimeter diameter, Type B12132

i. Bar type pulls: ANSI/BHMA A156.9, 100 millimeter overall length, Type B12012

j. Locks, keying, and keys: As directed

k. Catches: Magnetic, 5-pound pull

l. Sliding door set: Impregnated fiberboard track, Nylon glides

Provide fasteners conforming to the following:

a. Screws: ASME B18.6.1, Group, Type and Class as applicable

b. Anchoring Devices: FS FF-S-325, Group, Type, and Class as applicable

c. Toggle bolts: FS FF-B-588, Type I, Class A, Style 2

d. Nuts: ASTM F594, corrosion-resistant steel

e. Bolts: ASTM A325, heavy, hexagon head bolts corrosion-resistant steel

f. Nuts: ASTM F836M, corrosion-resistant steel

g. Bolts: ASTM A325M, heavy, hexagon head bolts corrosion-resistant steel

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Field Finishing Of Wood Cabinets

For natural finish, use the applicable procedure for the type of wood selected as follows:

a. For open-grain woods: Apply one coat of paste wood filler, and remove excess filler. Then apply one coat of pale varnish thinned with turpentine, followed by one coat of pale varnish and then by one coat of satin-finish varnish, plus an additional coat of satin-finish varnish on cabinet doors and drawer fronts. Lightly sand surfaces between coats.

b. For close-grain woods: Apply one coat of pale varnish thinned with turpentine, followed by one coat of pale varnish and then by one coat of satin-finish varnish, plus an additional coat of satin-finish varnish on cabinet doors and drawer fronts. Lightly sand surfaces between coats.

3.1.2 Cabinet Installation

Install casework plumb with countertops level to within 1/16 inch in 10-feet. Level base cabinets by adjusting leveling screws. Scribe and fit scribe strips to irregularities of adjacent surfaces. Gap opening is not to exceed 0.025-inch.

Secure cases permanently to floor and wall construction using 1/4-inch diameter masonry anchors, spaced 30 inches maximum on center, minimum of two for each case.

Support wall cases on continuous 18-gage galvanized steel hanging brackets. Secure wall cases in position with screws to blocking. Bolt adjoining cases together. Width of joints not exceed 1/32-inch. Provide closer strips, filler strips, and finish moldings as required. Align doors, adjust hardware, clean and wax surfaces.

Submit installation drawings for cabinets. Include in drawings location of cabinets, details of cabinets related and dimensional positions, and locations for roughing in plumbing, including sinks, faucets, strainers and cocks.

3.2 CLEANING

On completion of cabinet installation, touch up marred or abraded finished surfaces. Remove crating and packing materials from premises. Wipe down surfaces to remove fingerprints and markings and leave in clean condition.

3.3 INSPECTION

Examine casework grounds and supports for adequate anchorage, foreign material, moisture, and unevenness that could prevent quality casework installation. Ensure that electrical and plumbing rough-ins for casework are complete. Do not proceed with installation until defects are corrected.

-- End of Section --

SECTION 12 65 00

FIXED SEATING
08/08

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM A1011/A1011M	(2014) Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability and Ultra-High Strength
ASTM A513/A513M	(2014) Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing
ASTM D4157	(2010) Standard Test Method for Abrasion Resistance of Textile Fabrics (Oscillatory Cylinder Method)
ASTM F851	(1987; R 2005) Standard Test Method for Self-Rising Seat Mechanisms

HARDWOOD PLYWOOD AND VENEER ASSOCIATION (HPVA)

HPVA HP-1	(2009) American National Standard for Hardwood and Decorative Plywood

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA LD 3	(2005) Standard for High-Pressure Decorative Laminates

1.2 SUSTAINABILITY REQUIREMENTS

Materials in this technical specification may contribute towards contract compliance with sustainability requirements. See Section 01 33 29 LEED DOCUMENTATION for project low-emitting materials, recycled content and certified wood requirements.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detailed Drawings; G
Field Verification
Shop drawings to incorporate building information compiled from various sources associated with this project and deemed reliable. Conditions directly affecting the product or its installation must be verified.

SD-03 Product Data

Seating System; G
Installation; G

SD-04 Samples

Seating System; G

SD-06 Test Reports

Fire Safety; G
Tests; G

SD-07 Certificates

Seating System

SD-10 Operation and Maintenance Data

Assembly Manuals; G
Maintenance Manuals; G

SD-11 Closeout Submittals

LEED Documentation

1.4 QUALITY ASSURANCE

Field Verification: Shop Drawings are to incorporate building information compiled from various sources associated with this project and deemed reliable. Conditions directly affecting the product or its installation must be verified and any deviation reported to the contracting officer.

When recommended by the manufacturer, seating shall be delivered and installed by an authorized dealer with a certified installation crew.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver components to the site in unopened containers clearly labeled with the manufacturer's name and container contents. Store materials in a safe, dry, and clean, 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, maintained at a temperature above 60 degrees F for 2 days prior to installation. Seating shall not be stored with materials which have high emissions of volatile organic compounds (VOC's) or other contaminants. Do not store seating near materials that may offgas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives. Handle the items in a manner that will protect the materials from damage.

1.6 WARRANTY

Warrant the fixed seating for a period of ten (10) years with the following exceptions: three (3) year for fabric and five (5) years for tablet arms. Provide manufacturer's standard performance guarantees or warranties that extend beyond the periods listed.

PART 2 PRODUCTS

2.1 MATERIALS

Submit LEED documentation including local/regional materials 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.

2.1.1 Upholstery Fabric

Provide fabric which is a decorative weave, fiber content of a polyester and nylon blend treated to resist staining and soiling. Fabric upholstery for seating shall comply with a minimum of 100,000 double rubs when submitted to the tests required by ASTM D4157. Submit complete set of test reports for the fire safety and other testing. Refer to drawings for additional information.

2.1.2 Polyurethane Foam

Polyurethane foam shall be fire retardant, nonhardening and non-oxidizing and shall have a high resistance to alkalies, oils, grease, soaps, abrasions, moisture, mildew, and tearing. Handling of this foam shall conform to the requirements of fire safety as specified in the Submittals paragraph.

2.1.3 Plywood

Provide plywood conforming to HPVA HP-1, made of hardwood and of crossbanded construction.

2.1.4 Plastic Laminate

Plastic laminate shall conform to ANSI/NEMA LD 3, Horizontal General Purpose Standard (HGS) Grade, 0.048 inches (plus or minus 0.005 inches) in thickness.

2.1.5 Plastic

Plastic shall have built-in inhibitors to retard fading and anti-static compounds to retard dirt attraction. Pigment quality shall eliminate need to paint plastic parts. Component surfaces shall have a textured finish. Color shall be integral to the plastic.

2.1.6 Steel

Steel shall comply with ASTM A513/A513M or ASTM A1011/A1011M. Finish shall be powder coat.

2.2 SEATING SYSTEM

Construct components and assembly free from objectionable projections or irregularities. Make corners and edges smooth and rounded. Unless otherwise noted, bolts, nuts, and other fastenings shall be concealed where possible. Steel shall be well-formed to shape and size required. Jointing of members shall be welded, riveted, or interlocked. Casting shall be fine textured, sound, and free of pits, blow holes, and fins. Lines shall be true, accurate, and true-to-pattern with excess metal or imperfections removed. Submit Assembly Manuals, manufacturer's descriptive data, catalog cuts, installation instructions and the following:

a. Minimum 6 by 6 inches samples of upholstery, plastic laminate, identification plate, paint, armrest and plastic finish materials. Furnish fabric samples of sufficient size to show color range, pattern, and finish.

b. Two complete sets of certificates attesting that the proposed seating system meets specified requirements. Date the certificate after the award of contract, include name of the project and a list of specific requirements being certified. Three sets of assembly manuals describing assembly procedures.

c. One complete chair that meets requirements specified in most common seat width used on project. Chair sample may be incorporated into the installation, provided the sample is approved and it's location is noted.

2.2.1 Backs

Provide back assembly of the fixed type and consisting of a hard surface rear panel with an upholstered inner panel. Attach back assembly to standards with 14 gauge steel wings/back brackets; wings/back brackets shall have back pitch adjustability option. Total height of back to be 33-3/4 inches above the floor measured parallel to the back. Rear panel shall extend below the seat unit to completely conceal and protect the seat assembly.

2.2.1.1 Plastic Rear Panels

Panels shall be one-piece injection molded high impact resistant polypropylene with textured outer surface. Panel shall be formed to enclose and protect the edges of the inner upholstery panel at the top and sides.

2.2.1.2 Upholstered Inner Panels

Fabricate upholstered inner panels from 5 ply, 7/16 inch minimum thick plywood, inner structure bonded to 2-inch urethane foam on back. Padding shall be cemented to plywood inner panel. Upholstery cover shall be securely stapled to the inner plywood panel or held in place with draw strings for ease of re-upholstering. Upholstery cover shall not be attached with the use of nails, tacks, or screws.

2.2.2 Seats

Provide foundation for upholstered seats free from visible screws, bolts, open holes, and projections on the bottom, front, and sides. The front center edge of each seat shall have an aluminum identification plate. The

area to receive the plate shall be recessed to prevent wear and abrasion. Method of attachment shall be tamper-resistant. The seat unit shall be removable without disturbing the standards, the upholstered seat cover shall be easily removable without removing the seat unit; and the fabric covering shall be fastened to the frame in a manner that will permit easy reupholstering.

2.2.2.1 Steel Seat Units

Form steel foundation of not less than 14 gauge steel and roll it inward around entire perimeter for rigidity. Upholstered steel seat unit shall be nonsag construction. Nonsag spring units shall contain at least five serpentine design springs suspended under tension; cross bracing, if required by manufacturer, shall be welded to frame so as not to interfere with spring action. Cushions shall be polyurethane foam; shall have a minimum thickness of 3 inches throughout the other portions for nonsag spring units. Frame and spring assembly shall be covered with a chafing barrier to protect foam padding from abrasion. Upholstery cover shall be of panel side construction without welts, fastened to the frame without the use of nails, tacks, or screws, and shall be easily reupholstered.

2.2.3 Hinges

Hinges shall be a counterweight mechanism using gravity to return to the upright position, compensating type or spring lift mechanism, completely enclosed in the seat assembly, totally independent, free and easy in operation, and capable of compensating for circular installation, variation in installation conditions, and unevenness of floors. Each hinge shall have a noiseless, self-rising seat device, shall rise automatically to a uniform safety position of full fold at all times. Seat hinge mechanism shall comply with ASTM F851 and require no adjustment after installation. The compensating type and spring lift mechanism hinge shall be self-lubricating requiring no maintenance. Cushion both the up and down stops on the seat to reduce noise.

2.2.4 Standards/Uprights

Provide standards which are minimum 14 gauge tubular or sheet steel. Steel standards shall be welded. Standards with ADA hinged armrests shall be provided with a label displaying the handicapped symbol and shall be located as shown on drawings.

2.2.4.1 Floor Standards/Uprights

Form floor standards to fit the floor incline so that the standards will be vertical and the hinge point will be at a height that will maintain proper relation of seat to floor. Form the feet to eliminate tripping hazards, with a minimum of two holes for bolt attachment to the floor.

2.2.4.2 Aisle and End Standards/Panels

Aisle and end standard shall comply with standard specifications and have a plastic laminate decorator panel. Shape of decorator panel shall be manufacturer standard profile. Decorator panels are not required for standards that have the ADA armrest.

2.2.5 Armrests

Armrests shall be injection molded thermo-plastic. ADA Armrest shall be

provided in locations as shown on drawings. ADA armrest shall be hinged at rear to allow easy access for limited mobility occupants.

2.2.6 Tablet Arm

Equip each chair with a fold-away tablet arm assembly. Tablet arm shall automatically return to the stored position between the seats without interference with the seats when raised manually to a vertical position in one motion and fall to the stored position by force of gravity, fold smoothly and quietly, store completely out of the way and be easily accessible when needed by the occupant without bending or reaching. Tablet arm shall be fabricated using balanced construction and be composed of manufacturer's standard core material faced with plastic laminate on the writing surface. All edges shall be rounded. When in a writing position, the arm shall lock firmly in place so that it cannot be accidentally disengaged. Both left and right handed tablet arms shall be provided as shown on drawings.

2.2.7 Identification Plates

Seating shall have number and letter plates for seat and row designations. Plates shall be constructed of manufacturer's standard satin finished anodized aluminum and have black letters and numbers. Attaching hardware shall be tamper resistant and have a finish compatible with plates.

2.2.8 ADA Tablet Arm Bases

Provide matching tablet arm board on 14 gauge steel uprights at ADA locations shown on plan..

2.2.9 Bariatric Seats

Provide bariatric seats as shown on drawings. All specifications to match those above except back assembly to be constructed with 15mm Baltic Birch inner structure bonded to 2-inch urethane foam. A laminate back shroud conceals the inner structure board and foam. Bariatric seating must exceed all applicable BIFMA criteria and meet minimum testing standards of 500 pounds functional load plus 750 pounds proof load.

2.3 COLOR

Color shall be as indicated on the drawings. Color listed is not intended to limit the selection of equal colors from other manufacturers.

PART 3 EXECUTION

3.1 PLACEMENT OF STANDARDS

Standards in each row shall be placed laterally so the aisle-end standards will be in alignment as indicated on seating layout drawing. The angle of inclination of backs shall be adjusted for variations in sightlines. Mechanical attachment of components shall be of sufficient flexibility so that when permanently assembled they will compensate for the changing dimensions laterally between standards caused by convergence toward the center. Seat and back attachments shall absorb inaccuracies in lateral spacing of standards at point of attachment caused by unevenness of floor. Varying lateral dimensions of backs and seats shall be in accordance with approved seating layout. Minimum width of seating unit shall be 23 inch and may be used only to complete a specific row dimension.

3.2 INSTALLATION

Installation of the seating system shall be in accordance with the approved detailed drawings and manufacturer's recommended installation instructions. Submit seating plans dimensioned and showing row spacing, row lengths, the varying lateral spacing at backs and seats, back pitch, and seat widths for the various section lengths, placement of standards, floor pitch, and riser height, where applicable. Submit drawings indicating metal thickness, fastenings, details of hinge mechanism, seat and back dimensions, and proposed finish.

3.2.1 Floor Mounting Requirements

Minimum Floor Construction Required for Upright Installation

1. Concrete Floors

   - 3000 psi concrete compressive strength
   - 3-inchthick free of obstructions for 1-1/2 inches
   - 4-inchthick free of obstructions for 2-1/2 inches for riser mount
   - Riser to be plumb within 1/8 degree
   - Minimum anchor embedment 1-1/2 inches for floor mount or 2-1/2 inches for riser mount

2. Wood Floors

   - Minimum two layers of 3/4 inch thickness tongue and groove
   - APA rated grade plywood
   - Allow minimum embedment 1-1/2 inches with lag screws

   NOTE: Warranty null and void if KI product is installed on flooring not meeting minimum structural requirements stated above.

Floor Fastener Requirements

1. Concrete Floors

   1/4 inch x 2-5/8 inch Hilti KH-EZ
   - Max. torque: 18 ft. lbs.
   - Two anchor assemblies required per base

2. Concrete Risers

   1/4 inch x 3 inch Hilti KH-EZ
   - Max. torque: 18 ft. lbs.
   - Two anchor assemblies required per plate

3. Wood Floors

   - 3/8" - 16 x 2-1/2 inch min. Grade 3 nut, bolt and washer
   - Two bolt assemblies required per base

   NOTE: Floor mounting anchors are not provided, unless specified.

3.3 CLEANING

Upon completion of installation, all products shall be cleaned and polished and the area shall be left in a clean and neat condition. Any defects in material and installation shall be repaired, and damaged products that cannot be satisfactorily repaired shall be replaced. Submit three sets of

Maintenance Manuals describing routine maintenance and inspection, proper cleaning and minor repair procedures.

-- End of Section --

SECTION 12 93 00

SITE AND SPORTS FURNISHINGS
02/09

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 INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 303	(2010) Code of Standard Practice for Steel Buildings and Bridges

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.3	(2013) Operations - Safety Requirements for Powder Actuated Fastening Systems

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2010; Errata 2011) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME B18.2.1	(2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)
ASME B18.2.2	(2010) Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
ASME B18.21.1	(2009) Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (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) Machine Screws, Tapping Screws, and Machine Drive Screws (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM A1064/A1064M	(2013) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM A123/A123M	(2013) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A153/A153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A307	(2012) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A36/A36M	(2012) Standard Specification for Carbon Structural Steel
ASTM A47/A47M	(1999; R 2014) Standard Specification for Ferritic Malleable Iron Castings
ASTM A500/A500M	(2013) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A501	(2007) Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A615/A615M	(2014) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A653/A653M	(2013) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A780/A780M	(2009) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM B241/B241M	(2012; E 2013) Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube
ASTM B62	(2009) Standard Specification for Composition Bronze or Ounce Metal Castings
ASTM C150/C150M	(2012) Standard Specification for Portland Cement
ASTM C94/C94M	(2014a) Standard Specification for Ready-Mixed Concrete
ASTM D1187/D1187M	(1997; E 2011; R 2011) Asphalt-Base Emulsions for Use as Protective Coatings for Metal
ASTM D2990	(2009) Tensile, Compressive, and Flexural

	Creep and Creep-Rupture of Plastics
ASTM D3451	(2006; R 2012) Testing Coating Powders and Powder Coatings
ASTM D648	(2007) Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position
ASTM E488/E488M	(2010) Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
ASTM F1487	(2011) Playground Equipment for Public Use

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM FP 1001	Guide Specifications for Design of Metal Flagpoles

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 25	(1997; E 2004) Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-1925	(Rev A; Notice 2) Shield Expansion (Nail Anchors)

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 Notebook, in conformance to Section 01 33 29SUSTAINABILITY REQUIREMENTS. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Tables; G
Bike Racks; G
Bollards; G
Assembly Instruction Drawings; G
LED Scoreboard; G
Manual Scoreboard; G
Grandstand and Press Box; G
5-Row ADA Bleacher; G
Football Goal Post; G
Ball Stopper Fence; G
Foul Pole; G
Basketball Standard; G
Baseball Equipment; G
Play Clock; G
Flagpole; G

SD-03 Product Data

Tables; G
Bike Racks; G
Bollards; G
Litter Receptacles; G
LED Scoreboard; G
Manual Scoreboard; G
Grandstand and Press Box; G
5-Row ADA Bleacher; G
Football Goal Post; G
Ball Stopper Fence; G
Foul Pole; G
Basketball Standard; G
Baseball Base; G
Pitcher's Rubber; G
Home Plate; G
Fence Guard Warning; G
Play Clock; G
Flagpole; G

SD-04 Samples

Finish; G

SD-06 Test Reports

Recycled Materials; G

Testing; G

SD-07 Certificates

Primer certificate; G
Powder coatings certificate; G
engineer's certification letter; G

1.3 QUALITY ASSURANCE

Qualify welders in accordance with AWS D1.1/D1.1M using procedures, materials, and equipment of the type required for the work.

1.3.1 Fabrication Drawings

Submit fabrication drawings showing layout(s), connections to structural system, and anchoring details as specified in AISC 303.

1.3.2 Installation Drawings

Submit templates, erection and installation drawings indicating thickness, type, grade, class of metal, and dimensions. Show construction details, reinforcement, anchorage, and installation.

1.3.3 Assembly Instruction Drawings

Submit assembly instruction drawings showing layout(s), connections, bolting and anchoring details in accordance with manufacturer's standards. Submit drawings showing scaled details of proposed site furnishings, elevations for each type of site furnishing; dimensions, details, and methods of mounting or anchoring; shape and thickness of materials; and

details of construction.

1.3.4 Primer Certificate

Submit a certificate from the manufacturer stating that the primer conforms to requirements of SSPC Paint 25.

1.3.5 Powder Coatings Certificate

Submit a certificate from the manufacturer stating that the powder coat conforms to ASTM D3451.

1.4 DELIVERY, STORAGE, AND HANDLING

Ship items knocked-down (KD) ready for site assembly. Packaged components shall be complete including all accessories and hardware. Materials shall be delivered, handled, and stored in accordance with the manufacturer's recommendations. Site furnishings shall be inspected upon arrival at the job site for conformity to specifications and quality in accordance with paragraph MATERIALS. Protect from corrosion, staining, and other types of damage. Store items in designated area free from contact with soil and weather. Remove and replace damaged items with new items.

PART 2 PRODUCTS

2.1 MATERIALS

Provide materials which are the standard products of a manufacturer regularly engaged in the manufacture of such products. The materials provided shall be of a type with proven satisfactory usage for at least 2 years.

2.1.1 Metals

Metallic materials and products shall conform to Section 05 50 13 MISCELLANEOUS METAL FABRICATIONS. Furnish metal components with factory drilled holes and free of excess weld and spatter. Metal components with holes that will not be filled by hardware or hidden by other components will be rejected. Structural steel products shall conform to ASTM A36/A36M, ASTM A500/A500M and ASTM A501.

2.1.2 Structural Tubing

ASTM A500/A500M

2.1.3 Steel Pipe and Fittings

Steel pipe shall conform to ASTM A53/A53M, Type E or S, Grade B; standard malleable iron fittings shall conform to ASTM A47/A47M.

2.1.4 Anchors and Hardware

Provide anchors, where necessary, for fastening site furnishings securely in place and in accordance with approved manufacturer's instructions. Anchoring devices that may be used, when no anchors are otherwise specified or indicated, include anchor bolts, slotted inserts, expansion shields for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; and lag bolts and screws for wood. Anchor bolts shall conform to ASTM A307. Hardware shall be zinc-chromate plated or galvanized

steel in accordance with ASTM A153/A153M and compatible with the material to which applied. All exposed hardware shall match in color and finish. Mounting hardware shall be concealed, recessed, and plugged.

2.1.4.1 Threaded Inserts and Expansion Anchors

Provide inserts recessed not less than 3 inches into concrete or masonry. Pullout 198 pounds in concrete with f'c of 3,000 psi, as tested in accordance with ASTM E488/E488M. Expansion shields shall conform to CID A-A-1925, group II, type 4, class 1. Provide embedment required by manufacturer.

2.1.4.2 Lag Screws and Bolts

ASME B18.2.1, type and grade best suited for the purpose.

2.1.4.3 Toggle Bolts

ASME B18.2.1.

2.1.4.4 Bolts, Nuts, Studs and Rivets

ASME B18.2.2 or ASTM A307.

2.1.4.5 Power Driven Fasteners

Follow safety provisions of ASSE/SAFE A10.3.

2.1.4.6 Screws

ASME B18.2.1, ASME B18.6.2, and ASME B18.6.3.

2.1.4.7 Washers

Provide plain washers to conform to ASME B18.21.1. Provide beveled washers for American Standard beams and channels, square or rectangular, tapered in thickness, and smooth. Provide lock washers to conform to ASME B18.21.1.

2.1.5 Ounce Metals

Bronze, copper, and other ounce metals shall conform to ASTM B62.

2.1.6 Concrete

Ready-mixed concrete shall conform to ASTM C94/C94M, using 3/4 inch maximum size aggregate, and having minimum compressive strength of 3000 psi at 28 days. Portland cement shall conform to ASTM C150/C150M. Cast-in-place concrete materials and products shall conform to Section 03 30 00 CAST-IN-PLACE CONCRETE. Reinforcing steel shall conform to ASTM A615/A615M. Welded wire fabric shall conform to ASTM A1064/A1064M.

2.1.7 Plastics

Recycled materials shall be constructed or manufactured with a maximum 1/4 inch deflection or creep in any member in conformance with ASTM D648 and ASTM D2990. Provide panels and components molded of ultraviolet (UV) and color stabilized polyethylene, with minimum 1/4 inch wall thickness; exposed edges shall be smoothed, rounded, and free of burrs and points; and the material shall be resistant to fading, cracking, fogging, and

shattering. The material shall be non-toxic and have no discernible contaminates such as paper, foil, or wood. The material shall contain no more than 3 percent air voids and be resistant to deformation from solar radiation heat gain. Recycled materials to include plastic lumber will not be used as structural components of site furnishings. Submit a report of site furnishing parts consisting of recycled materials. Product specification data, providing test information for deflection and creep in accordance with ASTM D648 and ASTM D2990 for site furnishings which use plastic lumber as a component, shall be submitted. Provide data for comparison of deflection and creep measurements to other comparable materials.

2.2 COATINGS AND FINISHES

2.2.1 Galvanizing

Hot-dip galvanize items specified to be zinc-coated, after fabrication where practicable. Galvanizing shall conform to ASTM A123/A123M, ASTM A153/A153M or ASTM A653/A653M, as ap``plicable. Tailings and sharp protrusions formed as a result of the hot-dip process shall be removed and exposed edges burnished. Galvanize anchor bolts, grating fasteners, washers and parts or devices necessary for proper installation, unless otherwise indicated.

2.2.2 Polyester Powder

Powder-coated surfaces shall receive electrostatic zinc coating prior to painting. Powder coating shall be electrostatically applied and oven cured. Polyester powder coating shall be resistant to ultraviolet (UV) light.

2.2.3 Finish

Finish shall be as specified by the manufacturer or as indicated. Exposed surfaces and edges shall be rounded, polished, or sanded. Finish shall be non-toxic, non-glare, and resistant to corrosion. Exposed surfaces shall be smooth and splinter-free exposed surfaces. Submit two sets of color data for each furnishing displaying manufacturer's color selections and finishes, and identifying those colors and finishes proposed for use.

2.2.3.1 Paint

Paint shall be factory applied with a minimum of 2 coats. Paint shall be weather-resistant and resistant to cracking, peeling and fading.

2.2.3.2 Color

Color of site furnishing components shall be as indicated on the drawings.

2.3 SITE STANDARDS

Site furnishings shall be furnished with the dimensions and requirements indicated. Site furnishings placed in children's outdoor play areas shall meet the safety requirements of ASTM F1487 for entrapment; sharp points, edges, and protrusions; entanglement; pinch, crush, and shear points. Site furnishings to be included in children's outdoor play areas shall be free from sharp vertical edges and any protruding elements and designed with a minimum radius of 1/2 inch on all vertical edges; this includes, but is not limited to, seat walls, containment curbs and planters. Where practical,

horizontal edges exposed to children's activities shall be rounded.

2.4 BIKE RACKS

Design bike racks (stanchions) in accordance with manufacturer's standards and to meet design conditions indicated. Locate as shown on the drawings. Provide powder coat finish in color as selected from manufacturer's standards. Racks shall accommodate locking devices and secure, as a minimum, one wheel and part of the frame simultaneously. The spacing between racks shall be a minimum of 24 inches.

2.4.1 Metal Pipe Bike Racks

Provide ASTM A53/A53M schedule 40 steel pipe bike racks in configuration and of 2.375 inch pipe size minimum. Type of mounting, bike rack capacity and height above the ground as shown on the drawings.

2.5 BOLLARDS

Provide metal bollards 8 inch round, height as indicated, suitable for ground mount installation. Provide powder-coated finish as indicated; manufacturer's standard color. Submit manufacturer's descriptive data and catalog cuts.

2.6 LITTER RECEPTACLES

Provide for litter receptacles powder-coated steel with domed tops and removable semi-rigid plastic liner insert. Waste receptacles shall be furnished with weather protection, odor containment, and insect/animal-proofing. Container size shall be 32 gallon.

2.6.1 Height

Trash and litter deposit openings shall be between 30-40 inches above the ground.

2.6.2 Liners

Trash and litter receptacles shall be furnished with removable/reusable inner containers. Self-dumping type designs to include hinged bottom, top or sides will be rejected.

2.6.3 Anchors

Trash and litter receptacles that can be anchored to resist overturning by typical use, high winds, or animals shall be furnished and anchored in accordance with the manufacturer's recommendations.

2.6.4 Openings

Openings for trash and litter insertion shall be a minimum of 4 inches in diameter. Edges of the openings shall be crimped, rounded and smoothed.

2.6.5 Metal Waste Receptacle

Provide metal waste receptacles as indicated, fabricated from steel frame with steel staves welded to frame; powder coat finish, color as selected.

a. Metal thickness, width, and configuration shall be manufacturer's

standard. Chemically clean and phosphate coat prior to final powdercoat.

b. Provide 3/16 inch thick fiberglass-reinforced polyester resin liner in black for planter liners.

2.7 LED SCOREBOARD

Provide prefabricated LED scoreboard to meet design conditions indicated. LED scoreboard design shall conform to all applicable State and Local Building Codes and shall meet manufacturer's standards of construction and materials. Shelter systems shall be shipped with all hardware and accessories necessary for complete field assembly. Base power requirement: 600 W. Colors to be determined by owner from manufacturer's standard color options. Scoreboard to be a multi-sport with football, soccer and lacrosse/field hockey capabilities.

2.7.1 Framing Systems

Framing system; posts shall be steel as indicated. Manufacturer shall provide shop drawings and calculations prepared by a structural engineer.

2.7.1.1 Scoreboard

Dimensions as indicated on the drawings. Constructed of Alcoa aluminum alloy 5052, back, face and perimeter minimum 0.063 inches and scoreboard top and bottom minimum 0.125 inch. T.O.L digits: 18 inches high. All digits and indicators to be sealed front and back with weather tight silicone gel.

2.7.1.2 Steel

Structural steel shall conform to ASTM A36/A36M or ASTM A500/A500M, 36,000 psi yield strength and 58,000 psi tensile strength, factory finished with rust inhibited primer and powder coat conforming to ASTM D3451. Framing sizes and configurations shall be as required for size of structure indicated meeting manufacturer's standard and applicable building codes.

2.7.1.3 Captions

Vinyl applied directly to coreboard face. HOME and GUEST captions: 15 inches high. DOWN, TO GO, BALL ON and QTR captions: 14 inches high. T.O.L. captions: 12 inches high. Color: standard white.

2.7.1.4 Accessory Equipment

Backlit captions. Vinyl striping applied around the clock and scoreboard face. Soccer captions on changeable panels. Lacrosse/field hockey captions on changeable panels. Horn option to be provided.

2.7.2 Digits and Indicators

Provide manufacturer's standard LED color: amber. HOME, GUEST and clock digits: 36 inches high. DOWN, TO GO, BALL ON and QTR": 24 inches high.

2.7.3 Scoring Console

Capability to provide scores for multiple sports using changeable keyboard inserts. Recalls clock, score and period information if power is lost.

Console to be an aluminum enclosure to house electronics. Sealed membrane water-resistant kekboard. 32 character LCD to verify entries and recall information currently displayed. Power cord that plugs into a standard grounded outlet, 6 watts max. Hand held switch for main clock start/stop and horn. Soft-sided carrying case for hand held switch. Console shall be 2.4 GHz spread spectrum radio system with frequency hopping technology and 64 non-interfering channels. The system shall include a transmitter installed inside the console and a receiver installed inside the scoreboard. Provide a hard carrying case, and battery pack.

2.8 MANUAL SCOREBOARD

Hang-the-number style scoreboard, non-electronic, inning-by-inning scoreboard.

2.8.1 Framing Systems

Galvanized steel with powder coat finish.

2.8.1.1 Scoreboard

Dimensions as indicated on the drawings. Galvanized steel with powder coat finish. Designed to mount on two 4 inch by 4 inch galvanized steel posts. School logo panel to be included, manufacturer's standard top mounted sponsor panel.

2.8.1.2 Numbers

Manufacturer's standard hanging plastic numbers, 9 inch high double-sided 0-9, 48 numbers.

2.9 GRANDSTAND AND PRESS BOX

Provide engineering, material, freight, installation and supervision to provide a new permanent grandstand structure in accordance with the plan view and sectional view drawings. Color powder coated structural steel understructure, continuous aluminum welded decking system with slip resistant surface equal or greater than 0.80 coefficient of friction. 12/24 inch rise/run with riser mounted seatboard brackets with a structural steel connection. Powder coated riserboards (school colors) with 100% coverage front and back. Pre-fabricated press box as per manufacturer's design and as shown on the drawings.

2.9.1 Design Loads

a. Dead load: 6 psf for seatboards, risers and steel framing.
b. Live load: 100 psf for structural members. All stringers and girders shall be limited to L/200 for maximum vertical live load deflection. 120 plf for seatboards and footboards.
c. Structural elements shall be sized to limit the live load deflections to 1/200 of the span. Calculations shall be submitted with shop details confirming 1/200 deflection criteria.

2.9.1.1 Quality Assurance

A. Submit a letter of certification prepared by a Professional Structural Engineer (registered in the Commonwealth of Virginia) employed by the manufacturer certifying the following:

1. The aforementioned Engineer is fully experienced in the design of bleachers and press boxes.

2. All shop drawings (including all supports, connections and components) shall be prepared under the direction of the aforementioned engineer, in compliance with the Contract Document requirements and applicable building codes.

   His seal and signature shall appear on all shop drawings. The aforementioned shop drawings shall include sufficient information to enable the Contracting Officer to confirm that design loads, support points and tie backs are in compliance with the design criteria.

   This engineer's certification letter must be received by the Contracting Officer prior to the submission of the Shop Drawings and shall bear the seal and signature of the aforementioned engineer.

B. The aforementioned engineer shall submit a letter to the Contracting Officer stating that the fabrication and installation of the bleachers and press box has been performed in accordance with his design. This letter shall be signed and sealed by the aforementioned engineer as part of "Project Closeout".

C. All design calculations (which shall bear the seal and signature of the aforementioned engineer), indicating compliance with the requirements of the design criteria and appropriate codes shall be provided to the Contracting Officer prior to fabrication for record purposes.

D. The calculations provided to the Contracting Officer shall be part of "Project Closeout".

Manufacturer shall have a minimum of five (5) years experience in the fabrication of grandstand structures. Fabricator shall carry current certification and comply with AISC's "Code of Standard Practices for Steel Buildings and Bridges". Provide government with all calculations by a structural engineer. A successful third party engineer is required.

2.9.1.2 Structural Steel

All detailing, fabrication, and erection shall be in accordance with AISC Specifications. All welds shall conform to ANSI/AWS D1.1, latest edition. Columns, support beams and stringers shall be wide flange shapes. Steel finish: powder coated.

2.9.2 Decking System

a. The decking system has two components. The first component is a one-piece welded deck panel constructed by welding multiple aluminum extensions together in the factory utilizing a fully automated, computer controlled, multi-head welding machine. The welding machine will weld all extrusions together in a single pass with 0.040 inch diameter 4043 welded wire using Orlion Gas to insure uniform shape, dimension and appearance. The decking system is fixed with a 1% slope to the front to enhance water drainage. The decking system is attached by concealed clips and galvanized hardware. The decking extrusions are 1-¾ inch vertically with a .078 inch wall thickness and are interlocked horizontally prior to welding using a tongue and groove connection.
b. The second component is a one-piece aluminum riser extension that has a

male-female connection at the top with the welded deck panel and a shingled overlap connection at the bottom with the welded deck panel. The riser is finished with a powder coated or anodized surface treatment, covering 100% of the riser surface.

c. The decking system will run from raker beam to raker beam. There will be a ½" gap at joint of the welded deck panels to allow for expansion and construction of the aluminum due to temperature variations.
d. The joint of the welded deck panel is covered with a 4" wide aluminum extrusion joint cover. The joint of the welded deck panel is elevated ¼" by use of a ¼" steel plate that is installed below the welded deck panel and above the structural steel supports below.

2.9.3 Seating

Bench seats shall be 6063-T6 extruded aluminum with a fluted surface and a minimum of 4 vertical legs. The exact size of seatboard is 2" x 10" x .080" wall thickened at the joints and weighing 1.9 lbs. per foot with 1" radius comfort curve front edge. Aluminum shall be cleaned, pre-treated and powder coated with school colors. Mounting brackets: 3/16" thick A36 steel plate, plasma cut, bent and galvanized. Seatboards shall be attached to the system by riser mounted galvanized steel "L" brackets (deck mounted brackets not allowed). The seatboards shall align with the intermediate steps at the aisles. Seat brackets must have a positive connection to the steel frame of the bleacher. Attachment to the aluminum decking system is not allowed.

2.9.4 Guardrails

Vertical guardrail structural supports shall be aluminum rectangular tube 2.8" x 2.0 x .1888 inch or aluminum angle of equivalent strength, and shall be 6061-T6 alloy. Guardrail shall have structural support on each leg of the fencing at all 90° turns. Tension bars do not meet this requirement Guardrail horizontal and vertical framing members will be 1 5/8" O.D. aluminum pipe. Chain link fence shall be 2" mesh, 6 gauge vinyl-coated fabric.

2.9.5 Vertical Closure System

Vertical closure shall be provided at the following locations and shall enclose the area from the walking surface to 4" above grade:

a. Front of grandstand
b. Egress stairs and associated platforms at front walkway
c. Egress ramps and associated platforms
d. Behind mid-level cross aisle (if applicable)

Vertical closure material shall be corrugated 6063-T6 extruded aluminum riserboards and shall be provided in a color powder coated finish

2.10 5-ROW ADA BLEACHER

5-row non-elevated bleacher, minimum 60-seat capacity (including ADA seating areas). Each bleacher shall contain ADA seating areas.

2.10.1 Design

a. Rise and tread dimensions: Vertical rise and horizontal tread depth per each row: 8" x 24". Seat is 17" above the respective tread.
b. Stringer (frames): Welded angle frames are spaced at 6'-0" (max)

intervals and secured by cross braces.

c. Seat: Single 2″ x 10″ anodized planks with 9 ½″ anodized channel end cap.
d. Treads: Double 2″ x 11″ mill aluminum planks with anodized angle end caps.
e. Risers: Single 6.25″ LCD (10240) anodized riser plank.
f. Guard railing: Two aluminum rails at top and bottom with 42″ above seat on sides of bleacher and along the rear of bleacher. 9 gage chain link fence in between the railing.

2.10.2 Frames

a. Galvanized steel: All steel hot dipped after fabrication to ASTM A123/A123M.
b. Cross bracing: All cross braces to be aluminum L 1-1/2″ x 1-1/2″ x 3/16″ 6061-T6 mill finish.

2.10.3 Seat Planks

a. Aluminum alloy 6063-T6, clear anodized 204R1 with a wall thickness .094″ for impact and deformation resistance.

2.10.4 Tread and Riser Planks

a. Aluminum alloy 6063-T6, mill finish with a wall thickness of .094″ for impact and deformation resistance.

2.10.5 Design Loads

a. Dead Load - 10 psf.
b. Live Load - 100 psf.
c. Guardrails (perpendicular) 50 lbs/lf. 200 lbs. at any point.
d. Guardrails (vertical) 100 lbs/lf.
e. Seat & Tread - 120 lbs/lf.

2.11 FOOTBALL GOAL POST

Regulation high school football goal post. Color: yellow. Finish: powder coated.

2.11.1 Ground Sleeve

8 inch schedule 40 steel tube, 10 x 10 x 1/8 inch steel plate.

2.11.2 Offset/Goose Neck

6 inch schedule 40 aluminum pipe, 8 feet long, suitable for a soccer goal to fit underneath.

2.11.3 Cross Bar

6 inch schedule 40 aluminum pipe.

2.11.4 Uprights

4 inch x 1/8 inch wall aluminum pipe.

2.11.5 Flag

Manufacturer's standard end cap and flag for uprights.

2.12 BALL STOPPER FENCE

Manufacturer's standard powder coat finish: black. Maximum distance from pole to pole shall not exceed 40 feet.

2.12.1 Poles

8 inch diameter 6061-T6 x 0.312 inch wall thickness.

2.12.2 Net

Support with vinyl-coated galvanized steel 7x7 aircraft cable at top and bottom. 4 inch square mesh with a minimum break strength of 180 LBF, knotless high tenacity polypropylene with extra UV stabilizers. Anchor net straight down to bottom of poles with stainless eyebolts, cable and spring snaps.

2.12.3 Rope/Pulley System

System for raising and lowering the net. Hardware to be stainless steel or marine grade.

2.13 FOUL POLE

Powder coated steel, winged. Color: yellow.

2.13.1 Pole

4 inch O.D. schedule 40 steel pipe.

2.13.2 Wing

Offset screen fabricated of a 1-1/2 inch aluminum lockcrimp mesh encased on the entire perimeter by a slotted, welded aluminum frame, powder coated. Color to match pole.

2.14 BASKETBALL STANDARD

Standard 10 foot high basketball standard. Backboard and goal to be directly mounted to post. Offset backboard not permitted.

2.14.1 Post

5-9/16 inch O.D. heavy duty bent post with 6 foot extension.

2.14.2 Backboard

36 inch x 54 inch powder coated white with border and target, fan shaped.

2.14.3 Goal and Net

Heavy duty goal and white nylon net.

2.15 BASEBALL EQUIPMENT

Provide manufacturer's standard baseball equipment.

2.15.1 Baseball Base

Bolco-style, official 15 inch x 15 inch x 3 inch, heavy duty injected vinyl cover with bonded polyester foam core with 1 inch anchor.

2.15.2 Pitcher's Rubber

Baseball field: Step-down style, official 24 inch long heavy duty rubber.
Softball field: Step-down style, 18" long heavy duty rubber.

2.15.3 Home Plate

Official 18 inch, high durability, molded rubber with stanchion mounted steel plate and sleeve.

2.15.4 Fence Guard Warning

4 inch diameter corrugated plastic, pre-slit for top rail of fence, with manufacturer's standard tie wraps every two feet. Color: yellow.

2.16 PLAY CLOCK

Wireless, portable digital play clock with a viewing distance of 1500 feet.

2.16.1 Clock Face

30 inch number height, 2 digit red LED. 39-3/4 inch wide x 34-1/2 inch tall x 3-1/4" deep. Clock to be battery operated.

2.16.2 Portable Cart

48 inches wide x 48 inches deep x 110 inches tall, powder coated aluminum.

2.16.3 Accessories

Manufacturer's standard battery charger and handheld with belt clip RF wireless controller.

2.17 TABLES

Pedestal tables shall be furnished with attached benches that have backrests. Table's exposed edges and corners shall be rounded, eased or chamfered.

2.17.1 Height

Between 29-48 inches from the finished grade to the lowest surface of the top, or as noted.

2.17.2 Clearance

A minimum vertical clearance of 9 inches between the seat top and the bottom edge of the table top shall be provided. A minimum of 18 inches of leg space under tables, measured from the inside edge of the seat top to the nearest table support, shall be provided. A minimum of 18 inches from

the end of the table top to the nearest support leg shall be provided.

2.17.3 Top

Table top surfaces shall not contain recesses that might hold water or food particles. The table top width shall be a minimum of 18 inches when utilized from one side only, and a minimum of 36 inches when utilized from two sides. The table top length shall be a minimum of 24 inches per person.

2.17.4 Wheelchair Access

A minimum clear space of 29 inches from the finished grade to the underside of the table shall be provided for persons with disability to be able to pull a wheelchair beneath the table top at the end of the table; the minimum clear width shall be 34 inches.

2.17.5 Recycled Plastic Wood Tables

Provide manufacturer's standard recycled plastic wood tables with metal bases as indicated. Provide fasteners and accessories required for onsite assembly.

a. Design wood tables to sustain a live load of not less than 200 pounds per square foot.

b. Design bases of the materials listed below to support the loads imposed in the design of the tables.

c. Steel Support: ASTM A653/A653M.

2.18 FLAGPOLE

Provide aluminum round tapered model of sizes indicated on the drawings and in accordance with ASTM B241/B241M and NAAMM FP 1001. Furnish complete with flagpole assemblies, including anchorages and supports, capable of withstanding the effects of wind loads, determined according to NAAMM FP 1001 for specified ground speed.

a. Finish: directional sanded satin finish, fine, directional, medium satin polish; buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.

b. Hurricane series with internal halyard assembly as indicated on the drawings. Finish exposed metal surfaces to match flagpole.

c. Silver heavy duty flagpole beacon, external truck, heavy duty, revolving, 120v, 2 LED lights.

PART 3 EXECUTION

3.1 INSTALLATION

Verify that finished grades and other operations affecting mounting surfaces have been completed prior to the installation of site furnishings. Site furnishings shall be installed plumb and true, at locations indicated,in accordance with the approved manufacturer's instructions.

3.1.1 Assembly and Erection of Components

New parts shall be acquired from the manufacturer; substitute parts will not be accepted unless approved by the manufacturer. When the inspection of parts has been completed, the site furnishings shall be assembled and anchored according to manufacturer's instructions or as indicated. When site furnishings are assembled at the site, assembly shall not interfere with other operations or pedestrian and vehicular circulation.

3.1.2 Anchorage, Fastenings, and Connections

Furnish metal work, mounting bolts or hardware in ample time for securing into concrete or masonry as the work progresses. Provide anchorage where necessary for fastening furniture or furnishings securely in place. Provide, for anchorage not otherwise specified or indicated, slotted inserts, expansion shields, and power-driven fasteners, when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts 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 the fastenings to which they are applied. Conceal fastenings where practicable.

3.2 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.

3.3 TESTING

Test each site furnishing to ascertain a secure and correct installation. A correct installation shall be according to the manufacturer's recommendations and by the following procedure: Measure the physical dimensions and clearance of each installed site furnishing for compliance with manufacturer's recommendations and as indicated. Site furnishings which do not comply shall be reinstalled. Fasteners and anchors determined to be non-compliant shall be replaced. Submit a written report describing the results of the testing and a report of post-installation test results.

3.4 FINISHES

3.4.1 Field Finishes

Where dissimilar metals are in contact, protect surfaces with a coat conforming to SSPC Paint 25 to prevent galvanic or corrosive action. Where aluminum is in contact with concrete, mortar, masonry, wood, or absorptive materials subject to wetting, protect with ASTM D1187/D1187M, asphalt-base emulsion.

3.4.2 Repair of Zinc-Coated Surfaces

Repair damaged surfaces with galvanizing repair method and paint conforming to ASTM A780/A780M or by the application of stick or thick paste material specifically designed for repair of galvanizing, as approved by the Contracting Officer. Clean areas to be repaired and remove the slag from the 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 the molten material uniformly over surfaces to be coated and

wipe the excess material off.

3.5 BOLLARDS

Install in pipe sleeves embedded in concrete and filled with non-shrink grout or quick setting anchoring cement.

3.6 BICYCLE RACKS

Affix to base structure by flanges anchored to concrete or other existing masonry by expansion shields. Provide direct bury posts. Where aluminum or alloy fittings or extrusions are to be in contact with dissimilar metals or concrete, give the contact surface a heavy coating of bituminous paint.

3.7 RESTORATION AND CLEAN UP

When the installation has been completed, clean up and protect the site. Existing areas that have been damaged from the installation operation shall be restored to original condition at Contractor's expense.

3.7.1 Clean Up

The site shall be cleaned of all materials associated with the installation. Site furnishing surfaces shall be cleaned of dirt, stains, filings, and other blemishes occurring from shipment and installation. Cleaning methods and agents shall be according to manufacturer's instructions or as indicated.

3.7.2 Protection

The area shall be protected as required or directed by providing barricades and signage. Signage shall be in accordance with Section 10 14 01 EXTERIOR SIGNAGE.

3.7.3 Disposal of Materials

Excess and waste material shall be removed and disposed off Government property.

3.8 RE-INSTALLATION

Where re-installation is required, the following shall be accomplished:

a. Re-install the product as specified. Material acquisition of replacement parts is the responsibility of the Contractor. Provide replacement materials that are new and supplied by the original manufacturer to match.

b. Damage caused by the failed installation shall be repaired.

-- End of Section --

SECTION 13 48 00.00

SEISMIC PROTECTION FOR MECHANICAL EQUIPMENT
10/07

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 325 (2011) Steel Construction Manual

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-310-04 (2013) Seismic Design for Buildings

1.2 SYSTEM DESCRIPTION

1.2.1 General Requirements

Apply the requirements for seismic protection measures described in this section to the mechanical equipment and systems listed below. Structural requirements shall be in accordance with Section 13 48 00.00 SEISMIC PROTECTION FOR MISCELLANEOUS EQUIPMENT.

1.2.2 Mechanical Equipment

Mechanical equipment to be seismically protected shall include the following items to the extent required on the drawings or in other sections of these specifications:

All equipment mounted overhead that weights more than 31 pounds, to include but not limited to:

a. Water Source Heat Pumps
b. Fan Coil Units
c. Exhaust and Supply Fans
d. Variable Air volume Terminal Units
e. Constant Air volume Terminal Units
f. Expansion Tanks
g. Sound traps/attenuators
h. Kitchen Exhaust Hood.

Contractor Designed Bracing

Submit copies of the design calculations with the drawings. Calculations shall be approved, certified, stamped and signed by a registered Professional Engineer. Calculations shall verify the capability of structural members to which bracing is attached for carrying the load from the brace. Design the bracing in accordance with UFC 3-310-04 and additional data furnished by the Contracting Officer. Resistance to lateral forces induced by earthquakes shall be accomplished without

consideration of friction resulting from gravity loads. UFC 3-310-04 uses parameters for the building, not for the equipment in the building; therefore, corresponding adjustments to the formulas shall be required. Loadings determined using UFC 3-310-04 are based on strength design; therefore, AISC 325 Specifications shall be used for the design.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Coupling and Bracing
Flexible Couplings or Joints
Equipment Requirements
Contractor Designed Bracing; G

SD-03 Product Data

Coupling and Bracing; G
Equipment Requirements; G
Contractor Designed Bracing; G

SD-07 Certificates

Flexible Mechanical Joints

PART 2 PRODUCTS

2.1 EQUIPMENT REQUIREMENTS

Submit copies of the design calculations with the detail drawings. Calculations shall be stamped by a registered engineer and shall verify the capability of structural members to which bracing is attached for carrying the load from the brace.

2.1.1 Rigidly Mounted Equipment

Each item of rigid equipment shall be entirely located and rigidly attached on one side only of a building expansion joint. Piping, duct, electrical conduit, etc., which cross the expansion joint shall be provided with flexible joints that are capable of accommodating displacements equal to the full width of the joint in both orthogonal directions.

2.1.2 Nonrigid or Flexibly-Mounted Equipment

The specific items of equipment indicated in paragraph 1.2.2 shall be constructed and assembled to resist a horizontal lateral force of 5 times the operating weight of the equipment at the vertical center of gravity of the equipment, and 1.5 times the operating weight in the downward direction.

FLEXIBLE COUPLINGS

Flexible couplings shall have same pressure and temperature ratings as adjoining pipe.

FLEXIBLE MECHANICAL JOINTS

a. Mechanical couplings for steel or cast iron pipe shall be of the sleeve type and shall provide a tight flexible joint under all reasonable conditions, such as pipe movement caused by expansion, contraction, slight settling or shifting of the ground, minor variations in trench gradients, and traffic vibrations. Where permitted in other sections of these specifications, joints utilizing split-half couplings with grooved or shouldered pipe ends may be used.

b. Sleeve-type couplings shall be used for joining plain-end pipe sections. The coupling shall consist of one steel middle ring, two steel followers, two gaskets, and necessary steel bolts and nuts to compress the gaskets.

2.2 SWAY BRACING MATERIALS

Sway bracing materials (e.g. rods, plates, rope, angles, etc.) shall be as specified in Section 13 48 00.00 SEISMIC PROTECTION FOR MISCELLANEOUS EQUIPMENT.

PART 3 EXECUTION

3.1 COUPLING AND BRACING

a. Submit detail drawings, as specified here and throughout this specification, along with catalog cuts, templates, and erection and installation details, as appropriate, for the items listed. Submittals shall be complete in detail; shall indicate thickness, type, grade, class of metal, and dimensions; and shall show construction details, reinforcement, anchorage, and installation with relation to the building construction.

b. Coupling installation shall conform to the details shown on the drawings. Provisions of this paragraph apply to all piping within a 5 foot line around outside of building unless buried in the ground. Piping grouped for support on trapeze-type hangers shall be braced at the most frequent interval as determined by applying the requirements of this specification to each piping run on the common support.

c. Bracing components shall be sized as required for the total load carried by the common supports. Bracing rigidly attached to pipe flanges, or similar, shall not be used where it would interfere with thermal expansion of piping.

3.2 BUILDING DRIFT

Joints capable of accommodating seismic displacements shall be provided for vertical piping between floors of the building, where pipes pass through a building seismic or expansion joint, or where rigidly supported pipes connect to equipment with vibration isolators. Horizontal piping across expansion joints shall accommodate the resultant of the drifts of each building unit in each orthogonal direction. For threaded piping, swing joints made of the same piping material shall be provided.

3.3 FLEXIBLE COUPLINGS OR JOINTS

Building Piping

Flexible couplings or joints in building piping shall be provided at bottom of all pipe risers for pipe larger than 3-1/2 inches in diameter. Flexible couplings or joints shall be braced laterally without interfering with the action of the flexible coupling or joint. Cast iron waste and vent piping need only comply with these provisions when caulked joints are used. Flexible bell and spigot pipe joints using rubber gaskets may be used at each branch adjacent to tees and elbows for underground waste piping inside of building to satisfy these requirements.

PIPE SLEEVES

Pipe sleeves in interior non-fire rated walls shall be sized as indicated on the drawings to provide clearances that will permit differential movement of piping without the piping striking the pipe sleeve. Pipe sleeves in fire rated walls shall conform to the requirements in Section 07 84 00 FIRESTOPPING.

-- End of Section --

SECTION 14 24 00

HYDRAULIC ELEVATORS
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 WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2010; Errata 2011) Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME A17.1/CSA B44	(2013) Safety Code for Elevators and Escalators
ASME A17.2	(2012) 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
ASME B16.11	(2011) Forged Fittings, Socket-Welding and Threaded
ASME B16.9	(2012) Standard for Factory-Made Wrought Steel Buttwelding Fittings

ASTM INTERNATIONAL (ASTM)

ASTM A106/A106M	(2014) Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service
ASTM A53/A53M	(2012) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2012) International Building Code

NATIONAL ELEVATOR INDUSTRY, INC. (NEII)

NEII-1	(2000; R thru 2010) Building Transportation Standards and Guidelines, including the Performance Standards Matrix

for New Elevator Installation

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code

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

29 CFR 1910.27	Fixed Ladders
36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

1.2 SYSTEM DESCRIPTION

Provide a pre-engineered elevator system, by manufacturer regularly engaged in the manufacture of elevator systems, that complies with all relevant codes.

1.2.1 Miscellaneous Requirements

Submit one set of wiring diagrams, in plastic or glass cover, framed and mounted in elevator machine room for revised building electrical system, if needed, to make supplied elevator system function as specified. Deliver other sets to Contracting Officer. Coded diagrams are not acceptable unless adequately identified. Submit calculations for the Reaction Loads imposed on the building by elevator systems that comply with ASME A17.1/CSA B44 and for total anticipated Heat Loads generated by all the elevator machine room equipment. Calculations shall be certified by a Registered Professional Engineer. Do not fabricate materials nor perform construction until approved.

1.2.2 Provisions for Earthquake Protection

See strtuctural drawings for seismic design criteria.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G

SD-03 Product Data

Passenger Elevators; G
Field Quality Control Plan; G
Logic Control; G

SD-05 Design Data

Reaction Loads; G
Heat Loads; G

SD-06 Test Reports

Field Tests Reports; G

SD-07 Certificates

Welders' Qualifications; G

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals; G
Maintenance and Diagnostic Tools; G
Maintenance and Diagnostic Software
Maintenance and Repair Action Plan; G
Operation and Maintenance Training; G

1.4 QUALITY ASSURANCE

1.4.1 Elevator Specialist

Perform work specified in this section under the direct guidance of the Elevator Specialist who is regularly engaged in the installation and maintenance of the type and complexity of elevator system specified in the contract documents, and who served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 24 months. Provide endorsement letter from the elevator manufacturer certifying that the Elevator Specialist is acceptable to manufacturer. The Elevator Specialist oversees the acceptance inspections and tests, signs and certifies the successful results. Provide the Elevator Specialist's written certification that the installation is in accordance with the contract requirements, after completion of the acceptance inspections and tests. Bring any discrepancy to the attention of the Contracting Officer in writing, no later than three working days after the discrepancy is discovered.

1.4.2 Elevator Inspector

a. The Elevator Inspector shall be certified in accordance with the requirements of ASME A17.1/CSA B44 and licensed by the State of Virginia in elevator repair, except in the State of Hawaii. The Certified Elevator Inspector shall inspect the installation of the elevator(s) to ensure that the installation conforms with all contract requirements. The Elevator Inspector shall be directly employed by the Prime Contractor and be independent of the Elevator System Manufacturer and the Elevator Specialist, shall witness the acceptance inspections and tests, approve all results and shall sign and certify the successful results. The Elevator Inspector, after completion of the acceptance inspections and tests, shall certify in writing that the installation is in accordance with the contract requirements. Bring any discrepancy to the attention of the Contracting Officer in writing, no later than three working days after the discrepancy is discovered.

1.4.3 Welders' Qualifications

Comply with AWS D1.1/D1.1M, Section 4 Qualification. Provide certified

copies of welders' qualifications. List welders'names with corresponding code marks to identify each welder's work. Submit a letter, no later than 14 days after the Notice to Proceed, providing the name and Statement of Qualifications, including ASME A17.1/CSA B44 Certificate and all required state and local licenses of the individual who will perform the duties specified herein for the Elevator Inspector. A letter of endorsement from the elevator manufacturer certifying that the Elevator Specialist is acceptable to manufacturer, no later than 14 days after the Notice to Proceed, providing the name and Statement of Qualifications of the individual who will perform the duties specified herein for the Elevator Specialist. Copies of certified welders' qualifications, demonstrating compliance with AWS D1.1/D1.1M, Section 4; list welders' names with corresponding code marks.

1.4.4 Detail Drawings

Submit detail drawings, including dimensioned layouts in plan and elevation showing the arrangement of elevator equipment, accessories, supporting systems, anchorage of equipment, clearances for maintenance and operation; and details on hoistway, doors and frames, operation and signal stations, controllers, motors, guide rails and brackets, cylinder and plunge unit, and points of interface with normal power fire alarm system, HVAC or exhaust systems. Provide drawings to show any revised building electrical system required to make supplied elevator system function as specified. Prepare drawings with complete wiring diagrams showing electrical connections and other details required to demonstrate sequence of operations and functions of system devices. Include the appropriate sizing of electrical protective devices on the drawings, which are frequently different from National Electrical Code standard sizes.

1.5 SCHEDULING

Every six months, test systems for Hospital Emergency Commandeering Service Operations and Firefighters' Service. Schedule to not interfere with building operations. For Firefighters' Service, test monthly in accordance with ASME A17.1/CSA B44, Section 8.6.10.1. Provide written results of each test operation to the Contracting Officer. Document all inspection and testing. Maintain copy of documentation in machine room.

1.6 WARRANTY

Provide routine warranty service in accord with manufacturer's warranty requirements, for a period of 12 months after the date of acceptance by Contracting Officer. Perform work during regular working hours. During the warranty service period, include 24-hour emergency service, with 2 hour response time, without additional cost to the Government. Include adjustments, greasing, oiling, and cleaning. Provide routine inspection and tests of elevators in accordance with ASME A17.1/CSA B44 Section 8.11.3 and ASME A17.2. Provide supplies and parts to keep elevator system in operation. Perform service only by factory trained personnel. Maintain a maintenance log of all service orders performed during the warranty period and submit it to the Contracting Officer 21 days prior to the end of the warranty period.

1.7 MAINTENANCE AND REPAIR ACTION PLAN

Provide plan of action prepared by the Elevator Specialist for emergency and routine maintenance in accordance with paragraph titled WARRANTY. Provide a list of phone numbers, personnel contacts, and all maintenance

and diagnostic tools provided by paragraph "Maintenance and Diagnostic Tools", to the Contracting Officer.

1.7.1 Maintenance and Diagnostic Tools

Provide all special tools and software necessary to service and maintain each elevator delivered at time of final acceptance. Provide one of each tool per group of elevators. Include solid state or microprocessor diagnostic tools unavailable on the open market. Provide necessary diagnostic software in cases where the solid state or microprocessor diagnostic tools are available on the open market

1.7.2 Keys for Elevator Key Switches

Provide a minimum of twelve keys per unique cylinder used on all key switches for single elevator. If there is more than one elevator, additional keys are not required unless there are additional unique 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 other side.

PART 2 PRODUCTS

2.1 PASSENGER ELEVATORS

2.1.1 Basic Requirements

Submit information on motor, pump, gages, piston and cylinder, piping and valves, hall station, and buffer on elevators and accessories. For elevator supporting systems, include information on car control and emergency power systems. On data sheets, provide document identification number or bulletin number, published or copyrighted prior to the date of contract bid opening. These requirements apply to Freight Elevators also.

a. Rated Load: 3,500 lbs.

b. Rated Speed: 125 fpm.

c. Travel Length: 14.67 ft..

d. Number of Stops: 2.

e. Number of Hoist Way Openings: 2 Front; 0 Rear.

f. Car Inside Dimensions: 6 ft. 8-in. wide, 5 ft. 5-in. deep and 18 ft. 0 -in. high.

h. Car Door Types: Single-speed side slide Horizontal sliding.

2.1.2 Cab Enclosures and Door Finishes

Provide finishes as listed below:

a. Floor; linoleum.

b. Walls; laminated plastic on particleboard. Provide each cab wall with equally spaced and equally sized wall panels. Conceal all fasteners. Wall trim; stainless steel. Accessories; hand rails.

c. Interior face of door(s); stainless steel.

d. Ceilings; prefinished steel panels. Ceiling frame; stainless steel.

e. Hoistway Doors and Frame Finishes; provide finishes on exterior of hoistway as follows:

(1) Frame; factory primed steel.
(2) Exterior face of door; stainless steel.

2.2 SPECIAL OPERATION AND CONTROL

Provide all special operations and control systems in accordance with ASME A17.1/CSA B44. Provide special operation key switches with 5 pin cylinder locks with removable cores an a key control lock for each operation system.

2.2.1 Firefighters' Service

Provide equipment and signaling devices. The designated level for Firefighters' key operated switch is the ground floor.

2.2.2 Smoke Detectors

Provide connections directly to elevator controls which will, when smoke is detected by any smoke detector, actuate Firefighters' Service and send each elevator to the correct floor as required by ASME A17.1/CSA B44. Provide dual-contact smoke detectors located in the elevator lobbies and the elevator machine room. Provide dual-contact smoke detector at top of hoistway. Include only these smoke detectors with the circuit for elevator controller actuation of Firefighters' Service. In lieu of dual-contact smoke detectors, use an addressable fire alarm system with listed smoke detectors in the above stated locations. Ensure that all smoke detectors are mounted on finished ceiling.

2.2.3 Fire Sprinklers

For each elevator, provide control wiring connecting the flow switch to the shunt trip equipped circuit breaker within the electrical panel serving the main line disconnect. Upon flow of water, equip flow switch to instantaneously send a signal to cause opening of shunt-trip equipped mainline circuit breaker, in compliance with ASME A17.1/CSA B44, Section 2.8.2, and send a signal to fire alarm control panel to indicate water flow condition. Provide machine room sprinkler flow switch actuation to shunt trip all elevator(s) served by the machine room. Provide hoistway sprinkler flow switch actuation to shunt trip all elevator(s) in the hoistway.

2.2.4 Top-of-Car Operating Device

Provide operating device mounted on or from car crosshead, to permit operation of car at 150 fpm maximum for adjustment, maintenance, testing, and repair. Include integral or remote safety device, continuous pressure "UP" and "DOWN" switches or buttons, emergency stop switch, and inspection switch.

2.2.5 Hoistway Access Switches

Provide key-operated hoistway access switch to permit limited movement of

car at terminal floors for car positioning, operative only when "INSPECTION" switch in car operating panel is in the "INSPECTION" position. Locate switch 6 feet above floor level, within 12 inches of hoistway entrance frame or with only ferrule exposed when located in entrance frame.

2.2.6 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.

2.2.7 Elevator Operation

2.2.7.1 Single, Two-Stop, Automatic Operation

Provide Single Two-Stop Automatic Operation. Provide illuminating push buttons.

2.2.7.2 Selective Collective Automatic Operation

Provide Selective Collective Automatic Operation. Provide illuminating push buttons.

2.2.7.3 Duplex Selective Collective Automatic Operations

Provide Duplex Selective Collective Automatic Operation. Provide a single push button for terminal landings and dual push buttons, up and down, at intermediate landings. In each car operating panel, provide push buttons numbered to correspond to each landing. If a car is taken out of service, or fails to respond to a landing call within a predetermined adjustable time limit of approximately 40 to 180 seconds, transfer calls to the other elevator functioning as a Selective Collective elevator until the out-of-service car is returned to the system. Provide a push-button riser adjacent to each elevator.

2.2.7.4 Group Automatic Operation

Provide Group Automatic Operation. Provide a single push button for terminal landings and dual push buttons, up and down, at intermediate landings. In each car operating panel, provide push buttons numbered to correspond to each landing. If a car is taken out of service, or fails to respond to a landing call within a predetermined adjustable time limit of approximately 40 to 180 seconds, transfer calls to another car until the out-of-service car is returned to the system. Provide a push-button riser adjacent to each elevator.

2.2.8 Parking Switch

Provide two-position parking switch in car station service cabinet. One position causes car to remain parked at floor landing where last used; other position causes car to park at ground floor.

2.2.9 Hospital Emergency Commandeering Service

Provide "ON-OFF" key switch and indicator light at all landings to cause one elevator to respond directly to the landing activated. Turning switch to "ON" position cancels previously registered "CAR" calls and requires car

to bypass hall calls while in route to activated landing. On arrival, car shall remain at landing with hoistway and car doors open for predetermined time to permit car to be placed on emergency service. If the person decides not to use car during predetermined time period, car door closes and car automatically returns to normal service. Provide indicator lights that automatically illuminate during emergency service. Permit Removal of the key only when key is in "OFF" position.

2.3 ELEVATOR DRIVE SYSTEM

Provide hydraulic elevator drive system, including pump unit, piping, cylinder/plunger assembly, and associated equipment, which will operate at a maximum working pressure of 500 psi or less. Provide complete elevator system that meets or exceeds the NEII-1.

2.3.1 Hydraulic Pump Unit

Provide self-contained pump unit, including oil-hydraulic elevator pump, electric motor, suction-line oil strainer, oil-tight drip pan, and structural steel outer base with tank supports and isolation pads. Provide oil tank capacity for full plunger displacement plus at least 10 gallons. Provide means to maintain oil temperature between 80 and 120 degrees F regardless of ambient temperature. Limit acoustic output in elevator machine room to 80 dbA.

2.3.1.1 Pump Motor

Provide intermittent-duty pump motor rated at 120 starts/hour. Provide motor that is sized so that the motor amperage does not exceed the motor data tag amperage in any operating condition, exclusive of acceleration and deceleration. Provide minimum of one megohm insulation resistance between conductors and motor frame. Provide motor and pump nameplate and data tags permanently mounted on the outside of the pump unit frame, with all data viewable without the use of mirrors or other tools.

2.3.2 Hydraulic Controls and Equipment

Provide control valve, overspeed (rupture) valve, blowout-proof muffler, and hydraulic pump discharge strainer in the hydraulic oil supply line. Provide 1/4 turn, manual shutoff ball-valves in the elevator machine room and in the hoistway pit. Provide scavenger pump in hoistway pit.

2.3.2.1 Hydraulic Control Valve

Provide constant-velocity, down-speed regulated, control valve. Down-speed regulated control valve allows the car to travel at the same speed in the down direction, regardless of the load on the elevator. In addition, the hydraulic control valve shall have built-in adjustment capability to operate the elevator at 140 percent of rated speed in the down direction to facilitate periodic testing of the overspeed safety valve.

2.3.2.2 Hydraulic Overspeed Safety Valve

Provide overspeed safety valve in hydraulic oil supply line, directly adjacent to the hydraulic cylinder. Provide threaded pipe connections between the hydraulic cylinder and the overspeed valve. Provide valve equipped with manufacturer's manual shutoff feature. Overspeed valve shall not be equipped with a manual lowering feature. Provide adjustable valve with means to seal adjustment after inspection and testing by certified

elevator inspector.

2.3.2.3 Hydraulic Oil Scavenger Pump

Provide a scavenge oil reservoir with strainer and transfer pump. Provide a manual-reset pit flood switch to prevent pump operation if pit is flooded. Anchor pump and reservoir to pit floor.

2.3.3 Hydraulic Piping and Accessories

Provide ASTM A53/A53M or ASTM A106/A106M, Schedule 80, black steel piping with ASME B16.9 or ASME B16.11 fittings for supply piping. Extend schedule 80 piping from the pump control valve body, inside the pump unit, to the hydraulic cylinder in the hoistway. Provide welded or threaded forged pipe fittings for all fittings and components of the hydraulic oil supply line. For direct plunger cylinders, provide dielectric union or isolation couplings at each end of the hydraulic oil supply line. Provide hangers or supports for all piping and components.

2.3.3.1 Containment of Hydraulic Oil Supply Line

Protect all portions of hydraulic oil supply line that are installed below ground, including portions encapsulated in concrete or covered by construction, with continuous, Schedule 80, PVC. Inside diameter of PVC shall be 3 inches larger than the outside diameter of the hydraulic oil supply line pipe and couplings.

2.3.4 Hydraulic Elevator Type

Provide a direct plunger type hydraulic elevator. Do not utilize telescopic or inverted cylinder-plunger units. Telescopic and inverted jacks are not acceptable. Do not utilize roped-hydraulic elevator design.

2.3.4.1 Cylinder-Plunger (Jack) Unit

Provide a single-stage plunger of seamless steel construction. Provide cylinder with self-stabilizing mount that will support and hold cylinder plumb without the need for stabilization means at the bottom of the cylinder. Provide a threaded, 1/4 inch bleeder valve at the top of the cylinder, just below packing gland.

2.3.5 Cylinder Well System

For direct plunger type hydraulic elevator, the cylinder well system consists of a sealed, dry well casing and a PVC liner.

2.3.5.1 Well Casing

Locate and drill well for the cylinder well system. Line well with steel casing, minimum 1/4 inch wall with welded 1/2 inch steel bottom. Set casing plumb. Provide a dry, sealed well casing.

2.3.5.2 PVC or HDPE Cylinder Liner

Provide Schedule 80 PVC or HDPE pipe liner with bottom cap and couplings; joints sealed watertight using pipe manufacturer's recommended adhesive or heat welding methods. Provide liner inside diameter not less than 3 inches larger than elevator cylinder maximum outside diameter. Liner shall extend above hoistway pit finish floor. Liner may be provided as a cylinder

manufacture's applied liner or as a separate component. For separate liner, set liner plumb in well casing, located as necessary for cylinder installation. Provide dry, salt-free sand below and around liner to top of well casing.

2.3.5.3 Cylinder Installation

Remove all moisture from inside of cylinder liner. Install cylinder plumb, inside liner. Provide a 1/4 inch copper evacuation tube inside the PVC liner. The bottom of the evacuation tube, shall be within 6 inch of the bottom of the liner. Top of evacuation tube shall extend at least 6 inch above liner. Provide top of test tube with removable cap to exclude foreign matter. Provide separate air pressure fitting in liner to facilitate pressure test of liner as specified in paragraph PRESSURE TEST OF PVC LINER/CYLINDER ASSEMBLY. Secure Liner/Cylinder Assembly as recommended by cylinder manufacturer.

2.3.5.4 Pressure Test of PVC Liner/Cylinder Assembly

Perform 8 psig pressure test of liner/cylinder assembly. Perform the test of liner/cylinder assembly as a sealed unit. Provide safety relief valve, set to relieve at 10 psig. Provide 4.5 inch diameter dial pressure gage scaled for 0 to 50 psig and calibrated to 0.5 percent accuracy and an air pressure admission throttle and shutoff valve. For safety, pressure test shall only be performed when liner and cylinder are fully inserted and assembled in the well casing. Perform the test from remote location outside of the elevator pit. Perform test in the presence of, and witnessed by, a NAVFAC Certified Elevator Inspector.

2.3.5.5 Cylinder Liner Water and Oil Sensor System

Provide moisture sensor system designed to detect water and/or oil in the bottom of the cylinder liner. Water and oil sensors shall be located inside the cylinder liner and within 6 inches of the bottom of the liner. Water and oil senor system shall include a control and alarm panel, located in the elevator machine room. System shall provide automatic actuation of audible and visual alarms upon detection of either water or oil inside the cylinder liner.

2.3.5.6 Seal Top of Well Casing

Upon successful test and certification of PVC Liner/Cylinder assembly, seal gap between steel well casing and PVC liner with foam insert strong enough to retain and support final grouting. Provide 3000 psi grout to a minimum of 4 inch thickness and level top of final grouting with pit floor.

2.4 CONTROL EQUIPMENT

2.4.1 Motor Control Equipment

Provide elevator motor controller with electronic, soft-start motor starter. Enclose control equipment in factory-primed and baked-enamel coated sheet-metal cabinets with removable or hinged doors with ventilation louvers.

2.4.1.1 Electrical Isolation Protection

Provide individual isolation transformers and individual choke reactors for each individual motor. Provide filtering to maintain harmonic distortion

below IEEE standards as measured at the elevator machine room disconnect.

2.4.2 Logic Control Equipment

Provide a non-proprietary microprocessor controller for each individual elevator and group controller. Store all programming in non-volatile memory. Provide a microprocessor control system that includes all hardware and software required to service and maintain the elevator and a technical support service that is routinely provided to any elevator service provider.

2.4.2.1 On-Board Diagnostic Panel

a. Provide, for each individual elevator microprocessor controller, an on-board diagnostic control and LCD display panel that allows unrestricted access to the comprehensive range of adjustable parameters necessary to perform installation, adjusting, service, maintenance, and testing of the elevator.

b. For each elevator group control, provide a separate on-board diagnostic control and LCD display panel that allows unrestricted access to the comprehensive range of options and adjustments necessary to perform installation, adjusting, service, maintenance, and testing of the elevator group.

c. For both individual and group controllers, provide fault log capability to store all fault logs for up to 1 year of elevator service history. The on-board LCD display shall provide the capability to display and monitor any and all fault logs, trouble calls, and fault history for up to 1 year of elevator service history. The on-board LCD display shall also provide the capability to display and diagnose trouble calls, faults, and shutdowns.

2.4.2.2 External Port

For each individual elevator microprocessor controller, and elevator group microprocessor controller, provide a USB port or an RS 232 port that allows connection to an on-site or a remote portable laptop computer. Provide unrestricted access as specified in paragraph ON-BOARD DIAGNOSTIC PANEL.

2.4.2.3 Maintenance and Diagnostic Software

Provide three copies of the manufacturer's maintenance and service diagnostic software, with complete software documentation, that shall 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.

2.4.2.4 Acceptable Controller Suppliers

Provide microprocessor controller from one of the following controller manufacturers:

Elevator Controls Corporation 3525 La Grande Boulevard Sacramento, CA 95823
G.A.L. Manufacturing Corporation 50 East 153rd Street Bronx, New York 10451
Motion Control Engineering, Inc. 11354 Whiterock Road Rancho Cordova, CA 95742-6522
Virginia Controls, Inc. 2513 Mechanicsville Turnpike Richmond, Virginia 23223

2.5 OPERATING PANELS, SIGNAL FIXTURES, AND COMMUNICATIONS CABINETS

2.5.1 Capacity and Data Plates

Attach faceplates with spanner security screws. On car panel, provide stainless steel capacity and data plates, with name of elevator manufacturer.

2.5.2 Car and Hall Buttons

Provide recessed tamper-proof push buttons of minimum 3/4 inch size satin-finish stainless steel, with illuminating jewel center.

2.5.3 Hall Station Door Operating Buttons

Identical in size and design to hall call buttons, but not illuminating.

2.5.4 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 that must be passenger accessible. Provide service cabinet or keyed switches for those switches that should not be passenger accessible. Allow maximum 48 inch height between car floor and center line of top operating buttons. Allow 35 inch height between car floor and center line of bottom button. Use engraving and backfilling or photo etching for button and switch designations. Do not use attached signs.

2.6 PASSENGER CONTROLS

2.6.1 Passenger Car-Operating Panel

a. Illuminating operating call buttons identified to correspond to landings served by elevator car.

b. "DOOR OPEN" and "DOOR CLOSE" buttons.

c. Keyed "STOP" switch in accordance with ASME A17.1/CSA B44, rule 2.26.2.

d. "ALARM" button in compliance with UFAS, ADA, and ASME A17.1/CSA B44, Rule 2.27.1. Furnish a red alarm button with engraved legend "ALARM."

Allow alarm button to illuminate when pushed. Locate "ALARM" button at panel bottom.

e. "FIRE DEPARTMENT" key switch, with "OFF-HOLD-ON" positions, in that order with key to be removable in all positions. Provide fire sign or jewel, and audible signal device, in accordance with ASME A17.1/CSA B44 Section 2.27.3. Both visual and audible signals are activated when Phase I key switch in hall is activated or when smoke detector activates return of elevator(s) to main fire response floor. Keep visual and audible signal activated until car has reached main or designated alternate fire response floor. Upon arrival at fire response floor visual signal remains illuminated and audible signal becomes silent.

f. Emergency two-way communication. Provide momentary pressure, single illuminating pushbutton operated communication device that complies with ASME A17.1/CSA B44, UFAS, and the Americans with Disabilities Act.

g. Key-operated on-off "HOSPITAL EMERGENCY COMMANDEERING SERVICE" switch.

h. Sound-actuated firefighter phone jack.

2.6.1.1 Service Controls

a. Inspection switch that transfers car control to top-of-car inspection operating controls and prevents car operation from in-car control panel.

b. Independent service switch.

c. Two car light switches, one for light in car and one for lights on top and bottom of car frame.

d. Fan switch, two-speed.

e. 120-volt ac 60 Hz single-phase duplex electrical outlet of ground-fault-circuit-interrupt (GFCI) design.

f. Device for communication between car and elevator machine room.

g. Parking switch.

2.6.1.2 Certificate Window

Provide 4 inch high by 6 inch wide certificate window in car operating panel for elevator inspection certificate.

2.7 HOISTWAY AND CAR EQUIPMENT

2.7.1 Guide Rails and Fastenings

Paint rail shanks with one coat black enamel. Only T-section type rail is acceptable.

2.7.2 Car Buffers

Provide buffer data plate on each buffer.

2.7.3 Pit Equipment

2.7.3.1 Pit "STOP" Switch

Provide push/pull type pit "STOP" switch for stopping elevator motor, independent of regular operating device. Locate on same side of hoistway as ladder.

2.7.3.2 Ladders

Provide galvanized steel ladder conforming to 29 CFR 1910.27 with minimum 7 inch distance between rung and wall. Locate ladder on hoistway side wall closest to hoistway door opening.

2.7.3.3 Lighting of Pits

Locate pit light not less than 6 feet above pit floor. Locate switch on same side of hoistway as ladder. Provide GFCI duplex receptacle in each pit.

2.8 TERMINAL STOPPING DEVICES

Provide each elevator with a terminal stopping device.

2.8.1 Wiring and Traveling Cables

Suspend traveling cables by means of self-tightening webbed devices.

2.8.2 Emergency Signaling Device

Provide audible signaling device, operable from Car Operating Panel button marked "ALARM". Mount the audible signaling device in hoistway.

2.9 PASSENGER CAR AND HOISTWAY DOOR ACCESSORIES

ASME A17.1/CSA B44, Sections 2.12, 2.13, 2.14, and 3. Provide infra-red curtain unit (ICU) with multiple infra-red beams that protect to the full height of the door opening. Extend minimum coverage from 2 inches off the floor to 70 inch above floor level. Door operation must meet the requirements of ASME A17.1/CSA B44 Rule 2.27.1 and 2.13.5. Provide high-speed electric operator, safety interlocks for car and hoistway doors, and electric safety contact to prevent car operation unless doors are closed.

2.10 PASSENGER ELEVATOR GUIDES, FRAME, PLATFORM, AND ENCLOSURE

2.10.1 Roller Guides

Provide roller guide assemblies in adjustable mountings on each side of car in accurate alignment at top and bottom of car frame.

2.10.2 Car Enclosure, Car Door, and Car Illumination

Provide natural and forced ventilation, stainless steel hooks, with fire retardant pads.

2.10.2.1 Return Panels, Entrance Columns, Cove Base, and Transom

Provide 14 gauge minimum non perforated steel. Apply sound-deadening

mastic on car shell and all exterior components.

2.10.2.2 Car Top

Provide reinforced 12 gauge minimum steel with hinged emergency exit openable by hand from car top only. Provide electrical contact which prevents operation of elevator when emergency exit is open. Provide sound-deadening mastic on all exterior components.

2.10.2.3 Car Door

Provide 16 gauge minimum steel, sandwich construction without binder angles. Provide a minimum of 2 door guide assembles per door panel, one guide at leading and one at trailing door edge with guides in the sill groove their entire length of travel.

2.10.2.4 Car Entrance Sill

Provide one piece cast white bronze or nickel silver entrance sill. Set sills level and flush with floor finish. Use same material for hoistway and car entrance sills.

2.10.2.5 Carpet

Unless otherwise specified, install carpet in the elevator.

2.11 PASSENGER ELEVATOR HOISTWAY DOORS AND ENTRANCES

Provide hoistway entrance assemblies which have a minimum 1-1/2 hour fire rating.

2.11.1 Hoistway Entrance Frames

Frame of 14 gauge thick factory primed carbon sheet steel. Solidly grout uprights of entrances to height of 5 feet.

2.11.2 Hoistway Entrance Sills

Provide one-piece cast solid white bronze or nickel silver entrance sills. After sill is set level and flush with finished floor height, solidly grout under full length of sill. Use same material for hoistway and car door sills.

2.11.3 Hoistway Entrance Doors

Provide hoistway entrance door constructed with hollow metal non-vision construction with flush surfaces on car and landing sides. Provide a minimum of 2 door guide assembles per door panel, one guide at leading edge and one at trailing door edge with guides in the sill groove the entire length of travel.

2.11.4 Entrance Fascias and Dust Covers

Provide sheet metal hoistway door track dust covers at each landing. Dust covers must cover door locks and door roller tracks and extend the full width of the door track and associated hardware.

2.11.5 Hoistway Ventilation

Provide hoistway ventilation directly to outside air by fixed louver through side wall of hoistway at top of hoistway. The net size of the louver shall be a minimum of 3.5 percent of the cross section of hoistway.

2.12 HANDICAPPED AND MEDICAL SERVICES ACCESS

2.12.1 Provision For Handicapped

Refer to 36 CFR 1191, Sections 4.10 for Elevators, 4.30 for Signage, and 4.31 for Telephones.

2.12.2 Emergency Medical Service

ICC IBC - Chapter 30, for elevators and signage.

PART 3 EXECUTION

3.1 INSTALLATION

Install in accordance with manufacturer's instructions, ASME A17.1/CSA B44, 36 CFR 1191, and NFPA 70.

3.1.1 Traveling Cables

Do not allow abrupt bending of traveling cables.

3.1.2 Automatic Shutoff Valve

Locate in supply-return line, as close as possible to cylinder-plunger unit.

3.1.3 Structural Members

Do not cut or alter. Restore any damaged or defaced work to original condition.

3.1.4 Safety Guards

Completely enclose selector cables or tapes exposed to possibility of accidental contact in machine room with 16 gage thick sheet metal or expanded metal guards, both horizontally and vertically. Protect exposed gears, sprockets, and selector drums from accidental contact in accordance with ASME A17.1/CSA B44.

3.1.5 Other Requirements

Include 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. Completion of firefighters' service includes installation and wiring of all smoke detectors in accordance with ASME A17.1/CSA B44, Section 2.27.3.2. Coordinate smoke detector installation for firefighters' service.

3.2 FIELD QUALITY CONTROL

a. After completing elevators system installation, notify Contracting Officer that elevator system is ready for final inspection and acceptance test. In conjunction with the notification submit a plan detailing the testing procedures 60 days prior to performing the elevator tests.

b. Perform all required tests and demonstrate proper operation of each elevator system and prove that each system complies with contract requirements and ASME A17.1/CSA B44. Inspection procedures in ASME A17.2 form a part of this inspection and acceptance testing. Conduct all testing and inspections in the presence of both the Elevator Specialist and the Elevator Inspector. Demonstrate the proper operation of all equipment at various date settings, selected by the Elevator Inspector, ranging from the date of contract award through 1 January 2099.

c. The Elevator Inspector shall complete, sign and post the results of all tests and inspection results and form NAVFACENGCOM 9-11014/23 (Rev. 7-88), Elevator Inspection Certificate after successful completion of inspection and testing. The Contractor is responsible for all costs involved with reinspection and retesting required to correct discrepancies discovered during testing and the subsequent retesting required.

3.2.1 Testing Materials and Instruments

Provide testing materials and instruments required for final inspection. Include calibrated test weights, tachometer, 600-volt megohm meter, volt meter and ammeter, three Celsius calibrated thermometers, door pressure gage, spirit level, stop watch, hydraulic pressure test gauge, and a 100 foot tape measure.

3.2.2 Field Tests

Submit Field Tests Reports after completing each of the specified tests, as required in the Submittals paragraph.

3.2.2.1 Endurance Tests

Test each elevator for a period of one hour continuous run, with specified rated load in the car. Restart the one hour test period from beginning, following any shutdown or failure. During the test run, stop car at each floor in both directions of travel for standing period of 10 seconds per floor. The requirements for Rated Speed, Leveling, Temperature Rise, and Motor Amperes testing specified herein must be met throughout the duration of the Endurance test.

3.2.2.2 Automatic Shutoff Valve Tests

Test the automatic shutoff valve twice. Once at beginning of acceptance test and again at conclusion of one-hour Endurance test to ensure consistent performance of shutoff valve, regardless of temperature of equipment and oil.

3.2.2.3 Speed Tests

Determine actual speed of each elevator in both directions with rated load

and with no load in elevator car. Make Speed tests before and immediately after Endurance test. Determine speed by tachometer reading, excluding accelerating and slow-down zones in accordance with ASME A17.2, Section 2.22.4. Minimum acceptable speed is the Rated Speed as specified. Maximum acceptable elevator speed is 110 percent of Rated Speed.

3.2.2.4 Leveling Tests

Test elevator car leveling devices for landing accuracy of plus or minus 1/4 inch at each floor with no load in car, symmetrical load in car, and with rated load in car in both directions of travel. Determine accuracy of floor landing both before and immediately after endurance tests.

3.2.2.5 Pressure Tests

Check operating pressure at pump and cylinder head under no load and rated load. Test pressure at which relief valve operates.

3.2.2.6 Insulation Resistance Tests

Perform tests to ensure wiring systems free from short circuits and grounds. Minimum acceptable insulation resistance for electrical conductors is one megohm between each conductor and ground and between each conductor and other conductors. Prior to megohm meter test, make provision to prevent damage to the electronic devices.

3.2.2.7 Temperature Rise Tests

Determine the temperature rise of the hydraulic pump motor during the full load test run for a minimum of one hour. Under these conditions, do not exceed maximum acceptable temperature rise indicated on the manufacturer's data plate. Start test only when equipment is within 5 degrees C of ambient temperature.

3.2.2.8 Motor Ampere Tests

Measure and record motor amperage when motor is running and elevator is lifting at rated load and speed. Measure and record motor amperage at the beginning and the end of Endurance test.

3.3 OPERATION AND MAINTENANCE TRAINING

The Elevator Specialist shall instruct Government personnel in care, adjustment, and maintenance of elevator equipment for a period of not less than 5 working days immediately following acceptance of system. Submit data package in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA, three Operation and Maintenance Manuals, 28 days prior to the Operation and Maintenance Training, proposed Onsite Training schedule, submitted concurrently with the Operation and Maintenance Manuals. Include a list of phone numbers, personnel contacts, and all tools required for operation and maintenance.

-- End of Section --