



**US Army Corps  
of Engineers**  
Louisville District

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# **Solicitation For**

## **Renovation of Caven Point Army Reserve Center (ARC) Jersey City, NJ**

**P2: 475970**

**Design Bid Build**

**Specifications  
Certified Final Submittal  
Vol. 2 of 3**

**25 February 2020  
W912QR20R0018**

**Caven Point U. S. Army Reserve Center  
Training Building Renovation  
Jersey City, New Jersey**

**SPECIFICATIONS (VOLUME 2 OF 3)**

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**February 2020**

Solicitation Number: W912QR-20-R-0018

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**PROJECT TABLE OF CONTENTS**

**VOLUME 1**

**DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS**

00 80 00.00 06 SPECIAL PROVISIONS

**DIVISION 01 - GENERAL REQUIREMENTS**

01 32 01.00 06 PROJECT SCHEDULE  
01 33 00.00 06 SUBMITTAL PROCEDURES  
01 33 29.00 06 SUSTAINABILITY REPORTING  
01 35 26.00 06 GOVERNMENT SAFETY REQUIREMENTS  
01 42 00 SOURCES FOR REFERENCE PUBLICATIONS  
01 45 00.15 10 RESIDENT MANAGEMENT SYSTEM CONTRACTOR MODE (RMS CM)  
01 45 04.10 06 CONTRACTOR QUALITY CONTROL  
01 45 35 SPECIAL INSPECTIONS  
01 50 00 TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS  
01 57 19.00 06 TEMPORARY ENVIRONMENTAL CONTROLS AND PERMITS  
01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL  
01 78 23 OPERATION AND MAINTENANCE DATA  
01 91 00.15 TOTAL BUILDING COMMISSIONING

**DIVISION 02 - EXISTING CONDITIONS**

02 41 00 DEMOLITION AND DECONSTRUCTION  
02 82 00 ASBESTOS REMEDIATION  
02 83 13.00 06 LEAD IN CONSTRUCTION  
02 84 16 HANDLING OF LIGHTING BALLASTS AND LAMPS CONTAINING PCBs  
AND MERCURY  
02 84 33 REMOVAL AND DISPOSAL OF POLYCHLORINATED BIPHENYLS (PCBs)

**DIVISION 03 - CONCRETE**

03 30 00 CAST-IN-PLACE CONCRETE

**VOLUME 2**

**DIVISION 04 - MASONRY**

04 20 00 UNIT MASONRY  
04 24 50 THIN BRICK VENEER PANEL SYSTEM

**DIVISION 05 - METALS**

05 12 00 STRUCTURAL STEEL  
05 30 00 STEEL DECKS  
05 40 00 COLD-FORMED METAL FRAMING  
05 50 13 MISCELLANEOUS METAL FABRICATIONS  
05 52 00 METAL RAILINGS

**DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES**

06 10 00 ROUGH CARPENTRY  
06 41 16.00 10 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS  
06 61 16 SOLID SURFACING FABRICATIONS

**DIVISION 07 - THERMAL AND MOISTURE PROTECTION**

07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS  
07 21 13 BOARD AND BLOCK INSULATION  
07 21 16 MINERAL FIBER BLANKET INSULATION

07 22 00 ROOF AND DECK INSULATION  
07 24 00 EXTERIOR INSULATION AND FINISH SYSTEMS  
07 27 10.00 10 BUILDING AIR BARRIER SYSTEM  
07 27 19.01 SELF-ADHERING AIR BARRIERS  
07 27 26 FLUID-APPLIED MEMBRANE AIR BARRIERS  
07 52 00.00 48 SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM  
07 62 00.00 48 FLASHING AND SHEET METAL  
07 84 00 FIRESTOPPING  
07 92 00.00 48 JOINT SEALANTS

**DIVISION 08 - OPENINGS**

08 11 13 STEEL DOORS AND FRAMES  
08 11 16 ALUMINUM DOORS AND FRAMES  
08 14 00 WOOD DOORS  
08 33 23 OVERHEAD COILING DOORS  
08 34 59 VAULT DOORS AND DAY GATES  
08 51 14.00 48 ALUMINUM AND ENVIRONMENTAL CONTROL ALUMINUM WINDOWS  
08 71 00 DOOR HARDWARE  
08 81 00.00 48 GLAZING  
08 91 00 METAL WALL LOUVERS

**DIVISION 09 - FINISHES**

09 22 00 SUPPORTS FOR PLASTER AND GYPSUM BOARD  
09 29 00 GYPSUM BOARD  
09 30 10 CERAMIC, QUARRY, AND GLASS TILING  
09 51 00 ACOUSTICAL CEILINGS  
09 62 38 STATIC-CONTROL FLOORING  
09 65 00 RESILIENT FLOORING  
09 65 66 RESILIENT ATHLETIC FLOORING  
09 67 23.13 STANDARD RESINOUS FLOORING  
09 68 00 CARPETING  
09 90 00 PAINTS AND COATINGS

**DIVISION 10 - SPECIALTIES**

10 11 00 VISUAL DISPLAY UNITS  
10 14 00.10 EXTERIOR SIGNAGE  
10 14 00.20 INTERIOR SIGNAGE  
10 21 13 TOILET COMPARTMENTS  
10 22 13.00 48 WIRE MESH PARTITIONS  
10 28 00.00 48 TOILET AND BATH ACCESSORIES  
10 51 52.00 48 METAL WARDROBE LOCKERS AND BENCH SEAT  
10 56 13.00 48 METAL STORAGE SHELVING  
10 90 00.00 48 MISCELLANEOUS SPECIALTIES (PARTIAL OMAR FUNDED)

**DIVISION 11 - EQUIPMENT**

11 46 01.00 48 KITCHEN EQUIPMENT

**DIVISION 12 - FURNISHINGS**

12 24 13 ROLLER WINDOW SHADES

**DIVISION 14 - CONVEYING EQUIPMENT**

14 24 23 HYDRAULIC PASSENGER ELEVATORS

VOLUME 3

**DIVISION 21 - FIRE SUPPRESSION**

21 13 13.00 10 WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION  
21 21 03.00 10 WET CHEMICAL FIRE EXTINGUISHING SYSTEM

**DIVISION 22 - PLUMBING**

22 00 00 PLUMBING, GENERAL PURPOSE

**DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)**

23 00 00 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEMS  
23 03 00.00 20 BASIC MECHANICAL MATERIALS AND METHODS  
23 05 93.00 06 TESTING, ADJUSTING, AND BALANCING (TAB) OF HVAC  
23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS  
23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC  
23 09 13 INSTRUMENTATION AND CONTROL DEVICES FOR HVAC  
23 09 23.01 LONWORKS DIRECT DIGITAL CONTROL FOR HVAC AND OTHER  
BUILDING CONTROL SYSTEMS  
23 11 25 FACILITY GAS PIPING  
23 52 00.00 48 WATER AND STEAM HEATING; OIL, GAS OR BOTH; UP TO 20 MBTUH  
23 54 16.00 48 HEATING SYSTEM; GAS-FIRED HEATERS  
23 64 10 WATER CHILLERS, VAPOR COMPRESSION TYPE  
23 64 26.00 48 CHILLED, CHILLED-HOT, AND CONDENSER WATER PIPING SYSTEMS  
23 81 00 DECENTRALIZED UNITARY HVAC EQUIPMENT  
23 82 19.00 40 FAN COIL UNITS

**DIVISION 25 - INTEGRATED AUTOMATION**

25 10 10 UTILITY MONITORING AND CONTROL SYSTEM (UMCS) FRONT END  
AND INTEGRATION

**DIVISION 26 - ELECTRICAL**

26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS  
26 08 00 APPARATUS INSPECTION AND TESTING  
26 20 00 INTERIOR DISTRIBUTION SYSTEM  
26 28 01.00 10 COORDINATED POWER SYSTEM PROTECTION  
26 29 23 VARIABLE FREQUENCY DRIVE SYSTEMS UNDER 600 VOLTS  
26 41 00 LIGHTNING PROTECTION SYSTEM  
26 51 00 INTERIOR LIGHTING  
26 56 00 EXTERIOR LIGHTING

**DIVISION 27 - COMMUNICATIONS**

27 05 14.00 10 CABLE TELEVISION PREMISES DISTRIBUTION SYSTEM  
27 05 28 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS  
27 10 00 BUILDING TELECOMMUNICATIONS CABLING SYSTEM

**DIVISION 28 - ELECTRONIC SAFETY AND SECURITY**

28 13 00.00 48 PHYSICAL ACCESS CONTROL SYSTEM  
28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM

**DIVISION 31 - EARTHWORK**

31 00 00.00 06 EARTHWORK  
31 63 16 AUGER CAST GROUT PILES

**DIVISION 32 - EXTERIOR IMPROVEMENTS**

32 05 33	LANDSCAPE ESTABLISHMENT
32 11 23	AGGREGATE BASE COURSES
32 12 13	BITUMINOUS TACK AND PRIME COATS
32 12 16	HOT-MIX ASPHALT (HMA) FOR ROADS
32 13 13.06	PORTLAND CEMENT CONCRETE PAVEMENT FOR ROADS AND SITE FACILITIES
32 16 19	CONCRETE SIDEWALKS
32 17 23	PAVEMENT MARKINGS
32 31 13	CHAIN LINK FENCES AND GATES
32 92 19	SEEDING

**DIVISION 33 - UTILITIES**

33 11 00	WATER UTILITY DISTRIBUTION PIPING
33 30 00	SANITARY SEWERAGE
33 32 16	PACKAGED UTILITY WASTEWATER PUMPING STATIONS
33 51 15	NATURAL-GAS / LIQUID PETROLEUM GAS DISTRIBUTION
33 71 02	UNDERGROUND ELECTRICAL DISTRIBUTION
33 82 00	TELECOMMUNICATIONS OUTSIDE PLANT (OSP)

-- End of Project Table of Contents --

SECTION 04 20 00

UNIT MASONRY  
11/15

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)

ACI SP-66 (2004) ACI Detailing Manual

ASTM INTERNATIONAL (ASTM)

ASTM A1008/A1008M (2016) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable

ASTM A1064/A1064M (2017) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

ASTM A153/A153M (2016) 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 (2016) 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 A653/A653M (2017) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A951/A951M (2011) Standard Specification for Steel Wire for Masonry Joint Reinforcement

ASTM B370 (2012) Standard Specification for Copper Sheet and Strip for Building Construction

ASTM C1019	(2018) Standard Test Method for Sampling and Testing Grout
ASTM C1384	(2012a) Standard Specification for Admixtures for Masonry Mortars
ASTM C207	(2006; R 2011) Standard Specification for Hydrated Lime for Masonry Purposes
ASTM C270	(2014a) Standard Specification for Mortar for Unit Masonry
ASTM C476	(2018) Standard Specification for Grout for Masonry
ASTM C494/C494M	(2017) Standard Specification for Chemical Admixtures for Concrete
ASTM C55	(2017) Standard Specification for Concrete Building Brick
ASTM C780	(2017) Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
ASTM C90	(2016) Standard Specification for Loadbearing Concrete Masonry Units
ASTM D2000	(2012; R 2017) Standard Classification System for Rubber Products in Automotive Applications
ASTM D2287	(2012) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds

THE MASONRY SOCIETY (TMS)

TMS MSJC	(2016) Masonry Standard Joint Committee's (MSJC) Book - Building Code Requirements and Specification for Masonry Structures, Containing TMS 402/ACI 530/ASCE 5, TMS 602/ACI 530.1/ASCE 6, and Companion Commentaries
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Reinforcement Detail Drawings; G

SD-03 Product Data

Hot Weather Procedures; G  
Cold Weather Procedures; G  
Cement; G  
Cementitious Materials; G

SD-04 Samples

Concrete Brick

SD-05 Design Data

Masonry Compressive Strength; G

SD-06 Test Reports

Field Testing of Mortar  
Field Testing of Grout

SD-07 Certificates

Special Masonry Inspector Qualifications  
Concrete Masonry Units (CMU)  
Cementitious Materials  
Admixtures for Masonry Mortar  
Admixtures for Grout  
Anchors, Ties, and Bar Positioners  
Joint Reinforcement

SD-08 Manufacturer's Instructions

Admixtures for Masonry Mortar  
Admixtures for Grout

1.3 QUALITY ASSURANCE

1.3.1 Special Masonry Inspector Qualifications

Refer to Section 01 45 35 SPECIAL INSPECTIONS for qualifications and responsibilities of the masonry special inspector.

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver, store, handle, and protect material to avoid chipping, breakage, and contact with soil or contaminating material. Store and prepare materials in already disturbed areas to minimize project site disturbance

and size of project site.

#### 1.4.1 Masonry Units

Cover and protect masonry units from precipitation. Conform to handling and storage requirements of TMS MSJC.

#### 1.4.2 Reinforcement, Anchors, and Ties

Store steel reinforcing bars, coated anchors, ties, and joint reinforcement above the ground. Maintain steel reinforcing bars and uncoated ties free of loose mill scale and loose rust.

#### 1.4.3 Cementitious Materials, Sand and Aggregates

Deliver cementitious and other packaged materials in unopened containers, plainly marked and labeled with manufacturers' names and brands. Store cementitious material in dry, weathertight enclosures or completely cover. Handle cementitious materials in a manner that will prevent the inclusion of foreign materials and damage by water or dampness. Store sand and aggregates in a manner to prevent contamination and segregation.

### 1.5 PROJECT/SITE CONDITIONS

Conform to TMS MSJC for hot and cold weather masonry erection.

#### 1.5.1 Hot Weather Procedures

When ambient air temperature exceeds 100 degrees F, or exceeds 90 degrees F and the wind velocity is greater than 8 mph, comply with TMS MSJC Article 1.8 D for: preparation prior to conducting masonry work; construction while masonry work is in progress; and protection for newly completed masonry.

#### 1.5.2 Cold Weather Procedures

When ambient temperature is below 40 degrees F, comply with TMS MSJC Article 1.8 C for: preparation prior to conducting masonry work; construction while masonry work is in progress; and protection for newly completed masonry.

## PART 2 PRODUCTS

### 2.1 SYSTEM DESCRIPTION

#### 2.1.1 Design - Specified Compressive Strength of Masonry

The specified compressive strength of masonry,  $f'_m$ , is 1500 psi.

#### 2.1.2 Performance - Verify Masonry Compressive Strength

Verify specified compressive strength of masonry using the "Unit Strength Method" of TMS MSJC. Submit calculations and certifications of unit and mortar strength.

Verify specified compressive strength of masonry using the "Prism Test Method" of TMS MSJC when the "Unit Strength Method" cannot be used. Submit test results.

## 2.2 MANUFACTURED UNITS

### 2.2.1 General Requirements

Do not change the source of materials, which will affect the appearance of the finished work, after the work has started except with Contracting Officer's approval. Submit test reports from an approved independent laboratory. Certify test reports on a previously tested material as the same materials as that proposed for use in this project. Submit certificates of compliance stating that the materials meet the specified requirements.

### 2.2.2 Concrete Units

#### 2.2.2.1 Concrete Masonry Units (CMU)

##### 2.2.2.1.1 Cement

Use only cement that has a low alkali content and is of one brand.

##### 2.2.2.1.2 Recycled Content

Provide units with a minimum of 10 percent post-consumer recycled content, or a minimum of 20 percent post-industrial recycled content, based on mass, cost, or volume. Units may contain post-consumer or post-industrial recycled content.

##### 2.2.2.1.3 Size

Provide units with specified dimensions as required.

##### 2.2.2.1.4 Surfaces

Provide units with exposed surfaces that are smooth and of uniform texture.

##### 2.2.2.1.5 Unit Types

Hollow Load-Bearing Units: ASTM C90, lightweight or medium weight or normal weight. Provide load-bearing units for exterior walls, foundation walls, load-bearing walls, and shear walls.

##### 2.2.2.1.6 Jamb Units

Provide jamb units of the shapes and sizes to conform with wall units. Solid units may be incorporated in the masonry work where necessary to fill out at corners, gable slopes, and elsewhere as approved.

Provide sash jamb units with a 3/4 by 3/4 inch groove near the center at end of each unit.

### 2.2.2.2 Concrete Brick

#### 2.2.2.2.1 Common Concrete Brick

Provide common concrete brick conforming to ASTM C55. Common concrete brick may be used where necessary for filling out in concrete masonry unit construction.

## 2.3 EQUIPMENT

### 2.3.1 Vibrators

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

### 2.3.2 Grout Pumps

Pumping through aluminum tubes is not permitted.

## 2.4 MATERIALS

### 2.4.1 Mortar Materials

#### 2.4.1.1 Cementitious Materials

Provide cementitious materials that conform to those permitted by ASTM C270.

#### 2.4.1.2 Hydrated Lime and Alternates

Provide lime that conforms to one of the materials permitted by ASTM C207 for use in combination with portland cement, hydraulic cement, and blended hydraulic cement. Do not use lime in combination with masonry cement or mortar cement.

#### 2.4.1.3 Admixtures for Masonry Mortar

In cold weather, use a non-chloride based accelerating admixture that conforms to ASTM C1384, unless Type III portland cement is used in the mortar.

#### 2.4.1.4 Aggregate and Water

Provide aggregate (sand) and water that conform to materials permitted by ASTM C270.

### 2.4.2 Grout and Ready-Mix Grout Materials

#### 2.4.2.1 Cementitious Materials for Grout

Provide cementitious materials that conform to those permitted by ASTM C476.

#### 2.4.2.2 Admixtures for Grout

Water-reducing admixtures that conform to ASTM C494/C494M Type F or G and viscosity-modifying admixtures that conform to ASTM C494/C494M Type S are permitted for use in grout. Other admixtures require approval by the Contracting Officer.

In cold weather, a non-chloride based accelerating admixture may be used subject to approval by the Contracting Officer; use accelerating admixture that is non-corrosive and conforms to ASTM C494/C494M, Type C.

#### 2.4.2.3 Aggregate and Water

Provide fine and coarse aggregates and water that conform to materials permitted by ASTM C476.

## 2.5 MORTAR AND GROUT MIXES

### 2.5.1 Mortar Mix

- a. Provide mortar Type S unless specified otherwise herein.
- b. Provide Type N or S mortar for non-load-bearing, non-shear-wall interior masonry.

### 2.5.2 Grout and Ready Mix Grout Mix

Use grout that conforms to ASTM C476, coarse. Use conventional grout with a slump between 8 and 11 inches. Provide minimum grout strength of 2000 psi in 28 days, as tested in accordance with ASTM C1019. Do not change proportions and do not use materials with different physical or chemical characteristics in grout for the work unless additional evidence is furnished that grout meets the specified requirements. Use ready-mixed grout that conforms to ASTM C476.

## 2.6 ACCESSORIES

### 2.6.1 Grout Barriers

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

### 2.6.2 Anchors, Ties, and Bar Positioners

#### 2.6.2.1 General

- a. Fabricate anchors and ties without drips or crimps. Size anchors and ties to provide a minimum of 5/8 inch mortar cover from each face of masonry.
- b. Fabricate steel wire anchors and ties shall from wire conforming to ASTM A1064/A1064M and hot-dip galvanize in accordance with ASTM A153/A153M.
- c. Fabricate joint reinforcement in conformance with ASTM A951/A951M. Hot dip galvanize joint reinforcement in exterior walls and in interior walls exposed to moist environment in conformance with ASTM A153/A153M. Galvanize joint reinforcement in other interior walls in conformance with ASTM A641/A641M; coordinate with paragraph JOINT REINFORCEMENT below.
- d. Fabricate sheet metal anchors and ties in conformance with ASTM A1008/A1008M. Hot dip galvanize sheet metal anchors and ties in exterior walls and in interior walls exposed to moist environment in compliance with ASTM A153/A153M Class B. Galvanize sheet metal anchors and ties in other interior walls in compliance with ASTM A653/A653M, Coating Designation G60.

#### 2.6.2.2 Wall Ties for Multi-Wythe Masonry Construction

Provide rectangular-shaped wall ties, fabricated of hot-dipped galvanized W2.8 diameter steel wire. Provide rectangular wall ties no less than 4 inches wide.

Provide adjustable type wall ties, if approved for use, that consist of

two essentially U-shaped elements fabricated of minimum W2.8 diameter steel wire or pintle type ties that are inserted to eyes of horizontal joint reinforcement, hot-dip galvanized. Provide adjustable ties with double pintle legs and allows a maximum offset of 1-1/4 inch between each element of the tie and maximum distance between connecting parts no more than 1/16 inch. Form the pintle and eye elements shall be formed so that both can be in the same plane. Wall ties may also be of a continuous type conforming to paragraph JOINT REINFORCEMENT.

#### 2.6.2.3 Bar Positioners

Factory-fabricate bar positioners, used to prevent displacement of reinforcing bars during the course of construction, from 9 gauge steel wire or equivalent, and hot-dip galvanized.

#### 2.6.3 Joint Reinforcement

Factory fabricate joint reinforcement in conformance with ASTM A951/A951M, welded construction. Provide ladder type joint reinforcement, having one longitudinal wire in the mortar bed of each face shell for hollow units and one wire for solid units and with all wires a minimum of 9 gauge. Size joint reinforcement to provide a minimum of 5/8 inch cover from each face. Space crosswires not more than 16 inches. Provide joint reinforcement for straight runs in flat sections not less than 10 feet long. Provide joint reinforcement with factory formed corners and intersections. If approved for use, joint reinforcement may be furnished with adjustable wall tie features.

#### 2.6.4 Reinforcing Steel Bars

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

#### 2.6.5 Concrete Masonry Control Joint Keys

Provide control joint keys of a factory fabricated solid section of natural or synthetic rubber (or combination thereof) conforming to ASTM D2000 M2AA-805 with a minimum durometer hardness of 80 or polyvinyl chloride conforming to ASTM D2287 Type PVC 654-4 with a minimum durometer hardness of 85. Form the control joint key with a solid shear section not less than 5/8 inch thick and 3/8 inch thick flanges, with a tolerance of plus or minus 1/16 inch, to fit neatly, but without forcing, in masonry unit jamb sash grooves.

#### 2.6.6 Through Wall Flashing and Weeps

##### 2.6.6.1 General

Provide coated copper, copper or stainless steel sheet, self-adhesive rubberized sheet, or reinforced membrane sheet flashing 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.

##### 2.6.6.2 Coated-Copper Flashing

Provide 7 ounce, electrolytic copper sheet, uniformly coated on both sides with acidproof, alkaliproof, asphalt impregnated kraft paper or polyethylene sheets.

#### 2.6.6.3 Copper or Stainless Steel Flashing

Provide copper sheet, complying with ASTM B370, minimum 16 ounce weight; or stainless steel, ASTM A167, Type 304 or 316, 0.015 inch thick, No. 2D finish. Where indicated, provide with factory-fabricated deformations that mechanically bond flashing against horizontal movement in all directions, where deformations consist of dimples, diagonal corrugations, or a combination of dimples and transverse corrugations.

#### 2.6.6.4 Reinforced Membrane Flashing

Provide polyester film core with a reinforcing fiberglass scrim bonded to one side. Provide membrane that is impervious to moisture, flexible, is not affected by caustic alkalis, and after being exposed for not less than 1/2 hour to a temperature of 32 degrees F, shows no cracking when, at that temperature, it is bent 180 degrees over a 1/16 inch diameter mandrel and then bent at the same point over the same size mandrel in the opposite direction 360 degrees.

#### 2.6.6.5 Rubberized Flashing

Provide self-adhesive rubberized asphalt sheet flashing consisting of 32-mil thick pliable and highly adhesive rubberized asphalt compound bonded completely and integrally to 8-mil thick, high density, cross-laminated polyethylene film to produce an overall thickness of 40 mils. Provide rubberized, asphalt-based mastic and surface conditioner that are each approved by flashing manufacturer for use with flashing material.

#### 2.6.6.6 Weep Ventilators

Provide weep ventilators that are prefabricated from stainless steel or plastic. Provide inserts with grill or louver-type openings designed to allow the passage of moisture from cavities and to prevent the entrance of insects, and with a rectangular closure strip to prevent mortar droppings from clogging the opening. Provide ventilators with compressible flanges to fit in a standard 3/8 inch wide mortar joint and with height equal to the nominal height of the unit.

#### 2.6.6.7 Single-Wythe Exterior Wall CMU Flashing System

In single-wythe exterior CMU walls, provide a system of CMU cell flashing pans and interlocking CMU web covers made from UV-resistant, high-density polyethylene. For exterior CMU walls, provide a flashing/weep system in open cores that do not receive grout. Cell flashing pans are to have integral weep spouts built into mortar bed joints that extend into the cell to prevent clogging with mortar.

#### 2.6.6.8 Metal Drip Edge

Provide stainless steel drip edge, 15-mil thick, hemmed edges, with down-turned drip at the outside edge and upturned dam at the inside edge for use with membrane flashings.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

Prior to start of work, verify the applicable conditions as set forth in

TMS MSJC, inspection.

### 3.2 PREPARATION

#### 3.2.1 Stains

Protect exposed surfaces from mortar and other stains. When mortar joints are tooled, remove mortar from exposed surfaces with fiber brushes and wooden paddles. Protect base of walls from splash stains by covering adjacent ground with sand, sawdust, or polyethylene.

#### 3.2.2 Loads

Do not apply uniform loads for at least 12 hours or concentrated loads for at least 72 hours after masonry is constructed. Provide temporary bracing as required.

#### 3.2.3 Concrete Surfaces

Where masonry is to be placed, clean concrete of laitance, dust, dirt, oil, organic matter, or other foreign materials and slightly roughen to provide a surface texture with a depth of at least 1/8 inch. Sandblast, if necessary, to remove laitance from pores and to expose the aggregate.

#### 3.2.4 Shelf Angles

Adjust shelf angles as required to keep the masonry level and at the proper elevation.

#### 3.2.5 Bracing

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

### 3.3 ERECTION

#### 3.3.1 General

- a. Coordinate masonry work with the work of other trades to accommodate built-in items and to avoid cutting and patching. Lay masonry units in running bond pattern. Lay facing courses level with back-up courses, unless the use of adjustable ties has been approved in which case the tolerances is plus or minus 1/2 inch. Adjust each unit to its final position while mortar is still soft and has plastic consistency.
- b. Remove and clean units that have been disturbed after the mortar has stiffened, and relay with fresh mortar. Keep air spaces, cavities, chases, expansion joints, and spaces to be grouted free from mortar and other debris. Select units to be used in exposed masonry surfaces from those having the least amount of chipped edges or other imperfections detracting from the appearance of the finished work.
- c. When necessary to temporarily discontinue the work, step (rack) back the masonry for joining when work resumes. Tothing may be used only when specifically approved by the Contracting Officer. Before resuming work, remove loose mortar and thoroughly clean the exposed joint. Cover the top of walls subjected to rain or snow with nonstaining waterproof covering or membrane when work is not in

process. Extend the covering a minimum of 2 feet down on each side of the wall and hold securely in place.

- d. Ensure that units being laid and surfaces to receive units are free of water film and frost. Lay solid units in a nonfurrowed full bed of mortar. Bevel mortar for veneer wythes and slope down toward the cavity side. Shove units into place so that the vertical joints are tight. Completely fill vertical joints between solid units with mortar, except where indicated at control, expansion, and isolation joints. Place hollow units so that mortar extends to the depth of the face shell at heads and beds, unless otherwise indicated. Mortar will be permitted to protrude up to 1/2 inch into the space or cells to be grouted. Provide means to prevent mortar from dropping into the space below or clean grout spaces prior to grouting.
- e. In multi-wythe construction with collar joints no more than 3/4 inch wide, bring up the inner wythe not more than 16 inches ahead of the outer wythe. Fill collar joints with mortar during the laying of the facing wythe, and filling shall not lag the laying of the facing wythe by back-buttering each unit as it is laid.

#### 3.3.1.1 Jointing

Tool mortar joints when the mortar is thumbprint hard. Tool horizontal joints after tooling vertical joints. Brush mortar joints to remove loose and excess mortar.

##### 3.3.1.1.1 Tooled Joints

Tool mortar joints in exposed exterior and interior masonry surfaces concave, using a jointer that is slightly larger than the joint width so that complete contact is made along the edges of the unit. Perform tooling so that the mortar is compressed and the joint surface is sealed. Use a jointer of sufficient length to obtain a straight and true mortar joint. No exterior joints are to be left un-tooled.

##### 3.3.1.1.2 Flush Joints

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

##### 3.3.1.1.3 Door and Window Frame Joints

On the exposed interior side of exterior frames, joints between frames and abutting masonry walls shall be raked to a depth of 3/8 inch. On the exterior side of exterior frames, joints between frames and abutting masonry walls shall be raked to a depth of 3/8 inch.

##### 3.3.1.1.4 Joint Widths

- a. Construct brick masonry with mortar joint widths equal to the difference between the specified and nominal dimensions of the unit, within tolerances permitted by TMS MSJC.
- b. Provide 3/8 inch wide mortar joints in concrete masonry, except for prefaced concrete masonry units.

- c. Provide 3/8 inch wide mortar joints on unfaced side of prefaced concrete masonry units and not less than 3/16 inch nor more than 1/4 inch wide on prefaced side.
- d. Maintain mortar joint widths within tolerances permitted by TMS MSJC

#### 3.3.1.2 Cutting and Fitting

Use full units of the proper size wherever possible, in lieu of cut units. Locate cut units where they would have the least impact on the architectural aesthetic goals of the facility. Perform cutting and fitting, including that required to accommodate the work of others, by masonry mechanics using power masonry saws. Concrete masonry units may be wet or dry cut. Before being placed in the work, dry wet-cut units to the same surface-dry appearance as uncut units being laid in the wall. Provide cut edges that are clean, true and sharp.

- a. Carefully make openings in the masonry so that wall plates, cover plates or escutcheons required by the installation will completely conceal the openings and will have bottoms parallel with the masonry bed joints. Provide reinforced masonry lintels above openings over 12 inches wide for pipes, ducts, cable trays, and other wall penetrations, unless steel sleeves are used.
- b. Do not reduce masonry units in size by more than one-third in height and one-half in length. Do not locate cut products at ends of walls, corners, and other openings.

#### 3.3.1.3 Unfinished Work

Rack back unfinished work for joining with new work. Tothing may be resorted to only when specifically approved by the Contracting Officer. Remove loose mortar and thoroughly clean the exposed joints before laying new work.

#### 3.3.1.4 Control Joints

Provide control joints in concrete masonry as indicated. Construct by using sash jamb units with control joint key in accordance with the details shown on the Drawings. Form a continuous vertical joint at control joint locations, including through bond beams, by utilizing half blocks in alternating courses on each side of the joint. Interrupt the control joint key in courses containing continuous bond beam reinforcement. Do not interrupt the horizontal reinforcement and grout at the control joint.

Where mortar was placed in the joint, rake both faces of the control joints to a depth of 3/4 inch. Install backer rod and sealant on both faces in accordance with Section 07 92 00.00 48 JOINT SEALANTS.

#### 3.3.2 Partitions

- a. Construct partitions continuous from floor to underside of floor or roof deck where shown. Fill openings in firewalls around joists and other structural members 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. Construct an isolation joint in the

intersection between partitions and structural or exterior walls.

- b. Tie interior partitions having 4 inch nominal thickness units 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. Tie interior partitions over 4 inches thick together with joint reinforcement. Provide joint reinforcement with prefabricated pieces at corners and intersections of partitions.
- c. Double-Faced Bases or Partitions: Construct double-faced clay unit bases and partitions of two-unit construction. Bond units by overlapping from opposite faces of the wall, 2 inches for 6 inch thick partitions and 4 inches for 8 inch thick or greater. A single wythe prefaced concrete masonry base or partition may be made with double faced units.

### 3.3.3 Anchored Veneer Construction

- a. Construct exterior masonry wythes to the thickness indicated on the drawings. Provide air space behind the masonry veneer. Provide means to ensure that the cavity space and flashings are kept clean of mortar droppings and other loose debris. Maintain chases and raked-out joints free from mortar and debris.
- b. Place masonry in running bond pattern. Place longitudinal reinforcement, consisting of at least one continuous hot-dip galvanized W 1.7 (9gauge) steel wire, in the veneer wythe when laid in stack bond.
- c. For veneer over stud framing, do not install veneer until the exterior sheathing, moisture barrier, veneer anchors and flashing have been installed on the backing. Take extreme care to avoid damage to the moisture barrier and flashing during construction of the masonry veneer. Repair or replace portions of the moisture barrier and flashing that are damaged prior to completion of the veneer. Provide a continuous cavity as indicated.
- d. For veneer with a masonry backup wythe, lay up both the inner and the outer wythes together except when adjustable joint reinforcement assemblies are approved for use. When both wythes are not brought up together, install through-wall flashings with the exterior wythe, securing the top edge of the flashing with a termination bar and sealant, or protect flashings that are installed with the interior wythe from damage until they are fully enclosed in the wall.
- e. Provide anchors (ties) to connect the veneer to its backing in sufficient quantity to comply with the following requirements: maximum vertical spacing of 16 inches, and maximum horizontal spacing of 24 inches. Provide additional anchors around openings larger than 16 inch in either direction. Space anchors around perimeter of opening at a maximum of 24 inches on center. Place anchors within 12 inches of openings. Anchors with drips are not permitted.
- f. With solid units, embed anchors in mortar joint and extend into the veneer a minimum of 1-1/2 inch, with at least 5/8 inch mortar cover to the outside face.

- g. With hollow units, embed anchors in mortar or grout and extend into the veneer a minimum of 1-1/2 inch, with at least 5/8 inch mortar or grout cover to outside face.

### 3.3.4 Reinforced, Single Wythe Concrete Masonry Units Walls

#### 3.3.4.1 Concrete Masonry Unit Placement

- a. Fully bed units used to form piers, pilasters, columns, starting courses on footings, solid foundation walls, lintels, and beams, and where cells are to be filled with grout in mortar under both face shells and webs. Provide mortar beds under both face shells for other units. Mortar head joints for a distance in from the face of the unit not less than the thickness of the face shell.
- b. Solidly grout foundation walls below grade.
- c. Stiffen double walls at wall-mounted plumbing fixtures by use of strap anchors, two above each fixture and two below each fixture, located to avoid pipe runs, and extending from center to center of each wall within the double wall. Adequately reinforce walls and partitions for support of wall-hung plumbing fixtures when chair carriers are not specified.

#### 3.3.4.2 Preparation for Reinforcement

Lay units in such a manner as to preserve the unobstructed vertical continuity of cores to be grouted. Remove mortar protrusions extending 1/2 inch or more into cells before placing grout. Position reinforcing bars accurately as indicated before placing grout. Where vertical reinforcement occurs, fill cores solid with grout in accordance with paragraph PLACING GROUT in this Section.

### 3.3.5 Cavity Walls (Multi-Wythe Noncomposite Walls)

Provide a continuous cavity as indicated. 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. Clean mortar droppings and debris out of the cavity through the temporary openings at least once 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.

Securely tie the two wythes together with horizontal joint reinforcement, or provide ties to connect the masonry wythes in sufficient quantity to comply with the following requirements: maximum vertical spacing of 16 inches, and maximum horizontal spacing of 24 inches. Provide additional ties around openings larger than 16 inches in either direction. Space ties around perimeter of opening at a maximum of 3 feet on center. Place ties within 12 inches of openings. Ties with drips are not permitted.

### 3.3.6 ANCHORAGE

#### 3.3.6.1 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.

### 3.3.7 Lintels

#### 3.3.7.1 Masonry Lintels

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

#### 3.3.7.2 Steel Lintels

Provide steel lintels as shown on the Drawings. Set lintels in a full bed of mortar with faces plumb and true. Provide steel and precast lintels with a minimum bearing length of 8 inches unless otherwise indicated. In partially grouted masonry, provide fully grouted units under the full lintel bearing length, unless otherwise indicated.

### 3.3.8 Sills and Copings

Set sills and copings in a full bed of mortar with faces plumb and true. Slope sills and copings to drain water. Mechanically anchor copings and sills longer than 4 feet as indicated.

## 3.4 INSTALLATION

### 3.4.1 Bar Reinforcement Installation

#### 3.4.1.1 Preparation

Submit detail drawings showing bar splice locations. Identify bent bars on a bending diagram and reference and locate such bars on the drawings. Show wall dimensions, bar clearances, and wall openings. Utilize bending details that conform to the requirements of ACI SP-66. No approval will be given to the shop drawings until the Contractor certifies that all openings, including those for mechanical and electrical service, are shown. If, during construction, additional masonry openings are required, resubmit the approved shop drawings with the additional openings shown along with the proposed changes. Clearly highlight location of these additional openings. Provide wall elevation drawings with minimum scale of 1/4 inch per foot. Submit drawings including plans, elevations, and details of wall reinforcement; details of reinforcing bars at corners and wall intersections; offsets; tops, bottoms, and ends of walls; control and expansion joints; lintels; and wall openings.

Clean reinforcement of loose, flaky rust, scale, grease, mortar, grout, and other coatings that might destroy or reduce its bond prior to placing grout. Do not use bars with kinks or bends not shown on the approved shop drawings. Place reinforcement prior to grouting. Unless otherwise indicated, extend vertical wall reinforcement to within 2 inches of tops of walls.

#### 3.4.1.2 Positioning Bars

- a. Accurately place vertical bars within the cells at the positions indicated on the drawings. A minimum clearance of 1/2 inch shall be

maintained between the bars and masonry units. Provide minimum clearance between parallel bars of 1/2 inch between the bars and masonry units for coarse grout and a minimum clearance of 1/4 inch between the bars and masonry units for fine grout. Provide minimum clearance between parallel bars of 1 inch or one diameter of the reinforcement, whichever is greater. Vertical reinforcement may be held in place using bar positioners located near the ends of each bar and at intermediate intervals of not more than 192 diameters of the reinforcement or by other means to prevent displacement beyond permitted tolerances. As masonry work progresses, secure vertical reinforcement to prevent displacement beyond allowable tolerances.

- b. Wire column and pilaster lateral ties in position around the vertical reinforcing bars. Place lateral ties in contact with the vertical reinforcement and do not place in horizontal mortar bed joints.
- c. Position horizontal reinforcing bars as indicated. Stagger splices in adjacent horizontal bars, unless otherwise indicated.
- d. Form splices by lapping bars as indicated. Do not cut, bend or eliminate reinforcing bars. Foundation dowel bars may be field-bent when permitted by TMS MSJC.

#### 3.4.1.3 Splices of Bar Reinforcement

Lap splice reinforcing bars as indicated. When used, provide welded or mechanical connections that develop at least 125 percent of the specified yield strength of the reinforcement.

#### 3.4.2 Placing Grout

##### 3.4.2.1 General

Fill cells containing reinforcing bars with grout. Solidly grout hollow masonry units in walls or partitions supporting plumbing, heating, or other mechanical fixtures, voids at door and window jambs, and other indicated spaces. Solidly grout cells under lintel bearings on each side of openings for full height of openings. Solidly grout walls below grade, lintels, and bond beams. Units other than open end units may require grouting each course to preclude voids in the units.

Discard site-mixed grout that is not placed within 1-1/2 hours after water is first added to the batch or when the specified slump is not met without adding water after initial mixing. Discard ready-mixed grout that does not meet the specified slump without adding water other than water that was added at the time of initial discharge. Allow sufficient time between grout lifts to preclude displacement or cracking of face shells of masonry units. Provide a grout shear key between lifts when grouting is delayed and the lower lift loses plasticity. If blowouts, flowouts, misalignment, or cracking of face shells should occur during construction, tear down the wall and rebuild.

##### 3.4.2.2 Horizontal Grout Barriers

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

### 3.4.2.3 Grout Holes and Cleanouts

#### 3.4.2.3.1 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 hollow unit masonry is indicated. From such openings not less than 4 inches in diameter or 3 by 4 inches in horizontal dimensions. Upon completion of grouting operations, plug and finish grouting holes to match surrounding surfaces.

#### 3.4.2.3.2 Cleanouts for Hollow Unit Masonry Construction

For hollow masonry units, provide cleanout holes at the bottom of every grout pour in cores containing vertical reinforcement when the height of the grout pour exceeds 5 feet 4 inches. Where all cells are to be grouted, construct cleanout courses using bond beam units in an inverted position to permit cleaning of all cells. Provide cleanout holes at a maximum spacing of 32 inches where all cells are to be filled with grout.

Establish a new series of cleanouts if grouting operations are stopped for more than 4 hours. Provide cleanouts not less than 3 by 3 inch by cutting openings in one face shell. Manufacturer's standard cutout units may be used at the Contractor's option. Do not cleanout holes until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected. For walls which will be exposed to view, close cleanout holes in an approved manner to match surrounding masonry.

#### 3.4.2.3.3 Cleanouts for Multi-Wythe Composite Masonry Construction

Provide cleanouts for construction of walls that incorporate a grout filled cavity between solid masonry wythes, provide cleanouts at the bottom of every pour by omitting every other masonry unit from one wythe. Establish a new series of cleanouts if grouting operations are stopped for more than 4 hours. Do not plug cleanout holes until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected. For walls which will be exposed to view, close cleanout holes in an approved manner to match surrounding masonry.

#### 3.4.2.4 Grout Placement

A grout pour is the total height of masonry to be grouted prior to erection of additional masonry. A grout lift is an increment of grout placement within a grout pour. A grout pour is filled by one or more lifts of grout.

- a. Lay masonry to the top of a pour permitted by TMS MSJC Table 7, based on the size of the grout space and the type of grout. Prior to grouting, remove masonry protrusions that extend 1/2 inch or more into cells or spaces to be grouted. Provide grout holes and cleanouts in accordance with paragraph GROUT HOLES AND CLEANOUTS above when the grout pour height exceeds 5 feet 4 inches. Hold reinforcement, bolts, and embedded connections rigidly in position before grouting is started. Do not prewet concrete masonry units.
- b. Place grout using a hand bucket, concrete hopper, or grout pump to fill the grout space without segregation of aggregate. Operate grout

pumps to produce a continuous stream of grout without air pockets, segregation, or contamination.

- c. If the masonry has cured at least 4 hours, grout slump is maintained between 10 to 11 inches, and no intermediate reinforced bond beams are placed between the top and bottom of the pour height, place conventional grout in lifts not exceeding 12 feet 8 inches. For the same curing and slump conditions but with intermediate bond beams, limit conventional grout lift to the bottom of the lowest bond beam that is more than 5 feet 4 inches above the bottom of the lift, but do not exceed 12 feet 8 inches. If masonry has not cured at least 4 hours or grout slump is not maintained between 10 to 11 inches, place conventional grout in lifts not exceeding 5 feet 4 inches.
- d. Consolidate conventional grout lift and reconsolidate after initial settlement before placing next lift. For grout pours that are 12 inches or less in height, consolidate and reconsolidate grout by mechanical vibration or puddling. For grout pours that are greater than 12 inches in height, consolidate and reconsolidate grout by mechanical vibration. Apply vibrators at uniformly spaced points not further apart than the visible effectiveness of the machine. Limit duration of vibration to time necessary to produce satisfactory consolidation without causing segregation. If previous lift is not permitted to set, dip vibrator into previous lift. Do not insert vibrators into lower lifts that are in a semi-solidified state. If lower lift sets prior to placement of subsequent lift, form a grout key by terminating grout a minimum of 1-1/2 inch below a mortar joint. Vibrate each vertical cell containing reinforcement in partially grouted masonry. Do not form grout keys within beams.
- e. If the masonry has cured 4 hours, place self-consolidating grout (SCG) in lifts not exceeding the pour height. If masonry has not cured for at least 4 hours, place SCG in lifts not exceeding 5 feet 4 inches. Do not mechanically consolidate self-consolidating grout. Place self-consolidating grout in accordance with manufacturer's recommendations.
- f. Upon completion of each day's grouting, remove waste materials and debris from the equipment, and dispose of outside the masonry.

#### 3.4.3 Joint Reinforcement Installation

Install joint reinforcement at 16 inches on center unless otherwise indicated. Lap joint reinforcement not less than 6 inches. Install prefabricated sections at corners and wall intersections. Place the longitudinal wires of joint reinforcement in mortar beds to provide not less than 5/8 inch cover to either face of the unit.

#### 3.4.4 Bond Beams

Reinforce and grout bond beams as indicated and as described in paragraphs above. Install grout barriers under bond beam units to retain the grout as required, unless wall is fully grouted or solid bottom units are used. For high lift grouting in partially grouted masonry, provide grout retaining material on the top of bond beams to prevent upward flow of grout. Ensure that reinforcement is continuous, including around corners, except through control joints or expansion joints, unless otherwise indicated.

### 3.4.5 Flashing and Weeps

- a. Install through-wall flashing at obstructions in the cavity and where indicated on Drawings. Ensure continuity of the flashing at laps and inside and outside corners by splicing in a manner approved by the flashing manufacturer. Ensure that the top edge of the flashing is sealed by turning the flashing 1/2 inch into the mortar bed joint of backup masonry. Terminate the horizontal leg of the flashing by extending the sheet metal 1/2 inch beyond the outside face of masonry and turning downward with a hemmed drip or extending the fabric flashing beyond the outside face of masonry and, when construction is complete, cutting the flashing flush with the face of masonry. Provide sealant below the drip edge of through-wall flashing.
- b. Wherever through-wall flashing occurs, provide weep holes to drain flashing to exterior at acceptable locations as indicated. Provide weeps of weep ventilators. Locate weeps not more than 24 inches on centers in mortar joints of the exterior wythe directly on the horizontal leg of through-wall flashing over foundations, bond beams, and any other horizontal interruptions of the cavity. Place weep holes perfectly horizontal or slightly canted downward to encourage water drainage outward and not inward. Other methods may be used for providing weeps when spacing is reduced to 16 inches on center and approved by the Contracting Officer. Maintain weeps free of mortar and other obstructions.

## 3.5 APPLICATION

### 3.5.1 Insulation

Insulate cavity walls (multi-wythe noncomposite masonry walls), where shown, by installing board-type insulation on the cavity side of the inner wythe. Apply board type insulation directly to the masonry or thru-wall flashing with adhesive. Neatly fit insulation between obstructions without impaling insulation on ties or anchors. Apply insulation in parallel courses with vertical joints breaking midway over the course below and in moderate contact with adjoining units without forcing. Cut to fit neatly against adjoining surfaces.

### 3.5.2 Interface with Other Products

#### 3.5.2.1 Built-In Items

Fill spaces around built-in items with mortar. Point openings around flush-mount electrical outlet boxes in wet locations with mortar. Embed anchors, ties, wall plugs, accessories, flashing, pipe sleeves and other items required to be built-in as the masonry work progresses. Fully embed anchors, ties and joint reinforcement in the mortar. Fill cells receiving anchor bolts and cells of the first course below bearing plates with grout, unless otherwise indicated.

#### 3.5.2.2 Door and Window Frame Joints

On the exposed interior and exterior sides of exterior frames, rake joints between frames and abutting masonry walls to a depth of 3/8 inch.

#### 3.5.2.3 Bearing Plates

Set bearing plates for beams, joists, joist girders and similar structural

members to the proper line and elevation with damp-pack bedding mortar, except where non-shrink grout is indicated. Provide bedding mortar and non-shrink grout s specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.

### 3.5.3 Tolerances

Lay masonry plumb, true to line, with courses level within the tolerances of TMS MSJC, Article 3.3 F.

## 3.6 FIELD QUALITY CONTROL

### 3.6.1 Tests

#### 3.6.1.1 Field Testing of Mortar

Perform mortar testing at the following frequency: 1 times per day. For each required mortar test, provide a minimum of three mortar samples. Perform initial mortar testing prior to construction for comparison purposes during construction.

Prepare and test mortar samples for mortar aggregate ratio in accordance with ASTM C780 Appendix A4.

#### 3.6.1.2 Field Testing of Grout

- a. Perform grout testing at the following frequency: 1 times per day. For each required grout property to be evaluated, provide a minimum of three specimens.
- b. Sample and test conventional grout for compressive strength and temperature in accordance with ASTM C1019.
- c. Evaluate slump in conventional grout in accordance with ASTM C1019.

### 3.6.2 Special Inspection

Perform special inspections and testing in accordance with Section 01 45 35 SPECIAL INSPECTIONS.

## 3.7 POINTING AND CLEANING

After mortar joints have attained their initial set, but prior to hardening, completely remove mortar and grout daubs and splashings from masonry-unit surfaces that will be exposed or painted. Before completion of the work, rake out defects in joints of masonry to be exposed or painted, fill with mortar, and tool to match existing joints. Immediately after grout work is completed, remove scum and stains that have percolated through the masonry work using a low pressure stream of water and a stiff bristled brush. Do not clean masonry surfaces, other than removing excess surface mortar, until mortar in joints has hardened. Leave masonry surfaces clean, free of mortar daubs, dirt, stain, and discoloration, including scum from cleaning operations, and with tight mortar joints throughout. Do not use metal tools and metal brushes for cleaning.

### 3.7.1 Dry-Brushing Concrete Masonry

Dry brush exposed concrete masonry surfaces at the end of each day's work and after any required pointing, using stiff-fiber bristled brushes.

### 3.8 PROTECTION

Protect facing materials against staining. Cover top of walls with nonstaining waterproof covering or membrane to protect from moisture intrusion when work is not in progress. Continue covering the top of the unfinished walls until the wall is waterproofed with a complete roof or parapet system. Extend covering a minimum of 2 feet down on each side of the wall and hold securely in place. Before starting or resuming work, clean top surface of masonry in place of loose mortar and foreign material.

-- End of Section --

SECTION 04 24 50

THIN BRICK VENEER PANEL SYSTEM

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 A395/A395M	(1999; R 2018) Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures
ASTM A653/A653M	(2018) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B 117	(2009) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM C 1088	(2009a) Standard Specification for Thin Veneer Brick Units Made From Clay or Shale
ASTM C 1135	(2005) Standard Test Method for Determining Tensile Adhesion Properties of Structural Sealants
ASTM D 1037	(2006a) Evaluating Properties of Wood-Base Fiber and Particle Panel Materials
ASTM D 3498	(2003) Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems
ASTM E 2273	(2003) Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies
ASTM E 72	(2005) Conducting Strength Tests of Panels for Building Construction
ASTM E2129	(2010) Standard Practice for Data Collection for Sustainability Assessment of Building Products

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2009; Errata First Printing) International Building Code
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ICC EVALUATION SERVICE, INC. (ICC-ES)

ICC-ES AC356 (2009) Acceptance Criteria For Moisture  
Drainage Systems Used With Exterior Cement  
Plaster Or Adhered Masonry Veneer Walls

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 SYSTEM DESCRIPTION

1.2.1 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 29.00 06 SUSTAINABILITY REPORTING for cumulative total local material requirements. Masonry materials may be locally available.

1.2.2 Environmental Data

Submit Table 1 of ASTM E2129 for all products.

1.2.2 Design Requirements

Structural support panel system for thin brick veneer shall include integrated tab & locking system, be G90 hot dipped galvanized and manufactured with 26GA structural grade steel with thermo set coating.

System shall include adhesive or structural silicone, mortar additive, rain screen (when applicable), and all related fasteners, insulation, veneer, and flashing materials to meet appropriate ASTM standards from one manufacturer.

1.3 SCOPE OF WORK

Include all labor, materials and equipment, and perform all operations in connection with the installation of the panel system and all the related work, in strict accordance with drawings, and as specified herein.

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 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G

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.

#### SD-03 Product Data

Local/Regional Materials; (LEED BD+C)

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.

Environmental Data

Thin Brick; G; LEED BD+C)

#### SD-04 Samples

Thin Brick; G

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 sample of colored mortar with applicable masonry unit.

### 1.5 QUALITY ASSURANCE

#### 1.5.1 Appearance

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.

Panel components shall be made using prime materials and meet National Building codes.

Panel manufacturer will provide all component and prime material certifications.

1. Metal panel material shall have minimum G90 corrosion protection.
2. Metal panel material shall be of structural grade 33 steel or greater.
3. System manufacturer will provide material certifications to meet appropriate ASTM standards.

#### 1.5.2 Installer

Appoint at least one supervisory journeyman who shall be present at all times during execution of work, who shall be thoroughly familiar with design requirements, type of materials being installed, reference standards and other requirements, and who shall direct all work performed at jobsite.

Installer shall be certified by the wall system manufacturer and/or have at least five years experience in the installation of panel systems.

Comply with all applicable codes, regulations, and standards. Where

provisions of applicable local codes, regulations and standards conflict with requirements of this section, then the higher specification shall govern.

#### 1.6 DELIVERY, STORAGE AND HANDLING

Delivered materials to project sites in their original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, fire hazard classification, and lot number. Store materials in original undamaged packages and containers, inside a well ventilated area protected from weather, moisture, soiling, extreme temperatures and humidity, laid flat and blocked off-ground to prevent sagging and warping. Mastic and mortar additive are to be stored above 32° Fahrenheit and below 86° Fahrenheit temperatures.

#### 1.7 SEQUENCING AND SCHEDULING

Sequence thin veneer system installation in proper order to minimize the possibility of damage during the construction period.

### PART 2 PRODUCTS

#### 2.1 GENERAL REQUIREMENTS

Assembled wall system shall meet or exceed the following performance standards when tested by certified independent testing laboratory in accordance with the following methods:

ICC IBC requirement per paragraph 1405.9.1 for veneer surface shear value.

ASTM D 3498 Mastic

ASTM C 1135 Freeze-Thaw Tensile Adhesion Properties

ASTM E 72 Wind load Test of Building Panels

ASTM B 117 1000 Hour Salt Spray Test

ASTM D 1037 Fastener-Head Pull Through

ASTM E 2273 PER EG356-2006 Water Drainage

ICC-ES AC356 Section 3.1.3 Water Vapor Transmission

ICC-ES AC356 Section 3.1.1 Fungi Resistance Steel Sheet

ICC-ES AC356 Accelerated Weathering Section 3.1.6

ASTM A395/A395M Steel Panel

ASTM A653/A653M Requirements for Hot-Dip, Zinc-Coated Steel Sheet

ASTM C 1088 Thin Brick Veneer

#### 2.2 THIN BRICK

Color range and texture of thin brick shall be as indicated on drawings and shall conform to the approved sample. Solid clay or shale brick shall

conform to ASTM C 1088, Type TBS. Brick size shall be modular and the nominal size of the brick used shall be 3/4 inches thick, 2-1/4 inches high, and 8 inches long. Minimum compressive strength of the brick shall be 2000 psi. Brick shall be tested for efflorescence. Thin brick units shall be delivered factory-blended to provide a uniform appearance and color range in the completed wall. Clay units shall contain a minimum of 5 percent post-consumer recycled content, or a minimum of 20 percent post-industrial recycled content. See Section 01 33 29.00 06 SUSTAINABILITY REPORTING for cumulative total recycled content requirements. Clay units may contain post-consumer or post-industrial recycled content.

### 2.3 MORTAR

Mortar material shall be as specified in 04 20 00 MASONRY.

### 2.4 BRICK PANEL SYSTEM

Brick panel system shall be available in various sizes to facilitate installation.

Panel shall be galvanized steel, formed to align brick courses and to ensure a mechanical bond of each brick in place. The panel system shall have support ledges to support and space veneer. The system shall carry brick load evenly over entire wall surface without use of footings, starter angles, or special corner sections.

### 2.5 FASTENERS

Fasteners shall be non-corrosive design for applicable substrate.

### 2.6 ADHESIVES

Adhesive shall be as recommended by thin brick veneer panel system manufacturer.

### 2.7 FLASHING

Flashings and trims shall be G90 Hot Dip Galvanized, 26 gauge, with Kynar 500 finish or equal.

### 2.8 WARRANTY

Warranty shall be a Full Twenty-Five (25) Year System Warranty, which cover all components; Panel, Adhesive, Silicone, Membrane, Rain Screen, Fasteners, Insulation, Veneer, and Flashing manufactured or distributed by wall system manufacturer.

## PART 3 EXECUTION

### 3.1 INSPECTION

Installer must examine conditions under which the thin veneer system is to be installed and notify Contracting Officer in writing of any unsatisfactory conditions. Do not proceed with installation of the thin veneer system until the unsatisfactory conditions have been corrected in a manner acceptable to the installer and Contracting Officer.

Installer shall consult the other trades involved prior to start of the

thin veneer system installation. This is to determine any areas of potential interference. Do not start the installation until interferences have been resolved to the satisfaction of the installer and Contracting Officer.

### 3.2 PREPARATION

Wherever possible, take field measurements prior to the preparation of shop drawings and fabrication to insure proper fitting and installation of product.

Insure walls are plumb and corners are braced to specifications. Walls must be structurally sound and the substrate system designed with a wall deflection not greater than  $L/240$ . Substrate shall have no planer irregularities greater than 1/4 inch in 10 feet.

Water infiltration barrier must be installed prior to placement of panel. Trim or flash in place per manufacturer's details and/or BIA Technical Note 7A on flashing of Brick Walls.

### 3.3 INSTALLATION OF PANELS

Panels shall be mechanically secured to the wall with a manufacturer's approved fastener in accordance with the manufacturer's recommendation. Panels shall be attached with a minimum of one fastener per square foot. Panels applied to an oblique wall shall be installed with the supports aligned and level to each other. Panel joints shall be staggered over sheathing joints.

Control joints in the panel system are required to coincide with the building control joints.

### 3.4 THIN VENEERS

Thin veneers shall be field applied. Thin veneers shall be dry, clean & free of all debris, then adhered to panel using specially formulated adhesive in "Quarter" sized dabs or vertical strips 3/8 inch wide. Thin veneers shall be applied within 5 to 10 minutes after adhesive has been applied and shall be placed in the bond pattern called for.

### 3.5 MORTAR

When all applied veneers are secured in place, fill joints and seams with Type "S" mortar mix or industry accepted grout for tile or stone, mixed with mortar additive.

Mortar vertical joints immediately following each fourth horizontal joint. Mortar only an area that can be tooled before mortar becomes too stiff. Mortar should have a dull finish and be moist, but not wet.

### 3.6 WEATHER REQUIREMENTS

In cold weather do not use frozen materials in mortar mix. Do not apply mortar to frozen surfaces containing frost. Do not apply mortar when ambient temperature is less than 35 degrees Fahrenheit without sufficient protection and supplemental heat.

In hot weather, protect mortar from uneven and excessive evaporation. Where conditions are hot, dry and/or windy and evaporation is great,

veneer shall be fogged with water to allow the mortar enough time to set.  
Moist curing is not recommended for latex modified mortar.

### 3.7 CAULKING

All areas where thin veneer meets non-veneer surfaces must be sealed as specified in section 07 92 00.00 48 JOINT SEALANTS.

### 3.8 CLEANING

Thin veneer shall be cleaned per the appropriate method established by thin veneer manufacturer.

-- End of Section --

SECTION 05 12 00

STRUCTURAL STEEL

08/18

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 303	(2016) Code of Standard Practice for Steel Buildings and Bridges
AISC 325	(2017) Steel Construction Manual
AISC 326	(2009) Detailing for Steel Construction
AISC 360	(2016) Specification for Structural Steel Buildings
AISC DESIGN GUIDE 10	(1997) Erection Bracing of Low-Rise Structural Steel Buildings

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ANSI/ASNT CP-189	(2016) ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel (ANSI/ASNT CP-105-2006)
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AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(2012) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS D1.1/D1.1M	(2015; Errata 1 2015; Errata 2 2016) Structural Welding Code - Steel
AWS QC1	(2016) Specification for AWS Certification of Welding Inspectors

ASME INTERNATIONAL (ASME)

ASME B46.1	(2009) Surface Texture, Surface Roughness, Waviness and Lay
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ASTM INTERNATIONAL (ASTM)

ASTM A1085/A1085M	(2015) Standard Specification for Cold-Formed Welded Carbon Steel Hollow Structural Sections (HSS)
ASTM A123/A123M	(2017) 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 A29/A29M	(2016) Standard Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought
ASTM A307	(2014; E 2017) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A500/A500M	(2018) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A53/A53M	(2018) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A563	(2015) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A6/A6M	(2017a) Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A780/A780M	(2009; R 2015) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A992/A992M	(2011; R 2015) Standard Specification for Structural Steel Shapes
ASTM B695	(2004; R 2016) Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
ASTM C1107/C1107M	(2017) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM C827/C827M	(2016) Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
ASTM F1136/F1136M	(2011) Standard Specification for Zinc/Aluminum Corrosion Protective Coatings for Fasteners
ASTM F1554	(2018) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield

Strength

ASTM F2329/F2329M	(2015) Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners
ASTM F2833	(2011; R 2017) Standard Specification for Corrosion Protective Fastener Coatings with Zinc Rich Base Coat and Aluminum Organic/Inorganic Type
ASTM F3125/F3125M	(2015a) Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions
ASTM F436/F436M	(2016) Standard Specification for Hardened Steel Washers Inch and Metric Dimensions
ASTM F844	(2007a; R 2013) Washers, Steel, Plain (Flat), Unhardened for General Use

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC PA 1	(2016) Shop, Field, and Maintenance Coating of Metals
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; with Change 3) Structural Engineering
UFC 3-310-04	(2013; with Change 1) Seismic Design of Buildings

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

29 CFR Part 1926, Subpart R	Steel Erection
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1.2 SUBMITTALS

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

Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Erection and Erection Bracing Drawings; G, AE

SD-02 Shop Drawings

Fabrication Drawings Including Details of Connections; G, AE

SD-03 Product Data

Shop Primer

Welding Electrodes and Rods

Non-Shrink Grout

Tension Control Bolts

Recycled Content for Structural Steel; S

Recycled Content for Structural Steel Tubing; S

Recycled Content for Steel Pipe; S

SD-05 Design Data

Design Calculations for Steel Connections; G, AE

Shoring and Temporary Bracing; G, AE

SD-06 Test Reports

Bolts, Nuts, and Washers

Weld Inspection Reports

Bolt Testing Reports

Embrittlement Test Reports

SD-07 Certificates

Steel

Bolts, Nuts, and Washers

Galvanizing

Welding Procedures and Qualifications

Welding Electrodes and Rods

Certified Welding Inspector

NDT Technician

## Welding Procedure Specifications (WPS)

### 1.3 QUALITY ASSURANCE

#### 1.3.1 Preconstruction Submittals

##### 1.3.1.1 Erection and Erection Bracing Drawings

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

#### 1.3.2 Fabrication Drawing Requirements

Submit fabrication drawings for approval prior to fabrication. Prepare in accordance with AISC 303, AISC 326 and AISC 325. Fabrication drawings must not be reproductions of contract drawings. Sign and seal fabrication drawings by a registered professional engineer. Include complete information for the fabrication and erection of the structure's components, including the location, type, and size of bolts, welds, member sizes and lengths, connection details, blocks, copes, and cuts. Use AWS A2.4 standard welding symbols. Shoring and temporary bracing must be designed and sealed by a registered professional engineer and submitted for record purposes, with calculations, as part of the drawings. Clearly highlight any deviations from the details shown on the contract drawings highlighted on the fabrication drawings. Explain the reasons for any deviations from the contract drawings.

#### 1.3.3 Delegated Connection Design

Design structural steel connection indicated in the contract documents per AISC 303, Option 3, using the connection loads indicated. Submit design calculations for steel connections signed and sealed by a registered professional engineer.

#### 1.3.4 Certifications

##### 1.3.4.1 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 welder or welding operator is more than 6 months 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.

## PART 2 PRODUCTS

### 2.1 SYSTEM DESCRIPTION

Provide the structural steel system, including shop primer galvanizing, complete and ready for use. Provide structural steel systems including design, materials, installation, workmanship, fabrication, assembly, erection, inspection, quality control, and testing in accordance with

AISC 303, AISC 360, 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. Provide structural steel containing a minimum of 20 percent recycled content. Submit data identifying percentage of recycled content for structural steel.

### 2.2.2 Structural Steel Tubing

ASTM A500/A500M, Grade B or ASTM A1085/A1085M. Provide structural steel tubing containing a minimum of 25 percent recycled content. Submit data identifying percentage of recycled content for structural steel tubing.

### 2.2.3 Steel Pipe

ASTM A53/A53M, Type E or S, Grade B, weight class STD (Standard) or as indicated. Provide steel pipe containing a minimum of 20 percent recycled content. Submit data identifying percentage of recycled content for steel pipe.

## 2.3 BOLTS, NUTS, AND WASHERS

Submit the certified manufacturer's mill reports which clearly show the applicable ASTM mechanical and chemical requirements together with the actual test results for the supplied fasteners.

### 2.3.1 Common Grade Bolts

#### 2.3.1.1 Bolts

ASTM A307, Grade A, plain finish hot dipped zinc coating. The bolt heads and the nuts of the supplied fasteners must be marked with the manufacturer's identification mark, the strength grade and type specified by ASTM specifications.

#### 2.3.1.2 Nuts

ASTM A563, Grade A, heavy hex style.

#### 2.3.1.3 Washers

ASTM F844.

### 2.3.2 High-Strength Bolts

High strength bolts and nuts must be shipped together in the same shipping container. Fasteners indicated to be galvanized shall be tested by the supplier to show that the galvanized nut with the supplied lubricant provided may be rotated from the snug tight condition well in excess of the rotation required for pretensioned installation without stripping. The supplier shall supply nuts that have been lubricated and tested with the supplied bolts.

#### 2.3.2.1 Bolts

ASTM F3125/F3125M, Grade A325M A325 , Type 1 Heavy Hex Head Style, plain finish.

#### 2.3.2.2 Nuts

ASTM A563, Grade and Style as specified in the applicable ASTM bolt standard.

#### 2.3.2.3 Washers

ASTM F436/F436M, plain carbon steel.

#### 2.3.3 Tension Control Bolts

ASTM F3125/F3125M, Grade F1852, Type 1, twistoff style assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon steel nuts, and hardened carbon steel washers. Assembly finish must be plain. Submit product data for tension control bolts.

#### 2.3.4 Foundation Anchorage

##### 2.3.4.1 Anchor Rods

ASTM F1554 Gr 36, Class 1A.

##### 2.3.4.2 Anchor Nuts

ASTM A563, Grade A, hex style.

##### 2.3.4.3 Anchor Washers

ASTM F844.

##### 2.3.4.4 Anchor Plate Washers

ASTM A36/A36M.

#### 2.4 STRUCTURAL STEEL ACCESSORIES

##### 2.4.1 Welding Electrodes and Rods

AWS D1.1/D1.1M. Submit product data for welding electrodes and rods.

##### 2.4.2 Non-Shrink Grout

ASTM C1107/C1107M, with no ASTM C827/C827M shrinkage. Grout must be nonmetallic. Submit product data for non-shrink grout.

##### 2.4.3 Welded Shear Stud Connectors

ASTM A29/A29M, Grades 1010 through 1020. AWS D1.1/D1.1M, Table 7.1, Type B.

#### 2.5 GALVANIZING

ASTM F2329/F2329M, ASTM F1136/F1136M, ASTM F2833 or ASTM B695 for threaded parts or ASTM A123/A123M for structural steel members, as applicable,

unless specified otherwise galvanize after fabrication where practicable.

## 2.6 FABRICATION

Fabrication must be in accordance with the applicable provisions of AISC 325. Fabrication and assembly must be done in the shop to the greatest extent possible. Punch, subpunch and ream, or drill bolt holes perpendicular to the surface of the member.

Compression joints depending on contact bearing must have a surface roughness not in excess of 500 micro inch as determined by ASME B46.1, and ends must be square within the tolerances for milled ends specified in ASTM A6/A6M.

Shop splices of members between field splices will be permitted only where indicated on the Contract Drawings. Splices not indicated require the approval of the Contracting Officer.

### 2.6.1 Markings

Prior to erection, identify members by a painted erection mark. Connecting parts assembled in the shop for reaming holes in field connections must be match marked with scratch and notch marks. Do not locate erection markings on areas to be welded. Do not locate match markings in areas that will decrease member strength or cause stress concentrations. Affix embossed tags to hot-dipped galvanized members.

### 2.6.2 Shop Primer

SSPC Paint 20 or SSPC Paint 29, (zinc rich primer). Shop prime structural steel, except as modified herein, in accordance with SSPC PA 1. Do not prime steel surfaces embedded in concrete, galvanized surfaces, surfaces to receive sprayed-on fireproofing, or surfaces within 0.5 inch of the toe of the welds prior to welding (except surfaces on which metal decking and shear studs are to be welded). If flash rusting occurs, re-clean the surface prior to application of primer. Apply primer to a minimum dry film thickness of 2.0 mil. Submit shop primer product data.

Prior to assembly, prime surfaces which will be concealed or inaccessible after assembly. Do not apply primer in foggy or rainy weather; when the ambient temperature is below 45 degrees F or over 95 degrees F; or when the primer may be exposed to temperatures below 40 degrees F within 48 hours after application, unless approved otherwise by the Contracting Officer. Repair damaged primed surfaces with an additional coat of primer.

#### 2.6.2.1 Cleaning

SSPC SP 6/NACE No.3, except steel exposed in spaces above ceilings, attic spaces, furred spaces, and chases that will be hidden to view in finished construction may be cleaned to SSPC SP 3 when recommended by the shop primer manufacturer. Maintain steel surfaces free from rust, dirt, oil, grease, and other contaminants through final assembly.

## 2.7 DRAINAGE HOLES

Drill adequate drainage holes to eliminate water traps. Hole diameter must be 1/2 inch and location indicated on the detail drawings. Hole size and locations must not affect the structural integrity.

### PART 3 EXECUTION

#### 3.1 ERECTION

- a. Erection of structural steel, except as indicated in item b. below, must be in accordance with the applicable provisions of AISC 325, AISC 303 and 29 CFR Part 1926, Subpart R.
- b. For low-rise structural steel buildings ( 60 feet tall or less and a maximum of 2 stories), erect the structure in accordance with AISC DESIGN GUIDE 10.

After final positioning of steel members, provide full bearing under base plates and bearing plates using nonshrink grout. Place nonshrink grout in accordance with the manufacturer's instructions.

##### 3.1.1 STORAGE

Store the material out of contact with the ground in such manner and location as to minimize deterioration.

#### 3.2 CONNECTIONS

Except as modified in this section, design connections indicated in accordance with AISC 360. Build connections into existing work. Do not tighten anchor bolts set in concrete with impact torque wrenches. Holes must not be cut or enlarged by burning. Bolts, nuts, and washers must be clean of dirt and rust, and lubricated immediately prior to installation.

##### 3.2.1 Common Grade Bolts

Tighten ASTM A307 bolts to a "snug tight" fit. "Snug tight" is the tightness that exists when plies in a joint are in firm contact. If firm contact of joint plies cannot be obtained with a few impacts of an impact wrench, or the full effort of a man using a spud wrench, contact the Contracting Officer for further instructions.

##### 3.2.2 High-Strength Bolts

Bolts must be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, fully tension bolts, progressing from the most rigid part of a connection to the free edges.

Fastener components shall be protected from dirt and moisture in closed containers at the site of the installation. Fastener components that are not incorporated into the work shall be returned to protected storage at the end of the work shift.

##### 3.2.3 Tension Control Bolts

Bolts must be installed in connection holes and initially brought to a snug tight fit. After the initial tightening procedure, fully tension bolts, progressing from the most rigid part of a connection to the free edges.

#### 3.3 GAS CUTTING

Use of gas-cutting torch in the field for correcting fabrication errors is

not permitted on any major member in the structural framing. Use of a gas cutting torch will be permitted on minor members not under stress only after approval has been obtained from the Contracting Officer.

### 3.4 WELDING

Welding must be in accordance with AWS D1.1/D1.1M. 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. Submit for approval all WPS, whether prequalified or qualified by testing.

#### 3.4.1 Removal of Temporary Welds, Run-Off Plates, and Backing Strips

Removal is not required.

### 3.5 SHOP PRIMER REPAIR

Repair shop primer in accordance with the paint manufacturer's recommendation for surfaces damaged by handling, transporting, cutting, welding, or bolting.

#### 3.5.1 Field Priming

Field prime steel exposed to the weather, or located in building areas without HVAC for control of relative humidity. After erection, the field bolt heads and nuts, field welds, and any abrasions in the shop coat must be cleaned and primed with paint of the same quality as that used for the shop coat.

### 3.6 GALVANIZING REPAIR

Repair damage to galvanized coatings using ASTM A780/A780M zinc rich paint for galvanizing damaged by handling, transporting, cutting, welding, or bolting. Do not heat surfaces to which repair paint has been applied.

### 3.7 FIELD QUALITY CONTROL

Perform field tests, and provide labor, equipment, and incidentals required for testing. Notify the Contracting Officer in writing of defective welds, bolts, nuts, and washers within 7 working days of the date of the inspection.

#### 3.7.1 Welds

##### 3.7.1.1 Visual Inspection

AWS D1.1/D1.1M. Furnish the services of AWS-certified welding inspectors for fabrication and erection inspection and testing and verification inspections. A Certified Welding Inspector must perform visual inspection on 100 percent of all welds. Document this inspection in the Visual Weld Inspection Log. Submit certificates indicating that certified welding inspectors meet the requirements of AWS QC1.

##### 3.7.1.2 Nondestructive Testing

Nondestructive testing must be in accordance with AWS D1.1/D1.1M. All

personnel performing NDT must be certified in accordance with ANSI/ASNT CP-189 in the method of testing being performed. Submit certificates showing compliance with ANSI/ASNT CP-189 for all NDT technicians. If more than 20 percent of welds made by a welder contain defects identified by testing, then all groove welds made by that welder must be tested by ultrasonic testing, and all fillet welds made by that welder must be inspected by magnetic particle testing (MT) or dye penetrant testing (PT) as approved by the Contracting Officer. When groove welds made by an individual welder are required to be tested, magnetic particle or dye penetrant testing may be used only in areas inaccessible to ultrasonic testing. Retest all repaired areas. Submit weld inspection reports.

Testing frequency: Provide the following types and number of tests:

Test Type	Number of Tests
Dye Penetrant	50 percent of PJP and Fillet Welds

### 3.7.2 High-Strength Bolts

#### 3.7.2.1 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.

#### 3.7.2.2 Inspection

Inspection procedures must be in accordance with AISC 360. Confirm and report to the Contracting Officer that the materials meet the project specification and that they are properly stored. Confirm that the faying surfaces have been properly prepared before the connections are assembled. Observe the specified job site testing and calibration, and confirm that the procedure to be used provides the required tension. Monitor the work to ensure the testing procedures are routinely followed on joints that are specified to be fully tensioned.

#### 3.7.2.3 Testing

The Government has the option to perform nondestructive tests on 5 percent of the installed bolts to verify compliance with pre-load bolt tension requirements. Provide the required access for the Government to perform the tests. The nondestructive testing will be done in-place using an ultrasonic measuring device or any other device capable of determining in-place pre-load bolt tension. The test locations must be selected by the Contracting Officer. If more than 10 percent of the bolts tested contain defects identified by testing, then all bolts used from the batch from which the tested bolts were taken, must be tested at the Contractor's expense. Retest new bolts after installation at the Contractor's expense.

### 3.7.3 Testing for Embrittlement

ASTM A143/A143M for steel products hot-dip galvanized after fabrication.  
Submit embrittlement test reports.

### 3.7.4 Inspection and Testing of Steel Stud Welding

Perform verification inspection and testing of steel stud welding conforming to the requirements of AWS D1.1/D1.1M, Stud Welding Clause. The Contracting Officer will serve as the verification inspector. Bend test studs that do not show a full 360 degree weld flash or have been repaired by welding as required by AWS D1.1/D1.1M, Stud Welding Clause. Studs that crack under testing in the weld, base metal or shank will be rejected and replaced by the Contractor at no additional cost.

-- 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 (2015; Errata 1 2015; Errata 2 2016) Structural Welding Code - Steel

AWS D1.3/D1.3M (2018) Structural Welding Code - Sheet Steel

ASTM INTERNATIONAL (ASTM)

ASTM A1008/A1008M (2016) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable

ASTM A123/A123M (2017) 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 (2017) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A780/A780M (2009; R 2015) 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

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 NC	(2017) Standard for Non-Composite Steel Floor Deck
ANSI/SDI QA/QC	(2017) Standard for Quality Control and Quality Assurance for Installation of Steel Deck
ANSI/SDI RD	(2017) Standard for Steel Roof Deck
SDI DDM04	(2015; Errata 1-3 2016; Add 1 2015; Add 2 20162006) Diaphragm Design Manual; 4th Edition
SDI DDP	(1987; R 2000) Deck Damage and Penetrations
SDI MOC3	(2016) Manual of Construction with Steel Deck (3rd Edition)

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

29 CFR 1926	Safety and Health Regulations for Construction
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06, SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication Drawings; G

SD-03 Product Data

Accessories

Deck Units

Galvanizing Repair Paint

Mechanical Fasteners

Touch-Up Paint

Welding Equipment

Welding Rods and Accessories

Recycled Content of Steel Products; S

SD-05 Design Data

Deck Units; G

SD-07 Certificates

Powder-Actuated Tool Operator

Welder Qualifications

Welding Procedures

Manufacturer's Certificate

### 1.3 QUALITY ASSURANCE

#### 1.3.1 Deck Units

Furnish deck units and accessory products from a manufacturer regularly engaged in manufacture of steel decking. Provide manufacturer's certificates attesting that the decking material meets the specified requirements.

#### 1.3.2 Certification of Powder-Actuated Tool Operator

Provide manufacturer's certificate attesting that the operators are authorized to use the low velocity powder-actuated tool.

#### 1.3.3 Qualifications for Welding Work

Follow Welding Procedures of AWS D1.3/D1.3M for sheet steel and AWS D1.1/D1.1M for stud welding.

Submit qualified Welder Qualifications in accordance with AWS D1.3/D1.3M for sheet steel and AWS D1.1/D1.1M for stud welding.

Submit manufacturer's catalog data for Welding Equipment and Welding Rods and Accessories.

#### 1.3.4 Regulatory Requirements

#### 1.3.5 Fabrication Drawings

Show type and location of units, location and sequence of connections, bearing on supports, methods of anchoring, attachment of accessories, adjusting plate details, cant strips, ridge and valley plates, metal closure strips, size and location of holes to be cut and reinforcement to be provided, the manufacturer's erection instructions and other pertinent details.

### 1.4 DELIVERY, STORAGE, AND HANDLING

Deliver deck units to the site in a dry and undamaged condition. Store and handle steel deck in a manner to protect it from corrosion, deformation, and other types of damage. Do not use decking for storage or as working platform until units have been fastened into position. Exercise care not to damage material or overload decking during construction. The maximum uniform distributed storage load must not exceed the design live load. Stack decking on platforms or pallets and cover with weathertight ventilated covering. Elevate one end during

storage to provide drainage. Maintain deck finish at all times to prevent formation of rust. Repair deck finish using touch-up paint. Replace damaged material.

## 1.5 DESIGN REQUIREMENTS FOR ROOF DECKS

### 1.5.1 Properties of Sections

Properties of metal roof deck sections must comply with engineering design width as limited by the provisions of AISI D100.

### 1.5.2 Allowable Loads

Indicate total uniform dead and live load for detailing purposes.

## PART 2 PRODUCTS

### 2.1 DECK UNITS

Submit manufacturer's design calculations, or applicable published literature for the structural properties of the proposed deck units.

Provide products with an average recycled content of steel products so postconsumer recycled content plus one half of preconsumer recycled content not less than 25 percent.

#### 2.1.1 Roof Deck

Conform to ASTM A792/A792M or ASTM A1008/A1008M for deck used in conjunction with insulation and built-up roofing. Fabricate roof deck units of the steel design thickness required by the design drawings and zinc-coated in conformance with ASTM A653/A653M, Z275 G90 coating class.

#### 2.1.2 Form Deck

Conform to ASTM A653/A653M or ASTM A1008/A1008M for deck used as formwork for concrete. Fabricate form deck of the steel design thickness required by the design drawings. Zinc-coat in conformance with ASTM A653/A653M, Z275 G90 coating class.

Use panels of maximum possible lengths to minimize end laps. Fabricate deck units in lengths to span 3 or more supports with flush, telescoped, or nested 2 inch laps at ends, and interlocking, or nested side laps, unless otherwise indicated.

#### 2.1.3 Length of Deck Units

Provide deck units of sufficient length to span three or more spacings where possible.

#### 2.1.4 Touch-Up Paint

Provide a high zinc-dust content paint for regalvanizing welds in galvanized steel conforming to ASTM A780/A780M.

Provide touch-up paint for 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, and openings through deck.

### 2.2.3 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.

### 2.2.4 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 gage thick before galvanizing. Provide 6 inch wide cover plates and form to match the contour of the floor deck units.

### 2.2.5 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.

### 2.2.6 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.

### 2.2.7 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.

### 2.2.8 Mechanical Fasteners

Provide mechanical fasteners, such as powder actuated fasteners, pneumatically driven fasteners or self-drilling screws, for anchoring the deck to structural supports and adjoining units as indicated.

### 2.2.9 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 NCANSI/SDI RD and approved shop drawings. Place units on structural supports, properly adjusted, leveled, and aligned at right angles to supports before permanently securing in place. Damaged deck and accessories including material which is permanently stained or contaminated, deformed, or with burned holes shall not be installed. Extend deck units over three or more supports unless absolutely impractical. Report inaccuracies in alignment or leveling to the Contracting Officer and make necessary corrections before permanently anchoring deck units. Locate deck ends over supports only. Do not use unanchored deck units as a work or storage platform. Do not fill unanchored deck with concrete. Permanently anchor units placed by the end of each working day. Do not support suspended ceilings, light fixtures, ducts, utilities, or other loads by steel deck unless indicated. Distribute loads by appropriate means to prevent damage.

#### 3.2.1 Attachment

Immediately after placement and alignment, and after correcting inaccuracies, permanently fasten steel deck units to structural supports and to adjacent deck units by welding with normal 5/8 inch diameter puddle welds, fastened with screws, powder-actuated fasteners, or pneumatically driven fasteners as indicated on the design drawings and in accordance with manufacturer's recommended procedure and ANSI/SDI NC or ANSI/SDI RD. Clamp or weight deck units to provide firm contact between deck units and structural supports while performing welding or fastening. Attachment of adjacent deck units by button-punching is prohibited.

##### 3.2.1.1 Welding

Perform welding in accordance with AWS D1.3/D1.3M using methods and electrodes recommended by the manufacturers of the base metal alloys being used. Ensure only operators previously qualified by tests prescribed in AWS D1.3/D1.3M make welds. Immediately recertify, or replace qualified welders, that are producing unsatisfactory welding. Conform to the recommendations of the Steel Deck Institute and the steel deck manufacturer

for location, size, and spacing of fastening. Do not use welding washers at the connections of the deck to supports. Do not use welding washers at sidelaps. Holes and similar defects will not be acceptable. Attach all partial or segments of deck units to structural supports in accordance with Section 2.5 of SDI DDM04. . Immediately clean welds by chipping and wire brushing. Heavily coat welds, cut edges and damaged portions of coated finish with zinc-dust paint conforming to ASTM A780/A780M shop 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.

#### 3.2.1.3 Sidelap Fastening

Lock sidelaps between adjacent floor deck units together by welding or screws as indicated.

#### 3.2.2 Openings

Cut or drill all holes and openings required and be coordinated with the drawings, specifications, and other trades. Frame and reinforce openings through the deck in conformance with SDI DDP. Reinforce holes and openings 6 to 12 inch across by 0.0474 inch thick steel sheet at least 12 inch wider and longer than the opening and be fastened to the steel deck at each corner of the sheet and at a maximum of 6 inch on center. Reinforce holes and openings larger than 12 inch by steel channels or angles installed perpendicular to the steel joists and supported by the adjacent steel joists. Install steel channels or angles perpendicular to the deck ribs and fasten to the channels or angles perpendicular to the steel joists.

#### 3.2.3 Deck Damage

SDI MOC3, for repair of deck damage.

#### 3.2.4 Touch-Up Paint

##### 3.2.4.1 Roof Deck

After roof decking installation, wire brush, clean, and touchup paint the scarred areas on top and bottom surfaces of metal roof decking. The scarred areas include welds, weld scars, bruises, and rust spots. Touchup galvanized surfaces with galvanizing repair paint.

##### 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 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.

#### 3.2.6 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 NC.

#### 3.2.7 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 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.

### 3.4 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.

### 3.5 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.

### 3.6 CLEANING AND PROTECTION FOR ROOF DECKS

Upon completion of the deck, sweep surfaces clean and prepare for installation of the roofing.

### 3.7 FIELD QUALITY CONTROL

#### 3.7.1 Deck Weld Inspection

Visual inspect welds in accordance with AWS D1.3/D1.3M.

#### 3.7.2 Decks Not Receiving Concrete

Inspect the decking top surface for distortion after installation. For roof decks not receiving concrete, verify distortion by placing a straight edge across three adjacent top flanges. The maximum allowable gap between the straight edge and the top flanges should not exceed manufacturing and construction tolerances of supporting members. When gap is more than the allowable, provide corrective measures or replacement. Reinspect decking after performing corrective measures or replacement.

-- End of Section --

SECTION 05 40 00

COLD-FORMED METAL 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 CONCRETE INSTITUTE INTERNATIONAL (ACI)

ACI 318 (2014; Errata 1-2 2014; Errata 3-5 2015; Errata 6 2016; Errata 7-9 2017) Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary (ACI 318R-14)

AMERICAN 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 S214 (2012) North American Standard for Cold-Formed Steel Framing - Truss Design

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2015; Errata 1 2015; Errata 2 2016) Structural Welding Code - Steel

AWS D1.3/D1.3M (2018) Structural Welding Code - Sheet Steel

ASTM INTERNATIONAL (ASTM)

ASTM A1003/A1003M	(2015) Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2016) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A307	(2014; E 2017) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A370	(2017a) Standard Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM A653/A653M	(2017) 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	(2018) Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections
ASTM C955	(2017) Standard Specification for Cold-Formed Steel Structural Framing Members
ASTM E119	(2018) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E329	(2018) Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
ASTM E488/E488M	(2015) Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
ASTM F1554	(2018) Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
ASTM F1941	(2010) Standard Specification for Electrodeposited Coatings on Threaded Fasteners (Unified Inch Screw Threads

(UN/UNR))

ASTM F2329/F2329M (2015) Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2015) International Building Code

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-301-01 (2013; with Change 3) Structural Engineering

## 1.2 SUBMITTALS

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### SD-02 Shop Drawings

Framing Components; G, AE

### SD-03 Product Data

Steel Studs, Joists, Tracks, Bracing, Bridging and Accessories

Recycled Content of Steel Products; S

### SD-05 Design Data

Metal Framing Calculations; G, AE

### SD-07 Certificates

Load-Bearing Cold-Formed Metal Framing

Welds

## 1.3 DELIVERY, STORAGE, AND HANDLING

Steel framing and related accessories shall be stored and handled in accordance with the AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing".

## 1.4 LOAD-BEARING COLD-FORMED METAL FRAMING

Include top and bottom tracks, bracing, fastenings, and other accessories necessary for complete installation. Framing members shall have the minimum structural properties indicated. Where physical structural properties are not indicated, they shall be as necessary to withstand all

imposed loads. Design framing in accordance with AISI S100. 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.

Submit mill certificates or test reports from independent testing agency, qualified in accordance with ASTM E329, showing that the steel sheet used in the manufacture of each cold-formed component complies with the minimum yield strengths and uncoated steel thickness specified. Test reports shall be based on the results of three coupon tests in accordance with ASTM A370.

#### 1.5 MAXIMUM DEFLECTION

Deflections of structural members shall not exceed the more restrictive of the limitations of ICC IBC and UFC 3-301-01.

#### 1.6 QUALITY ASSURANCE

- a. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a registered professional engineer.
- b. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E329 for testing indicated.
- c. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- d. Welding Qualifications: Qualify procedures and personnel according to the following:
  - (1) AWS D1.1/D1.1M, "Structural Welding Code - Steel".
  - (2) AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel".
- e. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E119 by, and displaying a classification label from, a testing and inspecting agency acceptable to authorities having jurisdiction.
- f. AISI Specifications and Standards: Comply with:
  - (1) AISI S100, "North American Specification for the Design of Cold-Formed Steel Structural Members".
  - (2) AISI 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".

1.6.1 Drawing Requirements

Submit framing components to show sizes, thicknesses, layout, material designations, methods of installation, and accessories including the following:

- a. Cross sections, plans, and/or elevations showing component types and locations for each framing application; including shop coatings and material thicknesses for each framing component.
- b. Connection details showing fastener type, quantity, location, and other information to assure proper installation.
- c. Drawings depicting panel configuration, dimensions, components, locations, and construction sequence if the Contractor elects to install prefabricated/prefinished frames.

Sign and seal fabrication drawings by a registered professional engineer.

1.6.2 Design Data Required

Submit metal framing calculations with design criteria and structural loading to verify sizes, thickness, and spacing of members and connections signed and sealed by a registered professional engineer. Show methods and practices used in installation.

PART 2 PRODUCTS

2.1 STEEL STUDS, JOISTS, TRACKS, BRACING, BRIDGING AND ACCESSORIES

Framing components shall comply with ASTM C955 and the following.

- a. 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: ST33H (ST230H)ST50H, (ST340H), or as required by structural performance.
  - (2) Coating: G60 (Z180), A60 (ZF180), AZ50 (AZ150), or GF30 (ZGF90).
- c. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
  - (1) Minimum Base-Metal Thickness: 0.0428 inch.

(2) Flange Width: 1-5/8 inches.

d. 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: 0.0428 inch.

(2) Flange Width: 1-1/4 inches .

2.1.1 Studs and Joists of 54 mils (0.054 Inch) and Heavier

Galvanized steel, ASTM A653/A653M and ASTM A1003/A1003M, SS Grade 50, G60.

2.1.2 Studs and Joists of 43 mils (0.043 Inch) and Lighter

Studs and Joists of 43 mils (0.043 Inch) and Lighter, Track, and Accessories (All thicknesses): Galvanized steel, ASTM A653/A653M and ASTM A1003/A1003M, SS, Grade 33 33,000 psi G60.

2.1.3 Sizes, Thickness, Section Modulus, and Other Structural Properties

Size and thickness as required.

2.2 MARKINGS

Studs and track shall have product markings stamped on the web of the section. The markings shall be repeated throughout the length of the member at a maximum spacing of 4 feet on center and shall be legible and easily read. The product marking shall include the following:

- a. An ICC number.
- b. Manufacturer's identification.
- c. Minimum delivered uncoated steel thickness.
- d. Protective coating designator.
- e. Minimum yield strength.

2.3 CONNECTIONS

2.3.1 Steel-To-Concrete Connections

- a. Anchor Rods: ASTM F1554, Grade 36; galvanized per ASTM A153/A153M.
- b. Post-Installed Concrete Anchors: Adhesive or expansion anchors fabricated from corrosion-resistant materials with allowable load capacities in accordance with ICC-ES AC193 and ACI 318 greater than or equal to the design load as determined by testing per ASTM E488/E488M conducted by a qualified testing agency.
- c. Power-Actuated Fasteners: Fabricated from corrosion-resistant materials with allowable load capacities in accordance with ICC-ES AC 70 greater than or equal to the design load as determined by testing per ASTM E1190 conducted by a qualified testing agency.

### 2.3.2 Steel-To-Steel Connections

- a. Screws: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping steel screws of the type and size indicated. Provide low-profile head beneath sheathing and manufacturer's standard elsewhere. Electroplated to a minimum of 5 micron zinc coating per ASTM F1941 or hot-dipped galvanized per ASTM A123/A123M or ASTM A153/A153M.
- b. Bolts: ASTM A307 coated by hot-dip process per ASTM F2329/F2329M or zinc-coated by mechanical-deposition process per ASTM B695, Class 55.
- c. Welding Electrodes: Comply with AWS standards.

### 2.4 PLASTIC GROMMETS

Supply plastic grommets for stud webs as recommended by stud manufacturer, to protect electrical wires and plumbing piping. Prevent metal-to-metal contact between wiring/piping and studs.

## PART 3 EXECUTION

### 3.1 FASTENING

Fasten framing members together by welding or by using self-drilling, self-tapping screws. Electrodes and screw connections shall be as required and indicated in the design calculations.

#### 3.1.1 Welds

All welding shall be performed in accordance with AWS D1.3/D1.3M, as modified by AISI S100. All welders, welding operations, and welding procedures shall be qualified according to AWS D1.3/D1.3M. Submit certified copies of welder qualifications test records showing qualification in accordance with AWS D1.3/D1.3M. All welds shall be cleaned and coated with rust inhibitive galvanizing paint. Do not field weld materials lighter than 43 mils.

#### 3.1.2 Screws

Screws shall be of the self-drilling self-tapping type, size, and location as required. Screw penetration through joined materials shall not be less than three exposed threads. Minimum spacings and edge distances for screws shall be as specified in AISI S100. Screws covered by sheathing materials shall have low profile heads.

#### 3.1.3 Anchors

Anchors shall be of the type, size, and location as required.

#### 3.1.4 Powder-Actuated Fasteners

Powder-actuated fasteners shall be of the type, size, and location as required.

### 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 studs. Install sealer gasket under bottom of track on concrete slab or foundation. Anchor tracks as indicated in design calculations. Butt weld joints in tracks or splice with stud inserts. Fasteners shall be at least 3 inches from the edge of concrete slabs.

3.2.2 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 S100. Bracing shall be not less than the following:

<u>LOAD</u>	<u>HEIGHT</u>	<u>BRACING</u>
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

- a. Provide a stud directly under each joist or truss. The maximum spacing of studs as indicated shall be maintained.
- b. Install, bridge, and brace cold-formed steel joists according to AISI S214, AISI's "Code of Standard Practice for Cold-Formed Steel Structural Framing," and manufacturer's written instructions unless more stringent requirements are indicated.
- c. Install temporary bracing and supports. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

- d. Do not alter, cut, or remove framing members or connections of trusses.

#### 3.2.4 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.
- End of Section --

SECTION 05 50 13

MISCELLANEOUS METAL FABRICATIONS  
05/17

PART 1 GENERAL

1.1 REFERENCES

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

ALUMINUM ASSOCIATION (AA)

AA DAF45 (2003; Reaffirmed 2009) Designation System  
for Aluminum Finishes

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 303 (2016) Code of Standard Practice for Steel  
Buildings and Bridges

AMERICAN SOCIETY OF 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 (2015; Errata 1 2015; Errata 2 2016)  
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 (2015) Nuts for General Applications:  
Machine Screw Nuts, Hex, Square, Hex  
Flange, and Coupling Nuts (Inch Series)

ASME B18.21.1 (2009; R 2016) Washers: Helical  
Spring-Lock, Tooth Lock, and Plain Washers  
(Inch Series)

ASME B18.21.2M (1999; R 2014) Lock Washers (Metric Series)

ASME B18.22M (1981; R 2017) Metric Plain Washers

ASME B18.6.2 (1998; R 2010) Slotted Head Cap Screws,  
Square Head Set Screws, and Slotted  
Headless Set Screws: Inch Series

ASME B18.6.3 (2013; R 2017) Machine Screws, Tapping  
Screws, and Machine Drive Screws (Inch  
Series)

ASTM INTERNATIONAL (ASTM)

ASTM A108	(2013) Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2016) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A307	(2014; E 2017) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 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 A500/A500M	(2018) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A53/A53M	(2018) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A653/A653M	(2017) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A780/A780M	(2009; R 2015) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A924/A924M	(2017a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B108/B108M	(2015) Standard Specification for Aluminum-Alloy Permanent Mold Castings
ASTM B209	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B209M	(2014) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
ASTM B221	(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 B26/B26M (2014; E 2015) Standard Specification for  
Aluminum-Alloy Sand Castings

ASTM C1513 (2018) Standard Specification for Steel  
Tapping Screws for Cold-Formed Steel  
Framing Connections

ASTM D1187/D1187M (1997; E 2011; R 2011) Asphalt-Base  
Emulsions for Use as Protective Coatings  
for Metal

ASTM F1554 (2018) Standard Specification for Anchor  
Bolts, Steel, 36, 55, and 105-ksi Yield  
Strength

MASTER PAINTERS INSTITUTE (MPI)

MPI 79 (2012) Primer, Alkyd, Anti-Corrosive for  
Metal

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM MBG 531 (2017) Metal Bar Grating Manual

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 3 (1982; E 2004) Power Tool Cleaning

SSPC SP 6/NACE No.3 (2007) Commercial Blast Cleaning

U.S. ARMY CORPS OF ENGINEERS (USACE)

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

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Expansion Joint Covers, Installation Drawings; G

Floor Gratings, Installation Drawings; G

Bollards/Pipe Guards; G

Embedded Angles and Plates, Installation Drawings; G

SD-03 Product Data

Expansion Joint Covers; G

Floor Gratings; G

### 1.3 QUALIFICATION OF WELDERS

Qualify welders in accordance with AWS D1.1/D1.1M. Use procedures, materials, and equipment of the type required for the work.

### 1.4 DELIVERY, STORAGE, AND PROTECTION

Protect from corrosion, deformation, and other types of damage. Store items in an enclosed area free from contact with soil and weather. Remove and replace damaged items with new items.

### 1.5 MISCELLANEOUS REQUIREMENTS

#### 1.5.1 Fabrication Drawings

Submit fabrication drawings showing layout(s), connections to structural system, and anchoring details as specified in AISC 303.

#### 1.5.2 Installation Drawings

Submit templates, erection, and installation drawings indicating thickness, type, grade, class of metal, and dimensions. Show construction details, reinforcement, anchorage, and installation in relation to the building construction.

## PART 2 PRODUCTS

### 2.1 MATERIALS

Provide exposed fastenings of compatible materials (avoid contact of dissimilar metals). Coordinate color and finish with the material to which fastenings are applied.

#### 2.1.1 Structural Carbon Steel

Provide in accordance with ASTM A36/A36M.

#### 2.1.2 Structural Tubing

Provide in accordance with ASTM A500/A500M.

#### 2.1.3 Steel Pipe

Provide in accordance with ASTM A53/A53M, Type E or S, Grade B.

#### 2.1.4 Fittings for Steel Pipe

Provide standard malleable iron fittings in accordance with ASTM A47/A47M.

#### 2.1.5 Gratings

Provide metal bar type grating in accordance with NAAMM MBG 531.

## 2.1.6 Anchor Bolts

Provide in accordance with ASTM F1554. Where exposed, provide anchor bolts of the same material, color, and finish as the metal to which they are applied.

### 2.1.6.1 Expansion Anchors and Adhesive Anchors

Provide expansion and adhesive anchors where indicated and in accordance with manufacturer's recommendations.

### 2.1.6.2 Lag Screws and Bolts

Provide in accordance with ASME B18.2.1, type and grade best suited for the purpose.

### 2.1.6.3 Toggle Bolts

Provide in accordance with ASME B18.2.1.

### 2.1.6.4 Bolts, Nuts, Studs and Rivets

Provide in accordance with ASME B18.2.2 or ASTM A307.

### 2.1.6.5 Powder Actuated Fasteners

Follow safety provisions in accordance with ASSE/SAFE A10.3.

### 2.1.6.6 Screws

Provide in accordance with ASME B18.2.1, ASME B18.6.2, ASME B18.6.3 and ASTM C1513.

### 2.1.6.7 Washers

Provide plain washers in accordance with ASME B18.22M, ASME B18.21.1. Provide beveled washers for American Standard beams and channels, square or rectangular, tapered in thickness, and smooth. Provide lock washers in accordance with ASME B18.21.2M, ASME B18.21.1.

### 2.1.6.8 Welded Headed Shear Studs

Provide in accordance with ASTM A108.

## 2.1.7 Aluminum Alloy Products

Provide in accordance with ASTM B209M, ASTM B209 for sheet plate, ASTM B221M, ASTM B221M, ASTM B221 for extrusions and ASTM B26/B26M or ASTM B108/B108M for castings. Provide aluminum extrusions at least 1/8 inch thick and aluminum plate or sheet at least 0.050 inch thick.

## 2.2 FABRICATION FINISHES

### 2.2.1 Galvanizing

Hot-dip galvanize items specified to be zinc-coated, after fabrication where practicable. Provide galvanizing in accordance with ASTM A123/A123M, ASTM A153/A153M, ASTM A653/A653M or ASTM A924/A924M, Z275 G90.

## 2.2.2 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 in accordance with ASTM A780/A780M or by application of stick or thick paste material specifically designed for repair of galvanizing, as approved by Contracting Officer. Clean areas to be repaired and remove slag from welds. Heat, with a torch, surfaces to which stick or paste material will be applied. Heat to a temperature sufficient to melt the metals in the stick or paste. Spread molten material uniformly over surfaces to be coated and wipe off excess material.

## 2.2.4 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 must be free of dirt and grease prior to embed. Do not paint or galvanize bearing surfaces, including contact surfaces within slip critical joints. Shop coat these surfaces with rust prevention.

### 2.2.4.2 Pretreatment, Priming and Painting

Apply pre-treatment, primer, and paint in accordance with manufacturer's printed instructions. On surfaces concealed in the finished construction or not accessible for finish painting, apply an additional prime coat to a minimum dry film thickness of 1.0 mil. Tint additional prime coat with a small amount of tinting pigment.

## 2.2.5 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.

Provide in accordance with AA DAF45. Provide a polished satin finish on items to be anodized.

### 2.3 EXPANSION JOINT COVERS

Provide expansion joint covers constructed of extruded aluminum with anodized satin aluminum finish for walls and ceilings and standard mill finish for floor covers and exterior covers. Furnish plates, backup angles, expansion filler strips and anchors as indicated. Provide a 1-hour fire-rating for expansion joints at the elevator structure..

### 2.4 FLOOR GRATINGS

Design steel grating in accordance with NAAMM MBG 531 for bar type gratings, or in accordance with manufacturer's charts for plank grating. Galvanize steel floor gratings.

- a. Design floor gratings to support a live load of 100 pounds per square foot for the spans indicated, with maximum deflection of  $L/240$ .
- b. In accordance with NAAMM MBG 531, band edges of grating with bars of the same size as the bearing bars. Weld banding in accordance with the manufacturer's standard for trim unless otherwise indicated. Design tops of bearing bars, cross or intermediate bars to be in the same plane and to match grating finish.
- b. NAAMM MBG 531, band ends of gratings with bars of the same or greater thickness than the metal used for grating. Weld banding bars to bearing bars or channels at least every fourth bar or channel and in every corner. Tack weld intervening bars or channels. Band diagonal or round cuts by welding bars of the same or greater thickness as the grating and in accordance with the manufacturer's standard for trim unless otherwise indicated.

### 2.5 BOLLARDS/PIPE GUARDS

Provide standard weight steel pipe in accordance with ASTM A53/A53M. Anchor posts in concrete as indicated and fill solidly with concrete.

### 2.6 MISCELLANEOUS PLATES AND SHAPES

Provide items that do not form a part of the structural steel framework, such as lintels, sill angles, miscellaneous mountings and frames. Provide lintels fabricated from structural steel shapes over openings in masonry walls and partitions as indicated and as required to support wall loads over openings. Provide with connections. Construct to have at least 8 in bearing on masonry at each end.

Provide angles and plates in accordance with ASTM A36/A36M, for embedment as indicated. Galvanize embedded items exposed to the elements in accordance with ASTM A123/A123M.

## PART 3 EXECUTION

### 3.1 GENERAL INSTALLATION REQUIREMENTS

Install items at locations indicated in accordance with manufacturer's instructions. Verify all field dimensions prior to fabrication. Include materials and parts necessary to complete each assembly, whether indicated

or not. Miss-alignment and miss-sizing of holes for fasteners is cause for rejection. Conceal fastenings where practicable. Joints exposed to weather must be watertight.

### 3.2 WORKMANSHIP

Provide miscellaneous metalwork that is true and accurate in shape, size, and profile. Make angles and lines continuous and straight. Make curves consistent, smooth and unfaceted. Provide continuous welding along the entire area of contact except where tack welding is permitted. Do not tack weld exposed connections. Unless otherwise indicated and approved, provide a smooth finish on exposed surfaces. Provide countersunk rivets where exposed. Provide coped and mitered corner joints aligned flush and without gaps.

### 3.3 ANCHORAGE, FASTENINGS, AND CONNECTIONS

Provide anchorage as necessary, whether indicated or not, for fastening miscellaneous metal items securely in place. Include slotted inserts, expansion shields, powder-driven fasteners, toggle bolts (when approved for concrete), through bolts for masonry, headed shear studs, machine and carriage bolts for steel, through bolts, lag bolts, and screws for wood. Do not use wood plugs. Provide non-ferrous attachments for non-ferrous metal. Provide exposed fastenings of compatible materials (avoid contact of dissimilar metals), that generally match in color and finish the surfaces to which they are applied. Conceal fastenings where practicable. Provide all fasteners flush with the surfaces they fasten, unless indicated otherwise.

### 3.4 BUILT-IN WORK

Where necessary and not otherwise indicated, form built-in metal work for anchorage with concrete or masonry. Provide built-in metal work in ample time for securing in place as the work progresses.

### 3.5 WELDING

Perform welding, welding inspection, and corrective welding in accordance with AWS D1.1/D1.1M. Use continuous welds on all exposed connections. Grind visible welds smooth in the finished installation. Provide welded headed shear studs in accordance with AWS D1.1/D1.1M, Clause 7, except as otherwise specified. Provide in accordance with the safety requirements of EM 385-1-1.

### 3.6 DISSIMILAR METALS

Where dissimilar metals are in contact, protect surfaces with a coating in accordance with MPI 79 to prevent galvanic or corrosive action. Where aluminum is in contact with concrete, plaster, mortar, masonry, wood, or absorptive materials subject to wetting, protect in accordance with ASTM D1187/D1187M, asphalt-base emulsion. Clean surfaces with metal shavings from installation at the end of each work day.

### 3.7 PREPARATION

#### 3.7.1 Material Coatings and Surfaces

Remove rust preventive coating just prior to field erection, using a remover approved by the metal manufacturer. Surfaces, when assembled,

must be free of rust, grease, dirt and other foreign matter.

### 3.7.2 Environmental Conditions

Do not clean or paint surfaces when damp or exposed to foggy or rainy weather, when metallic surface temperature is less than minus 5 degrees F above the dew point of the surrounding air, or when surface temperature is below 45 degrees F or over 95 degrees F, unless approved by the Contracting Officer. Metal surfaces to be painted must be dry for a minimum of 48 hours prior to the application of primer or paint.

### 3.8 EXPANSION JOINT COVERS

Provide in accordance with manufacturer's written instructions. Verify installation allows specified movement prior to completion of work

### 3.9 INSTALLATION OF BOLLARDS/PIPE GUARDS

Set bollards/pipe guards vertically in concrete piers. Fill hollow cores with concrete.

### 3.10 INSTALLATION MISCELLANEOUS PLATES AND SHAPES

Provide lintels fabricated from structural steel shapes over openings in masonry walls and partitions as indicated and as required to support wall loads over openings. Provide with connections. Construct to have at least 8 inches bearing on masonry at each end.

-- End of Section --

SECTION 05 52 00

METAL RAILINGS

02/18

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO M 314 (1990; R 2013) Standard Specification for  
Steel Anchor Bolts

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2015; Errata 1 2015; Errata 2 2016)  
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; R 2016) Washers: Helical  
Spring-Lock, Tooth Lock, and Plain Washers  
(Inch Series)

ASME B18.6.1 (2016) Wood Screws (Inch Series)

ASME B18.6.3 (2013; R 2017) Machine Screws, Tapping  
Screws, and Machine Drive Screws (Inch  
Series)

ASTM INTERNATIONAL (ASTM)

ASTM A108 (2013) Standard Specification for Steel  
Bar, Carbon and Alloy, Cold-Finished

ASTM A123/A123M (2017) Standard Specification for Zinc  
(Hot-Dip Galvanized) Coatings on Iron and  
Steel Products

ASTM A153/A153M (2016) Standard Specification for Zinc  
Coating (Hot-Dip) on Iron and Steel  
Hardware

ASTM A27/A27M (2017) 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; E 2017) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
ASTM A36/A36M	(2014) Standard Specification for Carbon Structural Steel
ASTM A449	(2014) Standard Specification for Hex Cap Screws, Bolts, and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
ASTM A47/A47M	(1999; R 2014) Standard Specification for Ferritic Malleable Iron Castings
ASTM A500/A500M	(2018) Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A512	(2006; R 2012) Standard Specification for Cold-Drawn Butt-weld Carbon Steel Mechanical Tubing
ASTM A53/A53M	(2018) 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; R 2014) Standard Specification for Nails for the Application of Gypsum Board
ASTM C636/C636M	(2013) Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
ASTM E488/E488M	(2015) Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
ASTM F3125/F3125M	(2015a) Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM AMP 521	(2001; R 2012) Pipe Railing Systems Manual
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1.2 ADMINISTRATIVE REQUIREMENTS

1.2.1 Preinstallation Meetings

Within 90 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 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

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-07 Certificates

Welding Procedures; G  
Welder Qualification; G

#### SD-08 Manufacturer's Instructions

Installation Instructions

### 1.4 QUALITY CONTROL

#### 1.4.1 Welding Procedures

Submit results of welding procedures testing in accordance with AWS D1.1/D1.1M made in the presence of the Contracting Officer and by an approved testing laboratory at the Contractor's expense.

#### 1.4.2 Welder Qualification

Submit certified welder qualification by tests in accordance with AWS D1.1/D1.1M, or under an equivalent approved qualification test. In addition, perform tests on test pieces in positions and with clearances equivalent to those actually encountered. If a test weld fails to meet requirements, conduct an immediate retest of two test welds and ensure that each test weld passes. Failure in the immediate retest will require that the welder be retested after further practice or training and make a complete set of test welds.

## PART 2 PRODUCTS

### 2.1 FABRICATION

Preassemble items in the shop to the greatest extent possible. Disassemble units only to the extent necessary for shipping and handling. Clearly mark units for reassembly and coordinated installation.

For the fabrication of work exposed to view, use only materials that are smooth and free of surface blemishes, including pitting, seam marks, roller marks, rolled trade names, and roughness. Remove blemishes by grinding, or by welding and grinding, before cleaning, treating, and applying surface finishes, including zinc coatings.

Provide railing and handrail detail plans and elevations at not less than 1 inch to 1 foot. Provide details of sections and connections at not less

than 3 inches to 1 foot. Also detail setting drawings, diagrams, templates for installation of anchorages, including concrete inserts, anchor bolts, and miscellaneous metal items having integral anchors.

Use materials of size and thicknesses indicated or, if not indicated, of the size and thickness necessary to produce adequate strength and durability in the finished product for its intended use. Work the materials to the dimensions indicated on approved detail drawings, using proven details of fabrication and support. Use the type of materials indicated or specified for the various components of work.

Form exposed work true to line and level, with accurate angles and surfaces and straight sharp edges. Ensure that all exposed edges are eased to a radius of approximately 1/32 inch. Bend metal corners to the smallest radius possible without causing grain separation or otherwise impairing the work.

Weld corners and seams continuously and in accordance with the recommendations of AWS D1.1/D1.1M. Grind exposed welds smooth and flush to match and blend with adjoining surfaces.

Form the exposed connections with hairline joints that are flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of the type indicated or, if not indicated, use countersunk Phillips flathead screws or bolts.

Provide anchorage of the type indicated and coordinated with the supporting structure. Fabricate anchoring devices and space as indicated and as required to provide adequate support for the intended use of the work.

Use hot-rolled steel bars for work fabricated from bar stock unless work is indicated or specified to be fabricated from cold-finished or cold-rolled stock.

#### 2.1.1 Steel Handrails

Fabricate joint posts, rail, and corners by one of the following methods:

- a. Flush-type rail fittings of commercial standard, welded and ground smooth, with railing splice locks secured with 3/8 inch hexagonal-recessed-head setscrews.
- b. Mitered and welded joints made by fitting post to top rail and intermediate rail to post, mitering corners, groove-welding joints, and grinding smooth. Butt railing splices and reinforce them by a tight-fitting interior sleeve not less than 6 inches long.
- c. Railings may be bent at corners in lieu of jointing, provided that bends are made in suitable jigs and the pipe is not crushed.

#### 2.1.2 Protective Coating

Shop-prime the steelwork as indicated in accordance with Section 09 90 00 PAINTS AND COATINGS except the following:

- a. steel surfaces encased in concrete
- b. steel surfaces for welding

c. high-strength bolt-connected contact surfaces

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.

2.2 COMPONENTS

2.2.1 Structural Steel Plates, Shapes And Bars

Provide structural-size shapes and plates, except plates to be bent or cold-formed, conforming to ASTM A36/A36M, unless otherwise noted.

Provide steel plates, to be bent or cold-formed, conforming to ASTM A283/A283M, Grade C.

Provide steel bars and bar-size shapes conforming to ASTM A36/A36M, unless otherwise noted.

2.2.2 Structural-Steel Tubing

Provide structural-steel tubing, hot-formed, welded or seamless, conforming to ASTM A500/A500M, Grade B, unless otherwise noted.

2.2.3 Hot-Rolled Carbon Steel Bars

Provide bars and bar-size shapes conforming to ASTM A575, grade as selected by the fabricator.

2.2.4 Cold-Finished Steel Bars

Provide cold-finished steel bars conforming to ASTM A108, grade as selected by the fabricator.

2.2.5 Cold-Drawn Steel Tubing

Provide tubing conforming to ASTM A512, sunk-drawn, butt-welded, cold-finished, and stress-relieved.

2.2.6 Steel Pipe

Provide pipe conforming to ASTM A53/A53M, type as selected, Grade B; primed finish, unless galvanizing is required; standard weight (Schedule 40).

2.2.7 Concrete Inserts

Provide threaded-type concrete inserts consisting of galvanized ferrous castings, internally threaded to receive 3/4 inch diameter machine bolts; either malleable iron conforming to ASTM A47/A47M or cast steel conforming to ASTM A27/A27M, hot-dip galvanized in accordance with ASTM A153/A153M.

Provide wedge-type concrete inserts consisting of galvanized box-type ferrous castings designed to accept 3/4 inch diameter bolts having special wedge-shaped heads, made of either malleable iron conforming to ASTM A47/A47M or cast steel conforming to ASTM A27/A27M and hot-dip galvanized in accordance with ASTM A153/A153M.

Provide carbon steel bolts having special wedge-shaped heads, nuts, washers, and shims, galvanized in accordance with ASTM A153/A153M. Provide slotted-type concrete inserts consisting of a galvanized 1/8 inch thick pressed-steel plate conforming to ASTM A283/A283M, made of box-type welded construction with a slot designed to receive 3/4 inch diameter square-head bolt with knockout cover; and hot-dip galvanized in accordance with ASTM A123/A123M.

#### 2.2.8 Masonry Anchorage Devices

Provide masonry anchorage devices consisting of expansion shields complying with AASHTO M 314, ASTM E488/E488M and ASTM C514 as follows:

Provide lead expansion shields for machine screws and bolts 1/4 inch and smaller; head-out embedded nut type, single-unit class, Group I, Type 1, Class 1.

Provide lead expansion shields for machine screws and bolts larger than 1/4 inch in size; head-out embedded nut type, multiple-unit class, Group I, Type 1, Class 2.

Provide bolt anchor expansion shields for lag bolts; zinc-alloy, long-shield anchor class, Group II, Type 1, Class 1.

Provide bolt anchor expansion shields for bolts; closed-end bottom-bearing class, Group II, Type 2, Class 1.

Provide tumble-wing-type toggle bolts conforming to ASTM F3125/F3125M, ASTM A449 and ASTM C636/C636M, type, class, and style as required.

#### 2.2.9 Fasteners

Provide galvanized zinc-coated fasteners in accordance with ASTM A153/A153M used for exterior applications or where built into exterior walls or floor systems. Select fasteners for the type, grade, and class required for the installation of steel stair items.

Provide standard hexagon-head bolts, conforming to ASTM A307, Grade A.

Provide square-head lag bolts conforming to ASME B18.2.1.

Provide cadmium-plated steel machine screws conforming to ASME B18.6.3.

Provide flat-head carbon steel wood screws conforming to ASME B18.6.1.

Provide plain round, general-assembly-grade, carbon steel washers conforming to ASME B18.21.1.

Provide helical spring, carbon steel lockwashers conforming to ASME B18.2.1.

#### 2.2.10 Steel Railings And Handrails

Design handrails to resist a concentrated load of 200 lb in any direction at any point of the top of the rail or 50 lb per foot applied horizontally to the top of the rail, whichever is more severe. NAAMM AMP 521, provide the same size rail and post. Provide pipe collars of the same material and finish as the handrail and posts.

#### 2.2.10.1 Steel Handrails

Provide steel handrails, including inserts in concrete, steel pipe conforming to ASTM A53/A53M. Provide steel railings of 1 1/2 inch nominal size, hot-dip galvanized and shop-painted.

Provide kickplates between railing posts where indicated, and consisting of 1/8 inch steel flat bars not less than 6 inches high. Secure kickplates as indicated.

Galvanize exterior railings, including pipe, fittings, brackets, fasteners, and other ferrous metal components. Provide black steel pipe for interior railings.

Provide galvanized exterior and interior railings where indicated, including pipe, fittings, brackets, fasteners, and other ferrous metal components. Provide black steel pipe for interior railings not indicated as galvanized.

Provide galvanized railings, including pipe, fittings, brackets, fasteners, and other ferrous metal components.

### PART 3 EXECUTION

#### 3.1 PREPARATION

Adjust stair railings and handrails before securing in place in order to ensure proper matching at butting joints and correct alignment throughout their length. Space posts not more than 8 feet on center. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:

- a. Anchor posts in concrete by means of pipe sleeves set and anchored into concrete. Provide sleeves of galvanized, standard-weight, steel pipe, not less than 6 inches long, and having an inside diameter not less than 1/2 inch greater than the outside diameter of the inserted pipe post. Provide steel plate closure secured to the bottom of the sleeve, with closure width and length not less than 1 inch greater than the outside diameter of the sleeve. After posts have been inserted into sleeves, fill the annular space between the post and sleeve with nonshrink grout or a quick-setting hydraulic cement. Cover anchorage joint with a round steel flange welded to the post.
- b. Anchor posts to steel with oval steel flanges, angle type or floor type as required by conditions, welded to posts and bolted to the steel supporting members.
- c. Anchor rail ends into concrete and masonry with round steel flanges welded to rail ends and anchored into the wall construction with lead expansion shields and bolts.
- d. Anchor rail ends to steel with oval or round steel flanges welded to tail ends and bolted to the structural-steel members.

Secure handrails to walls by means of wall brackets and wall return fitting at handrail ends. Provide brackets of malleable iron castings, with not less than 3 inch projection from the finished wall surface to the center of the pipe, drilled to receive one 3/8 inch bolt. Locate brackets not more than 60 inches on center. Provide wall return fittings of cast

iron castings, flush type, with the same projection as that specified for wall brackets. Secure wall brackets and wall return fittings to building construction as follows:

- a. For concrete and solid masonry anchorage, use bolt anchor expansion shields and lag bolts.
- b. For hollow masonry and stud partition anchorage, use toggle bolts having square heads.

Install toe boards and brackets where indicated. Make splices, where required, at expansion joints. Install removable sections as indicated.

### 3.2 INSTALLATION

Submit manufacturer's installation instructions for the following products to be used in the fabrication of steel stair railing and hand rail work:

- a. Structural-steel plates, shapes, and bars
- b. Structural-steel tubing
- c. 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 cited in this section.

#### 3.2.1 Steel Handrail

Install handrail by means of masonry with expansion shields and bolts or toggle bolts. Secure rail ends by steel pipe flanges anchored by expansion shields and bolts.

#### 3.2.2 Touchup Painting

Immediately after installation, clean field welds, bolted connections, abraded areas of the shop paint, and exposed areas painted with the paint used for shop painting. Apply paint by brush or spray to provide a minimum dry-film thickness of 2 mils.

### 3.3 FIELD QUALITY CONTROL

#### 3.3.1 Field Welding

Ensure that procedures of manual shielded metal arc welding, appearance

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W912QR20R0018-0000  
W912QR-18-F-0500  
P2: 475970

and quality of welds made, and methods used in correcting welding work  
comply with AWS D1.1/D1.1M.

-- End of Section --

SECTION 06 10 00

ROUGH CARPENTRY

08/16

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN LUMBER STANDARDS COMMITTEE (ALSC)

ALSC PS 20 (2015) American Softwood Lumber Standard

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION (AREMA)

AREMA Eng Man (2017) Manual for Railway Engineering

AMERICAN WOOD COUNCIL (AWC)

AWC NDS (2015) National Design Specification (NDS) for Wood Construction

AWC WFCM (2012) Wood Frame Construction Manual for One- and Two-Family Dwellings

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA BOOK (2015) AWPA Book of Standards

AWPA M2 (2016) Standard for the Inspection of Preservative Treated Wood Products for Industrial Use

AWPA M6 (2013) Brands Used on Preservative Treated Materials

AWPA P18 (2014) Nonpressure Preservatives

AWPA P49 (2015) Standard for Fire Retardant FR-1

AWPA P5 (2015) Standard for Waterborne Preservatives

AWPA T1 (2017) Use Category System: Processing and Treatment Standard

AWPA U1 (2017) Use Category System: User Specification for Treated Wood

APA - THE ENGINEERED WOOD ASSOCIATION (APA)

APA L870 (2010) Voluntary Product Standard, PS 1-09, Structural Plywood

ASME INTERNATIONAL (ASME)

- ASME B18.2.1 (2012; Errata 2013) Square and Hex Bolts and Screws (Inch Series)
- ASME B18.2.2 (2015) Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
- ASME B18.5.2.1M (2006; R 2011) Metric Round Head Short Square Neck Bolts
- ASME B18.5.2.2M (1982; R 2010) Metric Round Head Square Neck Bolts
- ASME B18.6.1 (2016) Wood Screws (Inch Series)

ASTM INTERNATIONAL (ASTM)

- ASTM A153/A153M (2016) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- ASTM A307 (2014; E 2017) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
- ASTM D2898 (2010; R 2017) Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing
- ASTM F547 (2017) Standard Terminology of Nails for Use with Wood and Wood-Base Materials

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

- CDPH SECTION 01350 (2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

FM GLOBAL (FM)

- FM 4435 (2013) Roof Perimeter Flashing

GREEN SEAL (GS)

- GS-36 (2013) Adhesives for Commercial Use

INTERNATIONAL CODE COUNCIL (ICC)

- ICC IBC (2018) International Building Code

NATIONAL HARDWOOD LUMBER ASSOCIATION (NHLA)

- NHLA Rules (2015) Rules for the Measurement & Inspection of Hardwood & Cypress

NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)

NELMA Grading Rules (2013) Standard Grading Rules for  
Northeastern Lumber

REDWOOD INSPECTION SERVICE (RIS) OF THE CALIFORNIA REDWOOD  
ASSOCIATION (CRA)

RIS Grade Use (1998) Redwood Lumber Grades and Uses

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168 (2017) 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 (2014) Standard Grading Rules for Southern  
Pine Lumber

U.S. DEPARTMENT OF COMMERCE (DOC)

DOC/NIST PS56 (1973) Structural Glued Laminated Timber

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-1923 (Rev A; Notice 3) Shield, Expansion (Lag,  
Machine and Externally Threaded Wedge Bolt  
Anchors)

CID A-A-1924 (Rev A; Notice 3) Shield, Expansion (Self  
Drilling Tubular Expansion Shell Bolt  
Anchors)

CID A-A-1925 (Rev A; Notice 3) Shield Expansion (Nail  
Anchors)

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

WCLIB 17 (2015) Standard Grading Rules

WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

WWPA G-5 (2017) Western Lumber Grading Rules

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in

accordance with Section 01 33 00.00 06 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-06 Test Reports

Preservative-treated Lumber and Plywood

SD-07 Certificates

Preservative Treatment

1.3 DELIVERY AND STORAGE

Deliver materials to the site in an undamaged condition. Store, protect, handle, and install prefabricated structural elements in accordance with manufacturer's instructions and as specified. Store materials off the ground to provide proper ventilation, with drainage to avoid standing water, and protection against ground moisture and dampness. Store materials with a moisture barrier at both the ground level and as a cover forming a well ventilated enclosure. Store wood I-beams and glue-laminated beams and joists on edge. Adhere to requirements for stacking, lifting, bracing, cutting, notching, and special fastening requirements. Do not use materials that have visible moisture or biological growth. Remove defective and damaged materials and provide new materials. Store separated reusable wood waste convenient to cutting station and area of work.

1.4 GRADING AND MARKING

1.4.1 Lumber

Mark each piece of framing and board lumber or each bundle of small pieces of lumber with the grade mark of a recognized association or independent inspection agency. Such association or agency must be certified by the Board of Review, American Lumber Standards Committee, to grade the species used. Surfaces that are to be exposed to view must not bear grademarks, stamps, or any type of identifying mark. Hammer marking will be permitted on timbers when all surfaces will be exposed to view.

1.4.2 Plywood

Mark each sheet with the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of the plywood. The mark must identify the plywood by species group or span rating, exposure durability classification, grade, and compliance with APA L870. Surfaces that are to be exposed to view must not bear grademarks or other types of identifying marks.

1.4.3 Preservative-Treated Lumber and Plywood

The Contractor is responsible for the quality of treated wood products.

Each treated piece must be inspected in accordance with AWPA M2 and permanently marked or branded, by the producer, in accordance with AWPA M6. The Contractor must provide Contracting Officer's Representative (COR) with the inspection report of an approved independent inspection agency that offered products comply with applicable AWPA Standards. The appropriate Quality Mark on each piece will be accepted, in lieu of inspection reports, as evidence of compliance with applicable AWPA treatment standards.

#### 1.4.4 Fire-Retardant Treated Lumber

Mark each piece in accordance with AWPA M6, except pieces that are to be natural or transparent finished. In addition, exterior fire-retardant lumber must be distinguished by a permanent penetrating blue stain. Labels of a nationally recognized independent testing agency will be accepted as evidence of conformance to the fire-retardant requirements of AWPA M6.

#### 1.4.5 Hardboard, Gypsum Board, and Fiberboard

Mark each sheet or bundle to identify the standard under which the material is produced and the producer.

### 1.5 SIZES AND SURFACING

ALSC PS 20 for dressed sizes of yard and structural lumber. Lumber must be surfaced four sides. Size references, unless otherwise specified, are nominal sizes, and actual sizes must be within manufacturing tolerances allowed by the standard under which the product is produced. Other measurements are IP or SI standard.

### 1.6 MOISTURE CONTENT

Air-dry or kiln-dry lumber. Kiln-dry treated lumber after treatment. Maximum moisture content of wood products must be as follows at the time of delivery to the job site:

- a. Framing lumber and board, 19 percent maximum
- b. Materials other than lumber; moisture content must be in accordance with standard under which the product is produced

### 1.7 PRESERVATIVE TREATMENT

Treat wood products with waterborne wood preservatives conforming to AWPA P5. Pressure treatment of wood products must conform to the requirements of AWPA BOOK Use Category System Standards U1 and T1. Pressure-treated wood products must not contain arsenic, chromium, or other agents classified as carcinogenic, probably carcinogenic, or possibly carcinogenic to humans (compounds in Groups 1, 2A, or 2B) by the International Agency for Research on Cancer (IARC), Lyon, France. Pressure-treated wood products must not exceed the limits of the U.S. EPA's Toxic Characteristic Leaching Procedure (TCLP), and must not be classified as hazardous waste. Submit certification from treating plant stating chemicals and process used and net amount of preservatives retained are in conformance with specified standards. In accordance with AWPA U1 provide non-copper preservative treatment such as EL2, PTI or SBX, DOT for products in direct contact with sheet metal.

- a. 0.25 pcf intended for above ground use.

#### 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 must be pressure treated with fire retardants conforming to AWPA P49. Fire retardant treatment of wood products must conform to the requirements of AWPA U1, Commodity Specification H and AWPA T1, Section H. Treatment and performance inspection must be by an independent and qualified testing agency that establishes performance ratings. Each piece or bundle of treated material must bear identification of the testing agency to indicate performance in accordance with such rating. Treated materials to be exposed to rain wetting must be subjected to an accelerated weathering technique in accordance with ASTM D2898 prior to being tested. Such items which will not be inside a building, and such items which will be exposed to heat or high humidity, must receive exterior fire-retardant treatment. Fire-retardant-treated wood products must be free of halogens, sulfates, ammonium phosphate, and formaldehyde.

#### 1.9 QUALITY ASSURANCE

##### 1.9.1 Drawing Requirements

For fabricated structural members, trusses, glu-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 Data Required

Submit calculations and drawings for all proposed modifications of structural members. Do not proceed with modifications until the submittal has been approved.

##### 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, engineered wood products, and laminated wood products at interior spaces, provide temporary ventilation.

## 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.

#### 2.1.2 Salvaged Lumber

Provide salvaged lumber where specified. Unless otherwise noted, salvaged lumber must be delivered clean, denailed, and free of paint, finish materials, and other contamination. Lumber must meet the other criteria within this section. Provide documentation certifying products are from salvaged lumber sources.

#### 2.1.3 Recovered Lumber

Use recovered lumber where practical. Unless otherwise noted, recovered lumber must be delivered clean and free of contamination. Provide grading certificates for any recovered wood materials used in structural applications. Lumber must meet the other criteria within this section. Provide documentation certifying products are from recovered lumber sources.

### 2.2 LUMBER

#### 2.2.1 Framing Lumber

Framing lumber such as studs, plates, caps, collar beams, cant strips, bucks, sleepers, nailing strips, and nailers and board lumber such as subflooring and wall and roof sheathing must be one of the species listed in the table below. Minimum grade of species must be as listed. Finger-jointed lumber may be used in the same applications as solid lumber of an equivalent species and grade, provided the finger-jointed lumber meets all the requirements of the certification and the quality control programs of the rules writing agency having jurisdiction and all applicable requirements of DOC/NIST PS56.

<u>Table of Grades for Framing and Board Lumber</u>			
<u>Grading Rules</u>	<u>Species</u>	<u>Framing</u>	<u>Board Lumber</u>
WWPA G-5 standard grading rules	Aspen, Douglas Fir-Larch, Douglas Fir South, Engelmann Spruce-Lodgepole Pine, Engelmann Spruce, Hem-Fir, Idaho White Pine, Lodgepole Pine, Mountain Hemlock, Mountain Hemlock-Hem-Fir, Ponderosa Pine-Sugar Pine, Ponderosa Pine-Lodgepole Pine, Subalpine Fir, White Woods, Western Woods, Western Cedars, Western Hemlock	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	All Species: No. 3 Common
WCLIB 17 standard grading rules	Douglas Fir-Larch, Hem-Fir, Mountain Hemlock, Sitka Spruce, Western Cedars, Western Hemlock	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	All Species: Standard

<u>Table of Grades for Framing and Board Lumber</u>			
<u>Grading Rules</u>	<u>Species</u>	<u>Framing</u>	<u>Board Lumber</u>
SPIB 1003 standard grading rules	Southern Pine	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	No. 2 Boards
SCMA Spec standard specifications	Cypress	No. 2 Common	No. 2 Common
NELMA Grading Rules standard grading rules	Balsam Fir, Eastern Hemlock-Tamarack, Eastern Spruce, Eastern White Pine, Northern Pine, Northern Pine-Cedar	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	All Species: No. 3 Common except Standard for Eastern White and Northern Pine
RIS Grade Use standard specifications	Redwood	All Species: Standard Light Framing or No. 3 Structural Light Framing (Stud Grade for 2x4 nominal size, 10 feet and shorter)	Construction Heart

<u>Table of Grades for Framing and Board Lumber</u>			
<u>Grading Rules</u>	<u>Species</u>	<u>Framing</u>	<u>Board Lumber</u>
NHLA Rules rules for the measurement and inspection of hardwood and cypress lumber	Cypress	No. 2 Dimension	No. 2 Common

2.3 OTHER MATERIALS

2.3.1 Miscellaneous Wood Members

2.3.1.1 Wood Bumpers

AREMA Eng Man, Industrial grade cross ties

2.3.1.2 Sill Plates

Sill plates must be standard or number 2 grade.

2.3.1.3 Blocking

Blocking must be standard or number 2 grade.

2.3.1.4 Rough Bucks and Frames

Rough bucks and frames must be straight standard or number 2 grade.

2.3.2 Adhesives

Comply with applicable regulations regarding toxic and hazardous materials and as specified. Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide aerosol adhesives used on the interior of the building meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of GS-36. Provide certification or validation of indoor air quality for non-aerosol adhesives applied on the interior of the building (inside of the weatherproofing system). Provide certification or validation of indoor air quality for aerosol adhesives used on the interior of the building (inside of the weatherproofing system).

2.4 ROUGH HARDWARE

Unless otherwise indicated or specified, rough hardware must be of the type and size necessary for the project requirements. Sizes, types, and spacing of fastenings of manufactured building materials must be as recommended by the product manufacturer unless otherwise indicated or specified. Rough hardware exposed to the weather or embedded in or in

contact with preservative treated wood, exterior masonry, or concrete walls or slabs must be hot-dip zinc-coated in accordance with ASTM A153/A153M. Nails and fastenings for fire-retardant treated lumber and woodwork exposed to the weather must be copper alloy or hot-dipped galvanized fasteners as recommended by the treated wood manufacturer.

#### 2.4.1 Bolts, Nuts, Studs, and Rivets

ASME B18.2.1, ASME B18.5.2.1M, ASME B18.5.2.2M and ASME B18.2.2.

#### 2.4.2 Anchor Bolts

ASTM A307, size as indicated, complete with nuts and washers.

#### 2.4.3 Expansion Shields

CID A-A-1923, CID A-A-1924, and CID A-A-1925. Except as shown otherwise, maximum size of devices must be 3/8 inch.

#### 2.4.4 Lag Screws and Lag Bolts

ASME B18.2.1.

#### 2.4.5 Wood Screws

ASME B18.6.1.

#### 2.4.6 Nails

ASTM F547, size and type best suited for purpose. For sheathing and subflooring, length of nails must be sufficient to extend 1 inch into supports. In general, 8-penny or larger nails must be used for nailing through 1 inch thick lumber and for toe nailing 2 inch thick lumber; 16-penny or larger nails must be used for nailing through 2 inch thick lumber. Nails used with treated lumber and sheathing must be hot-dipped galvanized in accordance with ASTM A153/A153M. Nailing must be in accordance with the recommended nailing schedule contained in AWC WFCM. Where detailed nailing requirements are not specified, nail size and spacing must be sufficient to develop an adequate strength for the connection. The connection's strength must be verified against the nail capacity tables in AWC NDS. Reasonable judgment backed by experience must ensure that the designed connection will not cause the wood to split. If a load situation exceeds a reasonable limit for nails, a specialized connector must be used.

#### 2.4.7 Clip Angles

Steel, 3/16 inch thick, size best suited for intended use; or zinc-coated steel or iron commercial clips designed for connecting wood members.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

Conform to AWC WFCM and install in accordance with the National Association of Home Builders (NAHB) Advanced Framing Techniques: Optimum

Value Engineering, unless otherwise indicated or specified. Select lumber sizes to minimize waste. Fit framing lumber and other rough carpentry, set accurately to the required lines and levels, and secure in place in a rigid manner. Frame members for the passage of pipes, conduits, and ducts. Provide adequate support as appropriate to the application, climate, and modulus of elasticity of the product. Do not cut or bore structural members for the passage of ducts or pipes without approval. Reinforce all members damaged by such cutting or boring by means of specially formed and approved sheet metal or bar steel shapes, or remove and provide new, as approved. Provide as necessary for the proper completion of the work all framing members not indicated or specified. Spiking and nailing not indicated or specified otherwise must be in accordance with the Nailing Schedule contained in ICC IBC; perform bolting in an approved manner. Spikes, nails, and bolts must be drawn up tight.

### 3.1.1 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.

### 3.1.2 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 must 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.

## 3.2 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 must 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.

#### 3.2.1.2 Crickets, Cants, and Curbs

Provide wood saddles or crickets, cant strips, curbs for scuttles and ventilators, and wood nailers bolted to tops of concrete or masonry curbs and at expansion joints, as indicated, specified.

### 3.2.2 Wood Blocking

Provide proper sizes and shapes at proper locations for the installation and attachment of wood and other finish materials, fixtures, equipment, and items indicated or specified.

### 3.2.3 Wood Furring

Provide where shown and as necessary for facing materials specified. Except as shown otherwise, furring strips must be nominal one by 3, continuous, and spaced 16 inches o.c. Erect furring vertically or horizontally as necessary. Nail furring strips to masonry. Do not use wood plugs. Provide furring strips around openings, behind bases, and at angles and corners. Furring must be plumb, rigid, and level and must be shimmed as necessary to provide a true, even plane with surfaces suitable to receive the finish required. Form furring for offsets and breaks in walls or ceilings on 1 by 4 wood strips spaced 16 inches o.c.

### 3.2.4 Temporary Closures

Provide with hinged doors and padlocks and install during construction at exterior doorways and other ground level openings that are not otherwise closed. Cover windows and other unprotected openings with polyethylene or other approved material, stretched on wood frames. Provide dustproof barrier partitions to isolate areas as directed.

-- End of Section --

SECTION 06 41 16.00 10

PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS  
08/10

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A161.2 (1998) Decorative Laminate Countertops,  
Performance Standards for Fabricated High  
Pressure

ASTM INTERNATIONAL (ASTM)

ASTM F547 (2017) Standard Terminology of Nails for  
Use with Wood and Wood-Base Materials

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.9 (2015) Cabinet Hardware

COMPOSITE PANEL ASSOCIATION (CPA)

CPA A208.2 (2016) Medium Density Fiberboard (MDF) for  
Interior Applications

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA LD 3 (2005) Standard for High-Pressure  
Decorative Laminates

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS SCS Global Services (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

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

ANSI/WDMA I.S.1A (2013) Interior Architectural Wood Flush  
Doors

WOODWORK INSTITUTE (WI)

NAAWS 3.1 (2017; 2018 Errata Edition) North American  
Architectural Woodwork Standards

1.2 SYSTEM DESCRIPTION

Work in this section includes laminate clad custom casework cabinets and countertops as shown on the drawings and as described in this specification. This Section includes high-pressure laminate surfacing and cabinet hardware. Comply with EPA requirements in accordance with Section 01 33 29.00 06 SUSTAINABILITY REPORTING. All exposed and semi-exposed surfaces, whose finish is not otherwise noted on the drawings or finish schedule, shall be sanded smooth and shall receive a clear finish of polyurethane. Wood finish may be shop finished or field applied in accordance with Section 09 90 00 PAINTS AND COATINGS.

1.3 SUSTAINABILITY REPORTING

Materials in this technical specification may contribute towards contract compliance with sustainability requirements. See Section 01 33 29.00 06 SUSTAINABILITY REPORTING for project LEED BD+C.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings  
Installation

SD-03 Product Data

Wood Materials  
Wood Finishes  
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 custom grade quality standards as outlined in NAAWS 3.1, Section for laminate clad cabinets. These standards shall apply in lieu of omissions or specific requirements in this specification. Contractors and their personnel engaged in the work shall be able to demonstrate successful experience with work of comparable extent, complexity and quality to that shown and specified. Submit a quality control statement which illustrates compliance with and understanding of NAAWS 3.1 requirements, in general, and the specific NAAWS 3.1 requirements provided in this specification. The quality control statement shall also certify a minimum of ten years Contractor's experience in laminate clad casework fabrication and construction. The quality control statement shall provide a list of a minimum of five successfully completed projects of a similar scope, size, and complexity.

### 1.5.2 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.

## 1.6 DELIVERY, STORAGE, AND HANDLING

Casework may be delivered knockdown or fully assembled. Deliver all units to the site in undamaged condition, stored off the ground in fully enclosed areas, and protected from damage. The storage area shall be well ventilated and not subject to extreme changes in temperature or humidity.

## 1.7 SEQUENCING AND SCHEDULING

Coordinate work with other trades. Units shall not be installed in any room or space until painting, and ceiling installation are complete within the room where the units are located. Floor cabinets shall be installed before finished flooring materials are installed.

## PART 2 PRODUCTS

### 2.1 WOOD MATERIALS

#### 2.1.1 Lumber

- a. All framing lumber shall be kiln-dried Grade III to dimensions as shown on the drawings. Frame front, where indicated on the drawings, shall be nominal 3/4 inch hardwood.
- b. Standing or running trim casework components, which are specified to receive a transparent finish, shall be hardwood species, plain sawn. AWI grade shall be custom. Location, shape, and dimensions shall be as indicated on the drawings.

## 2.1.2 Panel Products

### 2.1.2.1 Plywood

All plywood panels used for framing purposes shall be veneer core hardwood plywood, NAAWS 3.1 Grade AA. Nominal thickness of plywood panels shall be as indicated in this specification and on the drawings.

### 2.1.2.2 Medium Density Fiberboard

Medium density fiberboard (MDF) shall be an acceptable panel substrate where noted on the drawings. Medium density fiberboard shall meet the minimum standards listed in CPA A208.2.

## 2.2 SOLID POLYMER MATERIAL

Solid surfacing casework components shall conform to the requirements of Section 06 61 16 SOLID SURFACING FABRICATIONS.

## 2.3 HIGH PRESSURE DECORATIVE LAMINATE (HPDL)

All plastic laminates shall meet the requirements of ANSI/NEMA LD 3 and ANSI A161.2 for high-pressure decorative laminates. Design, colors, surface finish and texture, and locations shall be as indicated on the drawings. Submit two samples of each plastic laminate pattern and color. Samples shall be a minimum of 5 by 7 inches in size. Plastic laminate types and nominal minimum thicknesses for casework components shall be as indicated in the following paragraphs.

### 2.3.1 Horizontal General Purpose Standard (HGS) Grade

Horizontal general purpose standard grade plastic laminate shall be 0.048 inches (plus or minus 0.005 inches) in thickness. This laminate grade is intended for horizontal surfaces where postforming is not required.

### 2.3.2 Vertical General Purpose Standard (VGS) Grade

Vertical general purpose standard grade plastic laminate shall be 0.028 inches (plus or minus 0.004 inches) in thickness. This laminate grade is intended for exposed exterior vertical surfaces of casework components where postforming is not required.

### 2.3.3 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 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 15/16 inches. Color and pattern shall match exposed door and drawer front laminate pattern and color.

## 2.5 CABINET HARDWARE

Submit one sample of each cabinet hardware item specified to include hinges, pulls, drawer glides, and any necessary items required for the function of the cabinet or drawer. All hardware shall conform to ANSI/BHMA A156.9, unless otherwise noted, and shall consist of the following components:

### 2.5.1 Door Hinges

Frameless concealed type, BHMA No. 02011.

### 2.5.2 Cabinet Pulls

Back type, BHMA No. B02011.

### 2.5.3 Drawer Slide

Side mounted self cleaning type, BHMA No. B05092 with full extension and a minimum 75 pound load capacity. Slides shall include an integral stop to avoid accidental drawer removal.

### 2.5.4 Adjustable Shelf Support System

Support brackets for the standards shall be BHMA No. B04112. Multiple holes with metal or plastic pin supports.

## 2.6 FASTENERS

Nails, screws, and other suitable fasteners shall be the size and type best suited for the purpose and shall conform to ASTM F547 where applicable.

## 2.7 ADHESIVES, CAULKS, AND SEALANTS

### 2.7.1 Adhesives

Adhesives shall be of a formula and type recommended by AWI. Adhesives shall be selected for their ability to provide a durable, permanent bond and shall take into consideration such factors as materials to be bonded, expansion and contraction, bond strength, fire rating, and moisture resistance. Adhesives shall meet local regulations regarding VOC emissions and off-gassing.

#### 2.7.1.1 Wood Joinery

Adhesives used to bond wood members shall be a Type II for interior use polyvinyl acetate resin emulsion. Adhesives shall withstand a bond test as described in ANSI/WDMA I.S.1A.

#### 2.7.1.2 Laminate Adhesive

Adhesive used to join high-pressure decorative laminate to wood shall be

adhesive consistent with AWI and laminate manufacturer's recommendations. PVC edgbanding shall be adhered using a polymer-based hot melt glue.

#### 2.7.2 Caulk

Caulk used to fill voids and joints between laminated components and between laminated components and adjacent surfaces shall be clear, 100 percent silicone.

#### 2.7.3 Sealant

Sealant shall be of a type and composition recommended by the substrate manufacturer to provide a moisture barrier at sink cutouts and all other locations where unfinished substrate edges may be subjected to moisture.

### 2.8 WOOD FINISHES

Paint, stain, varnish and their applications required for laminate clad casework components shall be as indicated in Section 09 90 00 PAINTS AND COATINGS. Color and location shall be as indicated on the drawings.

### 2.9 ACCESSORIES

#### 2.9.1 Grommets

Grommets shall be plastic material for cutouts with a diameter and locations 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 custom grade unless otherwise indicated in this specification. Cabinet style, in accordance with NAAWS 3.1, Section 400-G descriptions, shall be as indicated on the drawings.

#### 2.10.1 Base and Wall Cabinet Case Body

##### 2.10.1.1 Cabinet Components

Frame members shall be glued-together, kiln-dried hardwood lumber. Top corners, bottom corners, and cabinet bottoms shall be braced with either hardwood blocks or water-resistant glue and nailed in place metal or plastic corner braces. Cabinet components shall be constructed from the following materials and thicknesses:

##### 2.10.1.1.1 Body Members (Ends, Divisions, Bottoms, and Tops)

3/4 inch medium density fiberboard (MDF) panel product

##### 2.10.1.1.2 Face Frames and Rails

3/4 inch hardwood lumber

##### 2.10.1.1.3 Shelving

3/4 inch medium density fiberboard (MDF) panel product

2.10.1.1.4 Cabinet Backs

1/4 inch medium density fiberboard (MDF) panel product

2.10.1.1.5 Drawer Sides, Backs, and Subfronts

1/2 inch hardwood lumber

2.10.1.1.6 Drawer Bottoms

1/4 inch medium density fiberboard (MDF) panel product

2.10.1.1.7 Door and Drawer Fronts

3/4-inch medium density fiberboard (MDF) panel product

2.10.1.2 Joinery Method for Case Body Members

2.10.1.2.1 Tops, Exposed Ends, and Bottoms

- a. Steel "European" assembly screws ( 1-1/2 inch from end, 5 inch on center, fasteners will not be visible on exposed parts).
- b. Doweled, glued under pressure (approx. 4 dowels per 12 inches of joint).
- c. Stop dado, glued under pressure, and either nailed, stapled or screwed (fasteners will not be visible on exposed parts).
- d. Spline or biscuit, glued under pressure.

2.10.1.2.2 Exposed End Corner and Face Frame Attachment

2.10.1.2.2.1 Mitered Joint

Lock miter or spline or biscuit, glued under pressure (no visible fasteners)

2.10.1.2.2.2 Non-Mitered Joint (90 degree)

Butt joint glued under pressure (no visible fasteners)

2.10.1.2.2.3 Butt Joint

Glued and nailed

2.10.1.2.3 Cabinet Backs (Wall Hung Cabinets)

Wall hung cabinet backs must not be relied upon to support the full weight of the cabinet and its anticipated load for hanging/mounting purposes. Method of back joinery and hanging/mounting mechanisms should transfer the load to case body members. Fabrication method shall be:

2.10.1.2.3.1 Full Bound

Full bound, captured in grooves on cabinet sides, top, and bottom. Cabinet backs for floor standing cabinets shall be side bound, captured in grooves; glued and fastened to top and bottom.

#### 2.10.1.2.3.2 Full Overlay

Full overlay, plant-on backs with minimum back thickness of 1/2 inch and minimum No. 12 plated (no case hardened) screws spaced a minimum 3 inches on center. Edge of back shall not be exposed on finished sides. Anchor strips are not required when so attached.

#### 2.10.1.2.3.3 Side Bound

Side bound, captured in groove or rabbets; glued and fastened.

#### 2.10.1.2.4 Cabinet Backs (Floor Standing Cabinets)

##### 2.10.1.2.4.1 Side Bound

Side bound, captured in grooves; glued and fastened to top and bottom.

##### 2.10.1.2.4.2 Full Overlay

Full overlay, plant-on backs with minimum back thickness of 1/2 inch and minimum No. 12 plated (no case hardened) screws spaced a minimum 3 inches on center. Edge of back shall not be exposed on finished sides. Anchor strips are not required when so attached.

##### 2.10.1.2.4.3 Side Bound with Rabbets

Side bound, placed in rabbets; glued and fastened in rabbets.

##### 2.10.1.2.5 Wall Anchor Strips

Wall Anchor Strips shall be required for all cabinets with backs less than 1/2 inch thick. Strips shall consist of minimum 1/2 inch thick lumber, minimum 2-1/2 inches width; securely attached to wall side of cabinet back - top and bottom for wall hung cabinets, top only for floor standing cabinets.

#### 2.10.2 Cabinet Floor Base

Floor cabinets shall be mounted on a base constructed of nominal 2 inch thick lumber. 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 extend below the top of the base as indicated on the drawings.

#### 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, color and pattern as indicated on the drawings.

#### 2.10.4 Drawer Assembly

##### 2.10.4.1 Drawer Components

Drawer components shall consist of a removable drawer front, sides, backs, and bottom. Drawer components shall be constructed of the following materials and thicknesses:

2.10.4.1.1 Drawer Sides and Backs For Transparent Finish

1/2 inch thick solid hardwood lumber

2.10.4.1.2 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. Shelf edges shall be finished in a HPDL plastic laminate.

2.10.5.2 Shelf Support System

The shelf support system shall be:

2.10.5.2.1 Pin Hole Method

Drill holes on the interior surface of the cabinet side walls. Evenly space holes in two vertical columns. Space the holes in each column at 1 inch increments starting 6 inches from the cabinet interior bottom and extending to within 6 inches of the top interior surface of the cabinet. Drill holes to provide a level, stable surface when the shelf is resting on the shelf pins. Coordinate hole diameter with pin insert size to provide a firm, tight fit.

2.10.6 Laminate Clad Countertops

Construct laminate countertop substrate of 3/4 inch medium density fiberboard (MDF). The substrate shall be moisture-resistant where countertops receive sinks, lavatories, or are subjected to liquids. All substrates shall have sink cutout edges sealed with appropriate sealant against moisture. No joints shall occur at any cutouts. A balanced backer sheet is required.

2.10.6.1 Edge Style

Front and exposed side countertop edges shall be in shapes and to dimensions as shown on the drawings. The countertop edge material shall be:

#### 2.10.6.1.1 Post Formed Plastic Laminate

Laminate edge shall be integral with countertop surface. Shape and profile shall be as indicated and to dimensions as indicated.

#### 2.10.6.1.2 Hardwood

Species, finish, profile, shape, and dimensions shall be as indicated on the drawings. Hardwood edge shall overlap the exposed countertop laminate edge and shall be installed flush with the countertop laminate surface.

#### 2.10.6.1.3 Vinyl

Vinyl tee-mould edge shall be in shape, thickness, and color as indicated on the drawings. Tee mould edge shall overlap the exposed countertop laminate edge and shall be installed flush with the countertop laminate surface.

#### 2.10.6.1.4 Plastic Laminate Self Edge

Flat, 90 degree "self " edge. Edge must be applied before top. Laminate edge shall overlap countertop laminate and shall be eased to eliminate sharp corners.

#### 2.10.6.2 Laminate Clad Splashes

Countertop splash substrate shall be 3/4 inch MDF fiberboard. Laminate clad backsplash shall be loose, to be installed at the time of countertop installation. Side splashes shall be straight profile and provided loose, to be installed at the time of countertop installation. Back and side splash laminate pattern and color shall match the adjacent countertop laminate.

#### 2.10.7 Laminate Application

Laminate application to substrates shall follow the recommended procedures and instructions of the laminate manufacturer and ANSI/NEMA LD 3, using tools and devices specifically designed for laminate fabrication and application. Provide a balanced backer sheet (Grade BK) wherever only one surface of the component substrate requires a plastic laminate finish. Apply required grade of laminate in full uninterrupted sheets consistent with manufactured sizes using one piece for full length only, using adhesives specified herein or as recommended by the manufacturer. Fit corners and joints hairline. All laminate edges shall be machined flush, filed, sanded, or buffed to remove machine marks and eased (sharp corners removed). Clean up at easing shall be such that no overlap of the member eased is visible. Fabrication shall conform to ANSI A161.2. Laminate types and grades for component surfaces shall be as follows unless otherwise indicated on the drawings:

##### 2.10.7.1 Base/Wall Cabinet Case Body

- a. Exterior (exposed) surfaces to include exposed and semi-exposed face frame surfaces: HPDL Grade VGS.
- b. Interior (semi-exposed) surfaces to include interior back wall, bottom, and side walls: HPDL Grade CLS.

2.10.7.2 Adjustable Shelving

2.10.7.2.1 Top and Bottom Surfaces

HPDL Grade HGS

2.10.7.2.2 All Edges

PVC edgebanding

2.10.7.3 Fixed Shelving

2.10.7.3.1 Top and Bottom Surfaces

HPDL Grade HGS

2.10.7.3.2 Exposed Edges

PVC edgebanding

2.10.7.4 Door, Drawer Fronts, Access Panels

2.10.7.4.1 Exterior (Exposed) and Interior (Semi-Exposed) Faces

HPDL Grade VGS

2.10.7.4.2 Edges

PVC edgebanding

2.10.7.5 Drawer Assembly

All interior and exterior surfaces: HPDL Grade CLS.

2.10.7.6 Countertops and Splashes

All exposed and semi-exposed surfaces: HPDL Grade HGS

2.10.7.7 Tolerances

Flushness, flatness, and joint tolerances of laminated surfaces shall meet the NAAWS 3.1 custom grade requirements.

2.10.8 Finishing

2.10.8.1 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.

2.10.8.2 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.

### 2.10.8.3 Coatings

Types, method of application and location of casework finishes shall be in accordance with the finish schedule, drawings and Section 09 90 00 PAINTS AND COATINGS. All cabinet reveals shall be painted. Submit descriptive data which provides narrative written verification of all types of construction materials and finishes, methods of construction, etc. not clearly illustrated on the submitted shop drawings. Data shall provide written verification of conformance with NAAWS 3.1 for the quality indicated to include materials, tolerances, and types of construction. Both the manufacturer of materials and the fabricator shall submit available literature which describes re-cycled product content, operations and processes in place that support efficient use of natural resources, energy efficiency, emissions of ozone depleting chemicals, management of water and operational waste, indoor environmental quality, and other production techniques supporting sustainable design and products.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Installation shall comply with applicable requirements for NAAWS 3.1 custom 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 Countertops

Countertops shall be installed in locations as indicated on the drawings. Countertops shall be fastened to supporting casework structure with mechanical fasteners, hidden from view. All joints formed by the countertop or countertop splash and adjacent wall surfaces shall be filled with a clear silicone caulk. Loose back and side splashes shall be adhered to both the countertop surface perimeter and the adjacent wall surface with adhesives appropriate for the type of materials to be adhered. Joints between the countertop surface and splash shall be filled with clear silicone caulk in a smooth consistent concave bead. Bead size shall be the minimum necessary to fill the joint and any surrounding voids or cracks.

### 3.1.3 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 "Euro screws". The use of wood screws without insertion dowels is prohibited.

### 3.1.4 Doors, Drawers and Removable Panels

The fitting of doors, drawers and removable panels shall be accomplished within target fitting tolerances for gaps and flushness in accordance with NAAWS 3.1 custom grade requirements.

### 3.1.5 Plumbing Fixtures

Install sinks, sink hardware, and other plumbing fixtures in locations as indicated on the drawings and in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.

### 3.1.6 Glass

Install glass and glazing in the casework using methods and materials specified in Section 08 81 00.00 48 GLAZING in locations as indicated on the drawings.

-- End of Section --

SECTION 06 61 16

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	(2014) Standard Test Method for Tensile Properties of Plastics
ASTM D696	(2016) Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C With a Vitreous Silica Dilatometer
ASTM E84	(2018a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM G21	(2015) Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

CSA GROUP (CSA)

CSA B45.5-11/IAPMO Z124	(2011; Update 1 2012) Plastic Plumbing Fixtures - First Edition
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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)
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NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI/NEMA LD 3	(2005) Standard for High-Pressure
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Decorative Laminates

NSF INTERNATIONAL (NSF)

NSF/ANSI 51 (2012) Food Equipment Materials

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS SCS Global Services (SCS) Indoor Advantage

TILE COUNCIL OF NORTH AMERICA (TCNA)

TCNA Hdbk (2017) Handbook for Ceramic, Glass, and  
Stone Tile Installation

UNDERWRITERS LABORATORIES (UL)

UL 2818 (2013) GREENGUARD Certification Program  
For Chemical Emissions For Building  
Materials, Finishes And Furnishings

UL ENVIRONMENT (ULE)

ULE Greenguard UL Greenguard Certification Program

1.2 SYSTEM DESCRIPTION

- a. Work under this section includes countertops, vanities 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 REPORTING

Materials in this technical specification may contribute towards contract compliance with sustainability requirements. See Section 01 33 29.00 06 SUSTAINABILITY REPORTING for project LEED BD+C local/ regional materials recycled content and LEED documentation requirements.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When

used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G

Installation; G

SD-03 Product Data

Solid Polymer Material

Qualifications

Fabrications

Indoor air quality for solid surface fabricated products; S

SD-04 Samples

Material; G

Counter and Vanity Tops; G

Window Stools; G

SD-06 Test Reports

Solid Polymer Material

SD-07 Certificates

Fabrications

Qualifications

Indoor Air Quality for solid surface fabrication products; S

SD-10 Operation and Maintenance Data

Clean-up

1.5 CERTIFICATIONS

1.5.1 Indoor Air Quality

Submit required indoor air quality certifications and validations in one submittal package.

1.5.1.1 Indoor Air Quality for Solid Surface Fabricated Products

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification by other third-party program that products meet the requirements of this Section. Provide current product certification

documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

## 1.6 QUALITY ASSURANCE

### 1.6.1 Qualifications

To ensure warranty coverage, solid polymer fabricators must 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 must have a minimum of 5 years of experience working with solid polymer materials. Submit solid polymer manufacturer's certification attesting to fabricator qualification approval.

### 1.6.2 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 vanity top, countertop, and window stools where multiple units are required. The mock-up must include all solid polymer components required to provide a completed unit, and 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.

### 1.6.3 Sustainable Design Certification

Product shall be third party certified in accordance with ULE Greenguard, SCS Scientific Certification Systems Indoor Advantage or equal. VOC content and emissions shall be determined by ASTM D5116. Certification shall be performed annually and shall be current.

## 1.7 DELIVERY, STORAGE, AND HANDLING

Do not deliver materials to project site until areas are ready for installation. Deliver components and materials to the site undamaged, in containers clearly marked and labeled with manufacturer's name. Store materials indoors with adequate precautions taken to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation, for duration of project.

## 1.8 WARRANTY

Provide manufacturer's warranty of ten years against defects in materials, excluding damages caused by physical or chemical abuse or excessive heat. Provide warranty 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 CSA B45.5-11/IAPMO Z124 requirements. Provide materials with the minimum

physical and performance properties specified. Superficial damage to a depth of 0.01 inch must be repairable by sanding or polishing. Provide amterial thickness as indicated on the drawings. Provide material not less than 1/4 inch in thickness. Submit a minimum 4 by 4 inch sample of each color and pattern for approval. Provide samples that indicate the full range of color and pattern variation. Retain approved samples as the standard for this work throughout the construction duration. 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.

Provide certification or validation of indoor air quality for solid surface fabrication products.

2.1.1 Acrylic-modified Polymer Solid Surfacing Material

Provide cast, solid polymer material composed of a formulation containing acrylic and polyester polymers, mineral fillers, and pigments. Provide acrylic polymer content not less than 5 percent and not more than 10 percent to meet the following minimum performance requirements:

PROPERTY	REQUIREMENT (min. or max.)	TEST PROCEDURE
Tensile Strength	4100 psi (max.)	ASTM D638
Hardness	50-Barcol Impressor (min.)	ASTM D2583
Thermal Expansion	.000023 in/in/F (max.)	ASTM D696
Boiling Water Surface Resistance	No Change	ANSI/NEMA LD 3-3.05
High Temperature Resistance	No Change	ANSI/NEMA LD 3-3.06
Impact Resistance (Ball drop)		ANSI/NEMA LD 3-303
1/4 inch sheet	36 inches, 1/2 lb ball, no failure	
1/2 inch sheet	140 inches, 1/2 lb ball, no failure	
3/4 inch sheet	200 inches, 1/2 lb ball, no failure	
Mold & Mildew Growth	No growth	ASTM G21
Bacteria Growth	No growth	ASTM G21
Liquid Absorption (Weight in 24 hrs.)	0.6 percent max.	ASTM D570

PROPERTY	REQUIREMENT (min. or max.)	TEST PROCEDURE
Flammability		ASTM E84
Flame Spread	25 max.	
Smoke Developed	100 max.	
Sanitation	"Food Contact" approval	NSF/ANSI 51

2.1.2 Material Patterns and Colors

Provide patterns and colors for all solid polymer components and fabrications indicated on the project drawings. Pattern and color must be consistent in appearance, throughout the entire depth (thickness) of the solid polymer material.

2.1.3 Surface Finish

Provide exposed finished surfaces and edges with a uniform appearance. Exposed surface finish must be matte/satin as indicated on the drawings.

2.2 ACCESSORY PRODUCTS

Provide accessory products, as specified below, manufactured by the solid polymer manufacturer or products approved by the solid polymer manufacturer for use with the solid polymer materials being specified.

2.2.1 Seam Adhesive

Provide 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 must be approved by the solid polymer manufacturer and color-matched to the surfaces being bonded where solid-colored, solid polymer materials are being bonded together. Provide clear or color matched seam adhesive where particulate patterned, solid polymer materials are being bonded together.

2.2.2 Panel Adhesive

Provide neoprene based panel adhesive meeting TCNA Hdbk, Underwriter's Laboratories (UL) listed. Use this adhesive to bond solid polymer components to adjacent and underlying substrates.

2.2.3 Silicone Sealant

Provide a mildew-resistant, FDA and OSHA Nationally Recognized Testing Laboratory (NRTL) listed silicone sealant or caulk in a clear formulation. The silicone sealant must 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

Provide factory or shop fabricated components to sizes and shapes indicated, to the greatest extent practical, in accordance with approved Shop Drawings and manufacturer's requirements. Provide factory cutouts for sinks, lavatories, and plumbing fixtures where indicated on the drawings. Contours and radii must be routed to template, with edges smooth. Defective and inaccurate work will be rejected. Submit product data indicating product description, fabrication information, and compliance with specified performance requirements for solid polymer, joint adhesive, sealants, and heat reflective tape.

#### 2.3.1 Joints and Seams

Form joints and seams between solid polymer components using manufacturer's approved seam adhesive. Provide inconspicuous joints 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. Provide edge shapes and treatments, including any inserts, as detailed on the drawings. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.

#### 2.3.3 Counter and Vanity Top Splashes

Fabricate backsplashes and end splashes from 1/2 inch thick solid surfacing material to be in conformance with dimensions and shapes as indicated on the drawings. Provide backsplashes and end splashes at locations indicated on the drawings. Provide shop fabricated permanently attached backsplashes.

##### 2.3.3.1 Permanently Attached Backsplash

Fasten permanently attached backsplashes with seam adhesive and to form a radiused coved transition from countertop to backsplash.

##### 2.3.3.2 End Splashes

Provide end splashes as 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, including dimensions, edge shape, and other details as indicated on the drawings.

#### 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 including details, dimensions, locations, and quantities as indicated on the Drawings. Provide complete counter tops with 4 inch high permanently attached with coved transition backsplash and loose 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 must include the edge profile and backsplash as detailed on the project drawings. Provide solid polymer material of a pattern and color as indicated on the drawings. Provide sample that includes at least one seam and retain approved sample as standard for this work.

#### 2.3.5.1 Counter Top With Sink

- a. Stainless Steel or Vitreous China Sink. Provide countertops with sinks that include cutouts to template as furnished by the sink manufacturer. Provide manufacturer's standard sink mounting hardware for stainless steel rimless installation. Seal seam between sink and counter top shall be sealed with silicone sealant. Install sink, faucet, and plumbing requirements in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.
- b. Provide solid polymer sinks that are a manufacturer's standard, pre-molded product specifically designed for attachment to solid polymer countertops.

#### 2.3.5.2 Vanity Tops With Bowls

Provide countertops with vitreous china bowls including cutouts to template as furnished by the sink manufacturer. Provide manufacturer's standard sink mounting hardware for vitreous china rimless installation. Seal seam between sink and countertop with silicone sealant. Install sink, faucet, and plumbing requirements in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

##### 3.1.1 Components

Do not install items that show visual evidence of biological growth. 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. Install all solid polymer sinks and bowls using a color-matched seam adhesive. Install all plumbing connections to sinks and lavatories 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. Adhere loose splashes 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.

### 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 must be smooth and uniform in appearance and use the minimum size necessary to bridge any gaps between the solid surfacing material and the adjacent surface. Install continuous bead that runs 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

Clean all components after installation and cover 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 must approve estimate before repairs are made. Submit a minimum of six copies of maintenance data indicating manufacturer's care, repair and cleaning instructions. Provide maintenance video if available. Submit maintenance kit for matte finishes.

-- End of Section --

SECTION 07 05 23

PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS  
05/14

PART 1 GENERAL

1.1 SUMMARY

Employ an independent agency to conduct the pressure test on the building envelope in accordance with this specification section and ASTM E779.

1.2 REFERENCES

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

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ANSI/ASNT CP-189	(2016) ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel (ANSI/ASNT CP-105-2006)
ASNT CP-105	(2011) ASNT Standard Topical Outlines for Qualification of Nondestructive Testing Personnel - Item No. 2821
ASNT SNT-TC-1A	(2016) Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing

ASTM INTERNATIONAL (ASTM)

ASTM E1186	(2017) Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems
ASTM E1827	(2011; R 2017) 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

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 6781	(1983) Thermal Insulation - Qualitative Detection of Thermal Irregularities in Building Envelopes - Infrared Method
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1.3 DEFINITIONS

The following terms as they apply to this section:

### 1.3.1 Air Barrier Envelope

The surface that separates the inside air from the outside air. The combination of air barrier assemblies and air barrier components, connected by air barrier accessories are designed to provide a continuous barrier to the movement of air through an environmental separator. A single building may have more than one air barrier envelope. The air barrier surface includes the top, bottom, and sides of the envelope. The term "air barrier envelope" is also known as "air barrier system" or simply "air barrier".

### 1.3.2 Air Leakage Rate

How leaky, or conversely how air tight a building envelope is. The air leakage is normally described in terms of air flow rate for the surface area of the envelope at a defined differential pressure.

### 1.3.3 Bias Pressure

Also known as zero flow pressure, baseline pressure, offset pressure or background pressure. With the envelope not artificially pressurized, bias is the differential pressure that always exists between the envelope that has been prepared (sealed) for the pressure test and the outdoors. Bias pressure is made up of two components, fixed static offset (usually due to stack effect or the HVAC system) and fluctuating pressure (usually due to wind or a moving elevator). Because of pressure fluctuations many bias pressure readings are recorded and averaged for use in the calculations.

### 1.3.4 Blower Door

Commonly used term for an apparatus used to pressurize and depressurize the space within the building envelope and quantify air leakage through the envelope. The blower door typically includes a door fan and an air resistant fabric or a series of hard panels that extends to cover and seal the door opening between the fan shroud and door frame. The door fan is a calibrated fan capable of measuring air flow and is usually placed in the opening of an exterior door. With the air barrier otherwise sealed, air produced by the door fan pressurizes or de-pressurizes the envelope, depending on the fan's orientation.

### 1.3.5 Environmental Separator

The parts of a building that separate the controlled interior environment from the uncontrolled exterior environment, or that separate spaces within a building that have dissimilar environments. The term "environmental separator" is also known as the "control layer".

### 1.3.6 Pressure Test

A generic term for a test in which the envelope is either pressurized or de-pressurized with respect to the outdoors.

#### 1.3.6.1 Negative Pressure Test (Depressurization Test)

A test wherein air inside the envelope is drawn to the outdoors. This places the envelope at a lower (negative) pressure with respect to the outdoors.

1.3.6.2 Positive Pressure Test (Pressurization Test)

A test wherein outdoor air is pushed into the envelope. This air movement places the envelope at a higher (positive) pressure with respect to the outdoors.

1.4 WORK PLAN

Submit the following not later than 60 calendar days before start of pressure testing work, steps to be taken by the lead pressure test technician to accomplish the required testing.

a. Memorandum of test procedure.

(1) Proposed dates for conducting the pressure, thermographic and fog tests.

(2) Submit detailed pressure test procedures prior to the test. Provide a plan view showing proposed locations (personnel doors or other similar openings) to install blower doors or flexible ducts (for trailer-mounted fans), if used.

b. Test equipment to be used.

c. Scaffolding, scissor lifts, power, electrical extension cords, duct tape, plastic sheeting and other Contractor's support equipment required to perform all tests.

d. Other Contractor's support personnel who will be on site for testing.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Work Plan; G

SD-03 Product Data

Thermal Imaging Camera; G

SD-05 Design Data

Envelope Surface Area Calculations; G

SD-07 Certificates

Pressure Test Agency  
Thermographer Qualifications  
Test Instruments  
Date Of Last Calibration

## SD-06 Test Reports

Pressure Test Procedures; G  
Air Leakage Test Report; G  
Diagnostic Test Report; G

No later than 14 days after completion of the pressure test, submit 6 copies of an organized report bound in a durable 3-ring binder. The report is to contain a table of contents, an executive summary, an introduction, a results section and a discussion of the results. Submit the Air Leakage Test Report as described in paragraph AIR LEAKAGE TEST REPORT. Submit a diagnostic test report as described in paragraph LOCATING LEAKS BY DIAGNOSTIC TESTING. The diagnostic test report is to include the Thermographic Investigation Report and the Fog Test Report (if performed).

Submit field data and completed report forms found in the appendices. Use the sample forms, Test Agency Qualification Sheet, Air Leakage Test Form and Air Leakage Test Results Form to summarize the tests for the appropriate building envelope. Submit both electronically populated and field hand filled-in forms.

Report Data. Include in the report the following information for all tests:

- a. Date of Issue
- b. Project title and number
- c. Name, address, and telephone number of testing agency
- d. Dates and locations of samples and tests or inspections
- e. Names of individuals making the inspection or test
- f. Designation of the work and test method
- g. Identification of product and Specification Section
- h. Complete inspection or test data
- i. Test results and an interpretation of test results
- j. Comments or professional opinion on whether inspected or tested work complies with contract document requirements
- k. Recommendations on retesting

## 1.6 QUALITY ASSURANCE

### 1.6.1 Modification of References

Perform all pressure and diagnostic tests according to the referenced publications listed in paragraph REFERENCES and as modified by this section. Consider the advisory or recommended provisions, of the referred references, as mandatory.

### 1.6.2 Qualifications

#### 1.6.2.1 Pressure Test Agency

Submit, no later than 15 calendar days after contract award, information certifying that the pressure test agency is not affiliated with any other company participating in work on this contract. The work of the test agency is limited to pressure testing the building envelope, performing a thermography test and fog test, and investigating, through various methods, the location of air leaks through the air barrier. See paragraph PRESSURE TEST AGENCY for additional requirements. For thermographer

qualifications, see paragraph THERMOGRAPHER QUALIFICATIONS.

Use the sample TEST AGENCY QUALIFICATIONS SHEET form (Appendix C), to submit the following information.

- a. Verification of 2 years of experience as an agency in pressure testing commercial and/or industrial buildings.
- b. List of at least ten commercial/industrial facilities with building envelopes that the agency has tested within the past 2 years. Include building name, address, and name of prime construction contractor and contractor's point-of-contact information.
- c. Confirmation of 2 years of commercial and or industrial building pressure test experience for the lead pressure test technician and the thermographer in using the specified ASTM E779 testing standard. References from five Contracting Officers for facilities where the lead test technician has supervised commercial and or industrial building pressure tests in the last 2 years.
- d. Verification that the lead pressure test technician has been employed by a building pressure testing agency in the capacity of a lead pressure test technician for not less than 1 year.

#### 1.6.2.2 Thermographer Qualifications

To perform an infrared diagnostic evaluation, use a lead thermographer who has at least an active Level II Certification that is based on the requirements in ASNT CP-105 or ANSI/ASNT CP-189 and is in accordance with ASNT SNT-TC-1A. The course of study is to be specifically focused on infrared thermography for building science. The thermographer must have at least two years of building science thermography experience in IR testing commercial or industrial buildings. The thermographer must also have experience in building envelopes and building science in order to make effective recommendations to the contractor should the envelope require additional sealing. Submit the thermographer's certificate for approval. Submit a list of at least ten commercial/industrial buildings on which the thermographer has performed IR thermography in the past two years. The thermographer is to have a current active certification. Submit certification at least 60 days prior to thermography testing.

#### 1.6.3 Test Instruments And Date Of Last Calibration

Submit a signed and dated list of test instruments, their application, manufacturer, model, serial number, range of operation, accuracy and date of most recent calibration.

#### 1.7 CLIMATE CONDITIONS SUITABLE FOR A PRESSURE TEST

As the test date approaches, monitor the weather forecast for the test site. Avoid testing on days forecast to experience high winds, rain, or snow. Monitor weather forecasts prior to shipping pressure test equipment to the site. Preferred ambient weather test conditions as stated in ASTM E779 are 0 to 4 mph winds and an ambient temperature range of 41 - 95 degrees F. Based on current and forecast weather conditions, the Contracting Officer's representative is to grant final approval for testing to occur.

### 1.7.1 Rain

Rain can temporarily seal roof and wall assemblies so that they leak less than under no-rain conditions. Do not test during rain or if rain is anticipated during testing. If pneumatic hoses are installed and exposed to rain inspect the hose to insure rainwater has not migrated into the hose ends. Orient all exposed hose ends to keep them out of water puddles. Success in temporarily sealing outdoor ventilation components such as louvers and exhaust fans may also be compromised by rain. Don't seal roof-mounted ventilation components during times of potential lightning.

### 1.7.2 Snow

Snow piled against a wall or on top of a roof can make a building envelope appear to be more airtight than it actually is. Snow may also impact thermography readings. Remove snow from around and on top of the building prior to testing.

### 1.7.3 Wind

Because wind can skew pressure test results, test only on days and at times when winds are anticipated to be the calmest. Avoid pressure testing during gusty or high wind conditions.

## PART 2 PRODUCTS

### 2.1 PRESSURE TEST EQUIPMENT

Depending on site conditions and size of the envelope, the test may be conducted using blower door equipment and/or trailer-mounted fans. The testing agency is to supply sufficient quantity of blower equipment that will produce a minimum of 75 Pa differential pressure between the envelope and outdoors using the test methods described herein. Supplying additional blower test equipment to provide additional airflow capacity or to act as a backup is highly recommended.

#### 2.1.1 Blower Door Fans and Trailer Mounted Fans

Each air flow measuring system including blower door fans and trailer mounted fans are to be calibrated within the last 3 years in accordance with ASTM E1827. Calibrated blower door fans and trailer mounted fans must measure accurately to within plus or minus 5 percent of the flow reading. Blower door equipment and trailer mounted fans are to be specifically designed to pressurize building envelopes. Each set of blower door equipment is to include fan(s), digital gage(s), door frame, door fabric or hard panels.

#### 2.1.2 Digital Gages as Test Instruments

Use only digital gages as measuring instruments in the pressure test; analog gages are not acceptable. The gauges must be accurate to within 1.0 percent of the pressure reading or 0.15 Pa, whichever is greater. Each gage is to have been calibrated within two years of the test. The calibration is to be checked against a National Institute of Standards and Technology (NIST, formerly National Bureau of Standards) traceable standard.

## 2.2 THERMAL IMAGING CAMERA REQUIREMENTS

The thermal imaging camera used in the thermography test must have a thermal sensitivity (Noise Equivalent Temperature Difference.) of +/- 0.18 degrees F at 86 degrees F or less. Ensure the camera's operating spectral range falls between 2 and 15 micrometers. Ensure the camera's IR image viewing screen resolution measures at least 240x180 pixels. Ensure the camera has a means of recording thermal images seen on the camera viewing screen. The camera is to display output as individual still frame images that also can be downloaded and inserted into an electronic Thermographic Investigation Report. Submit camera make and model, and catalog information that defines the camera thermal sensitivity for approval.

## PART 3 EXECUTION

### 3.1 PRESSURE TEST AGENCY

The test agency is to be an independent third party subcontractor, not an affiliated or subsidiary of the prime contractor, subcontractors or A/E firm. The agency is to be regularly engaged in pressure testing of commercial/industrial building envelopes. If using blower door or trailer-mounted fans, the lead test technician must have at least two years of experience in using such equipment in building envelope pressurization tests. Formal training using pressure test equipment is highly recommended. Technicians using the building's air handling system for pressure testing are to have tested at least five commercial/industrial buildings within the past two years with each building having over 50,000 square feet of floor area. Submit the name, address and floor areas of each of these five buildings for approval.

#### 3.1.1 Field Work

The lead pressure test technician and thermographer are to be present at the project site while testing is performed and is to be responsible for conducting, supervising, and managing of their respective test work. Management includes health and safety of test agency employees.

#### 3.1.2 Reporting Work

The lead pressure test technician is to prepare, sign, and date the test agenda, equipment list, and submit a certified Air Leakage Test Report. The thermographer is to prepare, sign, and date the test agenda, equipment list, and submit a certified Thermographic Investigation Report. The contractor is to prepare a final report that identifies improvements that were made to the envelope to reduce leaks, mitigate thermal bridging, eliminate moisture migration, repair insulation voids discovered during diagnostic tests. Jointly submit all reports.

### 3.2 ENVELOPE SURFACE AREA CALCULATION

The architectural air barrier boundary includes the floor, walls, and ceiling. After construction of the air barrier envelope is complete, field measure the envelope to ensure the physical measurements match the design drawings and the air barrier envelope surface area calculations. If the measurements are not consistent with the defined air barrier boundary as indicated, re-calculate the envelope surface area and submit the envelope surface area calculation and results for review. If the air barrier was defined during design but the air barrier envelope surface area was not calculated, calculate it during construction and submit the

envelope surface area calculations and result for review.

### 3.3 PREPARING THE BUILDING ENVELOPE FOR THE PRESSURE TEST

#### 3.3.1 Testing During Construction

The pressure test cannot be conducted until all components of the air barrier system have been installed. After all sealing as described herein has been completed, inspect the envelope to ensure it has been adequately prepared. During the pressure test, stop all ongoing construction within and neighboring the envelope which may impact the test or the air barrier integrity. The pressure test may be conducted before finishes that are not part of the air barrier envelope have been installed. For example, if suspended ceiling tile, interior gypsum board or cladding systems are not part of the air barrier the test can be conducted before they are installed. Recommend testing prior to installing the finished ceilings within the envelope and immediately surrounding it. The absence of finished ceilings allows for inspection and diagnostic testing of the roof/wall interface and for implementation of repairs to the air barrier, if necessary to comply with the maximum allowed leakage.

#### 3.3.2 Sealing The Air Barrier Envelope

Seal all penetrations through the air barrier. Unavoidable penetrations due to electrical boxes or conduit, plumbing, and other assemblies that are not air tight are to be made so by sealing the assembly and the interface between the assembly and the air barrier or by extending the air barrier over the assembly. Support the air barrier so as to withstand the maximum positive and negative air pressure to be placed on the building without displacement or damage, and transfer the load to the structure. Durably construct the air barrier to last the anticipated service life of the assembly and to withstand the maximum positive and negative pressures placed on it during pressure testing. Do not install lighting fixtures that are equipped with ventilation holes through the air barrier.

#### 3.3.3 Sealing Plumbing

Prime all plumbing traps located within the envelope full of water.

#### 3.3.4 Close and Lock Doors

Close and lock all doors and windows in the envelope perimeter. For doors not equipped with latching hardware, temporarily secure them in the closed position. Secure the doors in such a way that they remain fully closed even when the maximum anticipated differential air pressure produced during the test acts on them.

#### 3.3.5 Hold Excluded Building Areas at the Outdoor Pressure Level

Keep building areas immediately surrounding but excluded from the test envelope at the outdoor pressure level during the pressure test. Maintain these areas at the outdoor pressure level by propping exterior doors open, opening windows and de-energizing all air moving devices in or serving these areas.

#### 3.3.6 Maintain an Even Pressure within the Envelope

Ensure the pressure differences within the envelope are minimized by opening all internal air pathways including propping open all interior

doors. Distribute test fans throughout the envelope as necessary to ensure the internal pressures are uniform (within 10 percent of the average differential pressure). Ideally, do not install suspended ceilings until after all pressure tests have been completed. If, however the envelope includes finished suspended ceiling spaces, temporarily remove approximately 5 percent of all ceiling tiles or a minimum of 1 tile from each isolated suspended ceiling space, whichever comprises the greatest surface area. Temporarily remove additional ceiling tiles during testing to allow for inspection and diagnostic testing of the ceiling/wall interface.

### 3.3.7 Maintain Access to Mechanical and Electrical Rooms

Maintain access to mechanical rooms and electrical rooms associated with the envelope to allow for de-energizing ventilation equipment and resetting circuit breakers tripped by blower door equipment, if used.

### 3.3.8 Minimize Potential for Blowing Dust and Debris

Because high velocity air will be blown into and out of the envelope during the test, debris, including dust and litter, may become airborne. Airborne debris may become trapped or entangled in test equipment, thereby skewing test results. Ensure areas within and surrounding the envelope are free of dust, litter and construction materials that are easily airborne. If pressurizing existing, occupied areas, provide adequate notice to building occupants of blowing dust and debris, and general disruption of normal activities during the test.

### 3.3.9 De-energize Air Moving Devices

De-energize all air moving devices serving the envelope to keep air within the envelope as still as reasonably achievable. De-energize all fans that deliver air to, exhaust air from, or recirculate air within the envelope. Also de-energize all fans serving areas adjacent to but excluded from the envelope.

### 3.3.10 Installing Blower Door Equipment in a Door Opening

Where blower door fans are used, before installing blower door equipment, select a door opening that does not restrict air flow into and out of the envelope and has at least 5 feet clear distance in front of and behind the door opening. Disconnect the door actuator and secure the door open to prevent it from being drawn into the fan by fan pressure.

## 3.4 BUILDING ENVELOPE AIR TIGHTNESS REQUIREMENT

For each building envelope, perform two pressure tests; the Architectural Only test and the Architectural Plus HVAC System test. The purpose of the pressure (air leakage) test is to determine final compliance with the airtightness requirement by demonstrating the performance of the continuous air barrier. An effective air barrier envelope minimizes infiltration and exfiltration through unintended air paths (leaks). The tests may be performed in any desired order.

### 3.4.1 Architectural Only Test

The test envelope is the architectural air barrier boundary as defined on the contract drawings. This boundary includes connecting walls, roof and floor which comprise a complete, whole, and continuous three dimensional

envelope. Perform both a positive pressure test and a negative pressure test on this envelope, unless otherwise directed.

3.4.1.1 Test Goal

Input data from the test into the Air Leakage Rate by Fan Pressurization spreadsheet as described in paragraph CALCULATION PROGRAM via the Air Leakage Test Form. Compare output from the spreadsheet against the maximum allowable leakage defined in Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM. The envelope passes the test if the leakage rate, as calculated using the spreadsheet, is equal to or lower than the Architectural Only leakage rate goal.

3.4.1.2 Preparing The Envelope For The Pressure Test - Seal All Openings Through The Air Barrier

Temporarily close all perimeter windows, roof hatches and doors in the envelope perimeter except for those doors that are to remain open to accommodate blower door or trailer mounted fan test equipment installation. Seal, or isolate all other intentional openings, pathways and fenestrations through the architectural envelope prior to pressure testing. Follow the Recommended Test Envelope Conditions identified in ASTM E1827, Table 1, for the Closed Envelope condition. These openings may include boiler flues, fuel-burning water heater flues, fuel-burning kitchen equipment, clothes dryer vents, fireplaces, wall or ceiling grilles, diffusers etc. Before sealing flues, close their associated fuel valves and verify the associated pilot lights are extinguished. Prime all plumbing traps located within the envelope full of water. In lieu of applying tape and/or plastic, Typical temporary sealing materials include tape and sheet plastic or a self-adhesive grille wrap. Use and apply tape and plastic in a manner that does not deface or remove paint or mar the finish of permanent surfaces. Be especially aware of residue that remains from tape applied to stainless steel surfaces such as kitchen hoods or rollup doors. For painted surfaces, use tape types that do not remove finish paint when the tape is removed. If paint is removed from the finished surface, repaint to match existing surfaces. Secure dampers closed either manually or by using the building's HVAC system controls. Use the table below for further guidance in building preparation.

Building Component	Envelope Condition
Air handling units, duct fans	As found (open) or temporarily sealed as necessary
Clothes dryer	Off
Clothes dryer vents	Temporarily sealed
Dampers - intake, exhaust	Physically closed or closed using control power or temporarily sealed
Diffusers, registers, grilles within the envelope	Temporarily sealed
Doors, personnel type, at the envelope perimeter	Secured closed
Doors, personnel type, within the envelope	Secured (propped) open

Building Component	Envelope Condition
Doors, roll-up type, at the envelope perimeter	Closed (no additional sealing)
Exhaust hoods	Closed* and temporarily sealed
Fireplace hearth	Temporarily sealed *
Kitchen hoods	Temporarily sealed *
Pilot light and associated fuel valve	Extinguished and closed, respectively
Vented combustion appliance	Temporarily sealed *
Vented combustion appliance exhaust flue	Off
Windows	Secured closed
* If the building component has an associated manual or automatic damper, consider securing the damper closed in lieu of temporarily sealing.	

### 3.4.2 Architectural Plus HVAC System Test

This test envelope includes the architectural air barrier boundary as defined on the contract drawings plus all HVAC supply, return and exhaust systems that penetrate and terminate within said architectural air barrier boundary and that extends outward from said boundary. All associated ductwork, intake and exhaust dampers, and air moving devices, including air handling units and fans, are included in this test envelope even if they are physically located outside of the architectural air barrier boundary. The boundary extends to and includes the low leakage intake and exhaust dampers. Perform both a positive pressure test and a negative pressure test on this envelope, unless otherwise indicated.

#### 3.4.2.1 Test Goal

Data from the test is to be input into the Air Leakage Rate by Fan Pressurization spreadsheet as described in paragraph CALCULATION PROGRAM via the Air Leakage Test Form. If both a positive and negative pressure tests were performed, both data sets are together to be input in the spreadsheet. Compare output from the spreadsheet against the leakage rate goal. The envelope passes the test if the leakage rate, as calculated using the spreadsheet, is equal to or lower than the Architectural Plus HVAC System leakage rate goal.

#### 3.4.2.2 Preparing the Building for the Pressure Test

In preparation of this test, de-energize all air moving devices within this envelope by putting their controls in the Unoccupied mode. This allows the building's HVAC controls to close all associated motorized intake, exhaust, and relief dampers. Make no other changes to the HVAC systems. Temporarily sealing diffusers, grilles, registers, kitchen hoods, exhaust hoods, fans, air handling units and all other HVAC system elements with tape and/or plastic sheeting or any other means is not allowed. If the envelope includes a fireplace hearth do not seal it with tape and plastic. Use the table below for further guidance in building

preparation.

Building Component	Envelope Condition
Air handling units, duct fans	As found (open)
Clothes dryer	Off
Clothes dryer vents	As found (no preparation)
Dampers - intake, exhaust	As found (no preparation)
Diffusers, registers, grilles within the envelope	As found (open)
Doors, personnel type, at the envelope perimeter	Secured closed
Doors, personnel type, within the envelope	Secured (propped) open
Doors, roll-up type, at the envelope perimeter	Closed (no preparation)
Exhaust hoods	Closed
Fireplace hearth	As found (open)
Kitchen hoods	As found (open)
Pilot light and associated fuel valve	Extinguished and closed, respectively
Vented combustion appliance	Off
Vented combustion appliance exhaust flue	As found (open)
Windows	Secured closed

### 3.5 CONDUCTING THE PRESSURE TEST

Notify the Contracting Officer at least 10 working days before conducting the pressure tests to provide the Government the opportunity to witness the tests and to monitor weather forecasts for conditions favorable for testing. Do not pressure test until verifying that the continuous air barrier is in place and installed without failures in accordance with installation instructions. During the pressure test periodically inspect temporarily sealed items to ensure they are still sealed. Seals on temporarily sealed items tend to release more readily at higher pressures. Test data obtained after temporarily sealed items become unsealed cannot be used as input into the calculation program. Follow the Envelope Pressure Test Procedures in the paragraphs below. Submit detailed pressure test procedures indicating the test apparatus, the test methods and procedures, and the analysis methods to be employed for the building envelope pressure (air tightness) test. Submit these procedures not later than 60 days after Notice to Proceed.

### 3.5.1 Extend Pneumatic Tubes and Establish a Reference Differential Pressure

Confirm the various zones within the envelope have a relatively uniform interior pressure distribution by establishing a representative differential pressure between the envelope and the outdoors with blower door or trailer-mounted fans operating. The number of indoor pressure difference measurements (pneumatic hoses) required depends on the number of interior zones separated by bottle necks that could create significant pressure drops (e.g. doorways and stairwells). Extend at least four pneumatic hoses (differential pressure monitoring ports) to locations within the envelope that are physically opposite of each other. In multiple story buildings, especially those over three stories, extend hoses to multiple floors. Locate the hose ends away from the effects of air discharge from blower test equipment. Select one of the four (or more) interior hoses, one judged by the test agency to be the most unaffected by air velocity produced by blower test equipment, to serve as the interior reference pressure port. Extend at least one additional pneumatic hose to the outdoors (outdoor pressure port). To the end of this hose manifold at least four hoses together and terminate each hose on a different side of the building. With the envelope sealed and the blowers energized, measure the differential pressure using the interior reference pressure port and the four outdoor pressure ports. Then measure and record the differential pressure by individually using each of the remaining three interior hoses. Ensure each reading is within plus or minus 10 percent of the reference reading. Thus at an average 75 Pa maximum pressure difference across the envelope, the difference between the highest and lowest interior pressure difference measurements should be 15 Pa or less. If this condition cannot be met, attempt to create additional air pathways within the envelope to minimize pressure differences within the envelope. If necessary, move the interior hose ends. See step 2.13 of the Air Leakage Test Form in Appendix A.

### 3.5.2 Bias Pressure Readings

With the fan pressurization equipment de-energized and the envelope sealed, obtain the differential pressure between the outdoors and the envelope. Record 12 bias pressure readings before the pressure test and 12 bias pressure readings after the pressure test. Each reading is the average of ten or more 1-second measurements. Include positive and negative signs for each reading. To help dampen bias pressures that significantly contribute to test pressure, reduce temperature differences between indoor and outdoor air. Temperature differences can be reduced by operating test fan equipment for a few minutes to replace most of the indoor air with outdoor air.

### 3.5.3 Testing in Both Positive and Negative Directions

The preferred method for testing a building envelope is to test in both the pressurized and depressurized directions. Testing in one direction is only allowed if opposite direction testing cannot logistically be performed due to test equipment limitations or restrictions. After obtaining the pre-test bias differential pressure readings, conduct the pressure test. Record the envelope pressures (in units of Pascals) from one interior pneumatic hose (monitoring port) and the outdoor pneumatic hose(s), averaged or manifolded, with corresponding flows (in units of cfm) for each fan. Record the flow rates at at least 10 to 12 positive and 10 to 12 negative building pressure readings. If conducting both positive and negative pressure tests the lowest allowable test pressure is 40 Pa

and the highest test pressure is 85 Pa. Keep at least 25 Pa difference between the lowest and highest test pressure readings. Include the 75 Pa pressure value between the lowest and highest readings. The 10 to 12 readings in each direction are to be roughly evenly spaced along the range of pressures and flows. After testing is complete de-energize the equipment used to provide pressurization and obtain an additional 10 to 12 post-test bias pressure readings. None of the bias pressure readings are allowed to exceed 30 percent of the minimum test pressure. If these limits are exceeded the test fails and must be repeated.

#### 3.5.4 Failed Pressure Test

If the pressure test fails to meet the established criteria, use diagnostic test methods described in paragraph LOCATING LEAKS BY DIAGNOSTIC TESTING to discover the leak locations. Provide additional permanent sealing measures to reduce or eliminate leak sources discovered during diagnostic testing. Retest (perform another pressure test) after sealing has been completed. Repeat this sequence of documenting test results in the test report, performing diagnostic tests, documenting recommendations for additional sealing measures in the test report, sealing leak locations per recommendations, and re-testing as necessary until the building envelope passes the pressure test and is in compliance with the performance requirements.

#### 3.5.5 Air Leakage Test Report

Report volumetric flow rates and corresponding differential pressures in cubic feet per minute (cfm) and Pascals (Pa), respectively, on the Air Leakage Test Form sample form found in Appendix A. Populate the accompanying spreadsheet file entitled Pressure Test Data Analysis with information obtained during the test. The spreadsheet uses equations found in ASTM E779 as a basis for calculating the envelope leakage rate. Other similar leakage rate calculation programs cannot be used or submitted for review. Submit a printout of the data input and output in the report. Should any air tightness (pressure) test fail, the pressure test report is to include data and results from all previous failed tests along with the final successful test data and results. Indicate if the resulting leakage rate did or did not meet the goal leakage requirement. Identify and document deficiencies in the building construction upon failure of a test to meet the specified maximum leakage rate.

Include the Test Agency Qualification Sheet, Air Leakage Test Form and Air Leakage Test Results Form in the written report. Document every test set-up condition with diagrams and photos to ensure the tests can be made repeatable. Document all pneumatic hose termination locations. Record in detail how the building envelope was prepared for the tests. Also describe in detail which building items were temporarily sealed. Include photos of test equipment and sealing measures in the report. Include an electronic (pdf) version of all test reports on a CD. If the building envelope fails to meet the leakage rate goal, provide recommendations to further seal the envelope and document these recommendations in the test report.

#### 3.6 LOCATING LEAKS BY DIAGNOSTIC TESTING

Use diagnostic test methods described herein to discover obvious leaks through the envelope. Perform diagnostic tests on the building envelope regardless of the envelope meeting or failing to meet the designated leakage rate goal. Use diagnostic test methods in accordance with

ASTM E1186 and in conjunction with pressurization equipment as necessary. Use the thermography diagnostic test to establish a baseline for envelope leakage. Apply additional diagnostic tests (find, feel, fog or other tests) as necessary to further define leak locations and pathways discovered using thermography or to find additional leaks not readily detected by thermography. Using a variety of diagnostic tests may help locate leaks that would otherwise go undetected if only a single diagnostic test were used. Pay special attention to locating leaks at interfaces where there is a change in materials or a change in direction of like materials. These interfaces, at a minimum, include roof/wall, wall/wall, floor/wall, wall/window, wall/door, wall/louver, roof mounted equipment/roof curb interfaces and all utility penetrations (ducts, pipes, conduit, etc) through the envelope's architecture. Also use diagnostic tests to check for leakage between the air duct and duct damper, when the damper, under normal control power, is placed in the closed position. Should leaks be discovered during diagnostic tests, thoroughly document their exact locations on a floor plan so that sealing can be later applied, if required or as directed. If the envelope passes the leakage test, use the diagnostic test procedure described above to identify obvious leakage locations. Seal the leaks at the discretion of the COR based on the magnitude, location, potential for liquid moisture penetration or retention, potential for condensation, presence of daylight through an architectural surface or if the leakage location could potentially cause rapid deterioration or mold growth of, or in the building envelope materials and assemblies. Apply sealing measures after diagnostic testing is complete and all pressurization blowers are off. To verify that the applied sealing measures that are effective, re-test for leaks using the same diagnostic methods that discovered the leak. Reseal and retest until the envelope meets the leakage rate goal and all obvious leaks through the envelope are sealed.

### 3.6.1 Find Test

Use visual observation to locate daylight and/or artificial light streaming from the opposite side of the envelope. Observe all interfaces identified above.

### 3.6.2 Feel Test

Use the building's air handling system or blower door equipment to negatively pressurize the building envelope, to at least 25 Pa but no greater than 85 Pa, with respect to the outdoors. The larger the pressure difference, the easier discovering leaks by feeling them becomes. While inside the envelope, hand feel roof/wall, wall/wall, and floor/wall interfaces and utility penetrations (ducts, pipes, conduit, etc) for leaks and note the leak locations on a floor plan. The "Feel" test may also be used to check for leaks between the ductwork and ductwork damper. To do this, positively pressurize the envelope and check for air movement from the envelope exterior.

### 3.6.3 Infrared Thermography Test

Avoid performing thermography tests just after pressure testing the building envelope (pressurizing and/or depressurizing the building envelope) as thermography readings may be inaccurate due to excessive air-wash. Perform thermography either before the pressure test or wait an appropriate amount of time after pressure test completion for the temperatures within the building envelope to stabilize before starting the thermography tests. Coordinate thermography examination with the pressure

test agency and the test agency's pressurization equipment. The pressure test agency is to allow adequate time for the thermographer to perform a complete thermographic examination, as described hereinafter, of the envelope interior and exterior.

### 3.6.3.1 Thermography Test Methods

Before thermographic testing, remove furniture, construction equipment, and all other obstructions both inside and outside the building as necessary to gain a clear field of view. In the Thermographic Investigation Report, document all areas where obstructions remain. For exterior thermal examination of the envelope, verify that no direct solar radiation has heated the envelope surfaces to be examined for a period of approximately 3 hours for frame construction and for approximately 8 hours for masonry veneer construction. Conduct exterior investigations after sunset, before sunrise, or on an overcast day when the influence of solar radiation can be determined to be minimal. Limit exterior examinations to times when the influence of solar radiation is minimal, such as after sunset or before sunrise or during an overcast day. Conduct thermal imaging tests only when wind speeds are less than 8 mph at the time of analysis and at the end of analysis. Document any variations in wind during the test. Document all variations of test conditions in the Thermographic Investigation Report. Test only when exterior surfaces are dry. Monitor and document ongoing test parameters, such as the temperatures inside and outside the air barrier envelope, wind speed, and differential pressure.

#### 3.6.3.1.1 Thermography Testing of the Air Barrier

Test the building envelope in accordance with ISO 6781, and ASTM E1186. Perform a complete thermographic inspection consisting of the full inspection of the interior and exterior of the complete air barrier envelope. Document envelope areas that are inaccessible for testing. Use infrared thermography technology in concert with standard pressurization methods (blower doors, trailer mounted fans and/or the building's own air handling systems) to locate leaks through the air barrier. Because thermography works best with at least a 18 degree F temperature difference between the envelope interior and the exterior, adjust the HVAC system, if possible, to create or enhance this temperature difference. The minimum allowable temperature difference is 3 degrees F. Maintain this temperature difference for at least 3 hours prior to the test. Use pressurization methods to establish a minimum of +20 Pa pressure difference with respect to the outdoors while using an infrared camera to view the envelope from outdoors. When viewing with the camera from inside the envelope, keep the envelope at a pressure differential of -20 Pa with respect to the outdoors using pressure testing equipment or the building's own air handling system.

#### 3.6.3.1.2 Thermography Testing of the Insulation Envelope to Find Insulation Voids (Qualitative Test)

After installation of the insulation envelope is complete, use thermography to identify anomalies (insulation voids) in this envelope. Test only when the temperature difference between inside and outside wall surfaces and as defined by the surface being imaged is a minimum of 18 degrees F or greater for a period of 4 hours before the test. Alternatively, the thermographer is to verify and document in the Thermographic Investigation Report that the imaging system is capable of providing satisfactory results with less temperature difference between

inside and outside. Test during a time when there is no more than 0.05 inches differential pressure across the insulation envelope. Document the location of the voids on floor plans or wall sections.

#### 3.6.3.1.3 Thermography Testing of Thermal Bridging

Take sample thermal images of representative parts of the building envelope being examined and analyze to demonstrate the majority of areas with anomalies or identifiable thermal features. Also sample thermal bridges in parts of the building that have no apparent anomalies to demonstrate the correct functioning of building components. In existing buildings, look for interior surface pattern staining. Such staining may be evidence of thermal bridges. This pattern staining is the deposition of dirt, often accompanied by mold growth, which occurs on the inside surface of the thermal bridge.

#### 3.6.3.2 Thermography Test Results

Document the location of all leaks, anomalies, and unusual thermal features on a floor plan and/or elevation view and catalog them with a visible light picture for locating the defect for correction. The thermographer is to recommend corrective actions to eliminate the leaks, anomalies and unusual thermal features. Where leaks are found perform corrective sealing as necessary to achieve the whole envelope air leakage rate specified. After sealing, again use thermography in concert with standard pressurization methods to verify that the air leakage has been reduced. After these leaks have been permanently sealed note all actions taken on the drawings or in the Thermographic Investigation Report. Submit the drawings for approval as part of the Thermographic Investigation Report. Also include thermographic photos that show where leaks were discovered. Include thermograms using an imaging palette that clearly shows the observed thermal patterns indicating air leakage. The Contracting Officer's Representative is to witness all testing.

#### 3.6.4 Fog Test

Before using a theatrical fog generator, disable all building smoke detectors as they may alarm when fog is issued. Coordinate fog tests and the disabling of all smoke detectors with the Contracting Officer's representative and the local fire department as necessary. Use pressure test equipment or the buildings own air handling system to positively pressurize the building envelope to at least 25 Pa but not greater than 85 Pa over the outdoors. Using a theatrical fog generator within the envelope, direct fog at suspected leakage points such as at building interfaces. Test the following interfaces: roof/wall, wall/wall, floor/wall, wall/window, roof/ mounted mechanical equipment. From the vantage point immediately outside the envelope and opposite that of the interface being tested, observe the effect as the fog is issued. Detection may also be further enhanced by using a scented fog liquid or a fog liquid that produces a colored fog. Look for fog and smell for associated odor percolating through the interface. Also use smoke puffers and smoke sticks as necessary to locate leaks at these and other interface locations. If the Architectural Plus HVAC System pressure test will be/was performed introduce fog into ductwork to check for leakage between ductwork and associated dampers. After fog testing has ended, reactivate the building smoke detectors and notify the Contracting Officer and local fire department that the test has ended. After sealing has been completed retest these areas using fog. Seal additional leaks that are found.

### 3.6.5 Diagnostic Test Report

Once the diagnostic tests have been completed and the leakage locations identified and sealed, document these procedures, locations and recommendations in the diagnostic test report. Submit plan and/or profile drawings that thoroughly identify leak locations. Describe in detail all leak locations so that the seal-up crew knows where to apply sealing measures. After sealing measures have been applied, describe the methods used along with applicable photos of the final sealed condition.

#### 3.6.5.1 Thermographic Investigation Report

Submit a report of each thermographic investigation identifying the thermal discontinuities in the thermal control layer. Indicate in the final report locations to which improvements for both the air control layer and the thermal control layer were made to reduce air leaks and correct discontinuities in the thermal control layer. Include in the report some selected radiometric images of suspected failure points in the air barrier envelope that indicate before and after conditions. Devote a chapter(s) of the Thermographic Investigation Report to identifying suspected points of thermal bridging, moisture migration through roofs and walls, and insulation voids. Indicate in the final report improvements that were made to the envelope to reduce air leaks, correct wet roof and wall areas, and repair insulation. Include the following items in the report:

- a. Brief description of the building construction
- b. Types of interior and exterior surface materials used in the building.
- c. Geographical orientation of the building with a description of the exterior surroundings including other buildings, vegetation, landscaping, and surface water drainage.
- d. Camera brand, model and serial number, and date of most recent calibration date; optional lenses with serial numbers (if applicable)
- e. Thermographer's and Government Inspector's names
- f. Date and time of tests
- g. Air temperature and humidity inside the air barrier envelope
- h. Outdoor air temperature and humidity
- i. General information for the last 12 hours on the solar radiation conditions in the geographic area where the test is being performed.
- j. Ambient conditions such as precipitation and wind direction and speed occurring with the last 24 hours, as applicable. Refer to specific requirements in each section of each thermographic inspection type for requirements in each specific area.
- k. Documentation of those portions of the building envelop which were not within test conditions when the scan was performed and which portions were obstructed by adjacent structures, interior furnishings, intervening cavities or reflective surfaces.
- l. Other relevant information, which may have influenced test results.

- m. Drawings, sketches, floor plans and/or photographs detailing the locations in the buildings where thermograms were taken detailing possible irregularities in the components being tested.
- n. Thermal images taken during the inspection with their relative locations and written or voiced recorded explanations of the anomaly listed along with visual and reference images.
- o. An identification of the aspects or components of the building being examined.
- p. Explanations for the type and the extent of each construction defect observed during the inspection.
- q. Any results from additional measurements and investigations. Identify additional equipment used and support with type, model number, serial number and date of most recent calibrated.

#### 3.6.5.2 Fog Test Report

Document all turbulent air flow and dead air spaces within the envelope. Report fog behavior as it exits from and/or is entrained within the building. Include a floor plan in the report that documents the locations where fog passed through the envelope.

#### 3.7 CALCULATION PROGRAM

To calculate the envelope leakage rate and other required outputs, input the data obtained during the pressure tests as documented in the Air Leakage Test Form (Appendix A) into the Air Leakage Rate by Fan Pressurization Excel spreadsheet. This spreadsheet can be found at the following web site: <http://www.wbdg.org/FFC/NAVGRAPH/graphtoc.pdf>.

#### 3.8 AFTER COMPLETION OF THE PRESSURE AND/OR DIAGNOSTIC TEST

After all pressure and/or diagnostic testing has been completed unseal all temporarily sealed items. Unless otherwise directed by the Contracting Officer, return all dampers, doors, and windows to their pre-test condition. Remove tape and plastic from all temporarily sealed openings, being careful not to deface painted surfaces. If paint is removed from finished surfaces, repaint to match existing surfaces. Unless otherwise directed by the Contracting Officer's representative, return fuel (gas) valves to their pre-test position and relight pilot lights. Return all fans and air handling units to pre-test conditions.

#### 3.9 REPAIR AND PROTECTION

Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for testing, inspection, and similar services. Upon completion of inspection, testing, or sample taking and similar services, repair damaged construction and restore substrates and finishes, protect construction exposed by or for quality control service activities, and protect repaired construction.

#### 3.10 APPENDICES

The following forms are available for download as a MS Word file at <http://www.wbdg.org/FFC/NAVGRAPH/graphtoc.pdf>.

Jersey City, New Jersey      \*\*\*SAFETY PAYS\*\*\*  
Caven Point Training Building Revitalization

W912QR20R0018-0000  
W912QR-18-F-0500  
P2: 475970

Appendix A - Air Leakage Test Form  
Appendix B - Air Leakage Test Results Form  
Appendix C - Test Agency Qualifications Sheet

-- 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	(2017) Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
ASTM C203	(2005; R 2012) Breaking Load and Flexural Properties of Block-Type Thermal Insulation
ASTM C930	(2018) Standard Classification of Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories
ASTM D3833/D3833M	(1996; R 2011) Water Vapor Transmission of Pressure-Sensitive Tapes
ASTM D4397	(2016) Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
ASTM E84	(2018a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E96/E96M	(2016) Standard Test Methods for Water Vapor Transmission of Materials

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code
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NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 211	(2016) Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances
NFPA 54	(2018) National Fuel Gas Code
NFPA 70	(2017; ERTA 1-2 2017; TIA 17-1; TIA 17-2; TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6; TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10; TIA 17-11; TIA 17-12; TIA 17-13; TIA 17-14; TIA 17-15; TIA 17-16; TIA 17-17 ) National Electrical Code

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS SCS Global Services (SCS) Indoor Advantage

UNDERWRITERS LABORATORIES (UL)

UL 2818 (2013) GREENGUARD Certification Program  
For Chemical Emissions For Building  
Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 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

Recycled Content for Block or Board Insulation; S

SD-07 Certificates

Block or Board Insulation; G

Vapor Retarder; G

Protection Board or Coating; G

Draft Special Warranties; G

Final Special Warranties; G

Indoor Air Quality For Block Or Board Insulation; S

SD-08 Manufacturer's Instructions

Block or Board Insulation

Adhesive

### 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 certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification by other third-party programs. Provide current product certification documentation from certification body.

### 1.6 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 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 Substantial Completion.

1.8.2 Warranty

Provide manufacturer's material warranty for all system components for a period of three years from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 BLOCK OR BOARD INSULATION

Provide thermal insulating materials as recommended by manufacturer for each type of application indicated. Provide insulation with the following physical properties and in accordance with the following standards:

- a. Faced Rigid Cellular Polyisocyanurate and Polyurethane Insulation:  
ASTM C1289 REV A

- (1) Type II Fibrous felt or glass fiber mat membrane on both major surfaces of the core foam.

2.1.1 Thermal Resistance

As indicated on the drawings

2.1.2 Fire Protection Requirements

- a. Flame spread index of 75 or less when tested in accordance with ASTM E84.
- b. Smoke developed index of 200 or less when tested in accordance with ASTM E84.

2.1.3 Other Material Properties

Provide thermal insulating materials with the following properties:

- a. Block-type insulation: Block-type insulation: Flexural strength:  
Not less than 20 psi when measured according to ASTM C203 REV A.
- b. 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.

2.1.4 Recycled Materials

Provide thermal insulation containing recycled materials to the extent practicable, provided that the material meets all other requirements of this section. The minimum required recycled material contents (by weight, not volume) are:

Polyisocyanurate/Polyurethane:	9 percent
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Provide data identifying percentage of recycled content for block or board insulation.

2.1.5 Indoor Air Quality

Provide certification of indoor air quality for block or board insulation.

#### 2.1.6 Prohibited Materials

Do not provide materials containing asbestos.

#### 2.2 VAPOR RETARDER AND DAMPPROOFING

##### 2.2.1 Vapor Retarder in Framed Walls and Roofs

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.

#### 2.3 PRESSURE SENSITIVE TAPE

As recommended by manufacturer of vapor retarder(s). Match water vapor permeance rating for each vapor retarder specified. Provide tape in accordance with ASTM D3833/D3833M.

#### 2.4 PROTECTION BOARD OR COATING

As recommended by insulation manufacturer.

#### 2.5 ACCESSORIES

##### 2.5.1 Adhesive

As recommended by insulation manufacturer.

##### 2.5.2 Mechanical Fasteners

Corrosion resistant fasteners as recommended by the insulation manufacturer.

### PART 3 EXECUTION

#### 3.1 EXISTING CONDITIONS

Prior to installation, ensure all areas that are in contact with the insulation are dry and free of projections that could cause voids, compressed insulation, or punctured vapor retarders. For foundation perimeter or under slab applications, check that subsurface fill is flat, smooth, dry, and well tamped. Do not proceed with installation if moisture or other conditions are present, and notify the Contracting Officer of such conditions. Do not proceed with the work until conditions have been corrected and verified to be dry.

#### 3.2 PREPARATION

##### 3.2.1 Blocking Around Heat Producing Devices

Provide noncombustible blocking at all spaces between heat producing devices and the floors, ceilings and roofs through which they pass. Provide in accordance with ICC IBC Section 2111.12 Fireplace Blocking and with the following clearances:

- a. Recessed lighting fixtures, including wiring compartments, ballasts, and other heat producing devices, unless certified for installation surrounded by insulation: 3 inches from outside face of fixtures and

devices or as required by NFPA 70 and, if insulation is placed above fixture or device, 24 inches above fixture.

- b. Vents and vent connectors used for venting products of combustion, flues, and chimneys other than masonry chimneys: Minimum clearances as required by NFPA 211.
- c. Gas Fired Appliances: Clearances as required in NFPA 54.

### 3.3 INSTALLATION

#### 3.3.1 Installation and Handling

Provide insulation in accordance with the manufacturer's printed installation instructions. Keep material dry and free of extraneous materials.

#### 3.3.2 Electrical Wiring

Do not install insulation in a manner that would enclose electrical wiring between two layers of insulation.

#### 3.3.3 Cold Climate Requirement

Place insulation on the outside of pipes.

#### 3.3.4 Continuity of Insulation

Butt tightly against adjoining boards, studs, rafters, joists, sill plates, headers and obstructions. Provide continuity and integrity of insulation at corners, wall to ceiling joint, roof, and floor. Avoid creating thermal bridges and voids. Provide and verify continuity of insulative barrier throughout the building enclosure.

#### 3.3.5 Coordination

Verify final installed insulation thicknesses comply with thicknesses indicated, R-values specified herein, and with the approved insulation submittal(s).

### 3.4 INSTALLATION ON WALLS

#### 3.4.1 Installation on Masonry Walls

Apply board directly to masonry with adhesive or fasteners as recommended by the insulation manufacturer. Fit between obstructions without impaling board on ties or anchors. Apply in parallel courses with joints breaking midway over course below. Place boards in moderate contact with adjoining insulation without forcing and without gaps. Cut and shape as required to fit around wall penetrations, projections or openings to accommodate conduit or other utilities. Seal around cutouts with sealant. Install insulation in wall cavities so that it leaves at least a nominal 1 inch air space outside of the insulation to allow for cavity drainage.

#### 3.4.2 Adhesive Attachment to Concrete and Masonry Walls

Apply adhesive to wall and completely cover wall with insulation.

- a. As recommended by the insulation manufacturer.

- b. Use only full back method for pieces of 1 square foot or less.
- c. Butt all edges of insulation and seal edges with tape.

### 3.5 PERIMETER AND UNDER SLAB INSULATION

Install perimeter thermal insulation where heated spaces are adjacent to exterior walls, slab edges in slab-on-grade, or floating slab construction.

#### 3.5.1 Manufacturer's Instructions

Layout insulation, tape edges, provide vapor retarder and other required accessories to protection against vermin, insects, and damage in accordance with manufacturer's printed instructions.

#### 3.5.2 Insulation on Vertical Surfaces

Provide thermal insulation as indicated on drawings. Fasten insulation with adhesive or mechanical fasteners.

#### 3.5.3 Protection of Insulation

Protect insulation from damage during construction and back filling by application of protection board or a coating. Do not leave installed vertical insulation unprotected overnight. Protect installed insulation from weather, including rain and ultraviolet light, from mechanical abuse, compression, and dislocation.

### 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	(2017) Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
ASTM C930	(2018) Standard Classification of Potential Health and Safety Concerns Associated with Thermal Insulation Materials and Accessories
ASTM D3833/D3833M	(1996; R 2011) Water Vapor Transmission of Pressure-Sensitive Tapes
ASTM D5359	(2015) Standard Specification for Glass Cullet Recovered from Waste for Use in Manufacture of Glass Fiber
ASTM E136	(2016) Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C
ASTM E84	(2018a) Standard Test Method for Surface Burning Characteristics of Building Materials

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers
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GREEN SEAL (GS)

GS-36	(2013) Adhesives for Commercial Use
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NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 54	(2018) National Fuel Gas Code
NFPA 70	(2017; ERTA 1-2 2017; TIA 17-1; TIA 17-2; TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6; TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10; TIA 17-11; TIA 17-12; TIA 17-13; TIA

17-14; TIA 17-15; TIA 17-16; TIA 17-17 )  
National Electrical Code

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168 (2017) Adhesive and Sealant Applications

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

29 CFR 1910.134 Respiratory Protection

UNDERWRITERS LABORATORIES (UL)

UL 2818 (2013) GREENGUARD Certification Program  
For Chemical Emissions For Building  
Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-03 Product Data

Blanket Insulation

Recycled Content for Insulation Materials; S

Accessories

SD-07 Certificates

Indoor Air Quality for Insulation Materials; S

SD-08 Manufacturer's Instructions

Insulation

1.3 CERTIFICATIONS

Submit required indoor air quality certifications and validations in one submittal package.

1.3.1 Insulation Products

Provide product certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification by other third-party programs. Provide current product certification from certification body.

### 1.3.2 Adhesives and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party programs that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

### 1.4 DELIVERY, STORAGE, AND HANDLING

#### 1.4.1 Delivery

Deliver materials to site in original sealed wrapping bearing manufacturer's name and brand designation, specification number, type, grade, R-value, and class. Store and handle to protect from damage. Do not allow insulation materials to become wet, soiled, crushed, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storing, and protecting of materials before and during installation.

#### 1.4.2 Storage

Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling.

### 1.5 SAFETY PRECAUTIONS

#### 1.5.1 Respirators

Provide installers with dust/mist respirators, training in their use, and protective clothing, all approved by National Institute for Occupational Safety and Health (NIOSH)/Mine Safety and Health Administration (MSHA) in accordance with 29 CFR 1910.134.

#### 1.5.2 Other Safety Concerns

Consider other safety concerns and measures as outlined in ASTM C930.

## PART 2 PRODUCTS

### 2.1 BLANKET INSULATION

ASTM C665, Type I, blankets without membrane coverings; Class A, membrane-faced surface with a flame spread of 25 or less, except a flame spread rating of 75 or less and a smoke developed rating of 150 or less when tested in accordance with ASTM E84.

#### 2.1.1 Thermal Resistance Value (R-VALUE)

The R-Value must be as indicated on drawings.

#### 2.1.2 Recycled Materials

Provide insulation materials containing the following minimum percentage of recycled material content by weight:

Fiberglass: 20 percent glass cullet complying with ASTM D5359

Provide data identifying percentage of recycled content for insulation materials.

#### 2.1.3 Prohibited Materials

Do not provide asbestos-containing materials.

#### 2.1.4 Reduced Volatile Organic Compounds (VOC) for Insulation Materials

Provide certification of indoor air quality for insulation materials.

### 2.2 BLOCKING

Wood, metal, unfaced mineral fiber blankets in accordance with ASTM C665, Type I, or other approved materials. Use only non-combustible materials meeting the requirements of ASTM E136 for blocking around heat producing devices.

### 2.3 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.

### 2.4 ACCESSORIES

#### 2.4.1 Adhesive

As recommended by the insulation manufacturer. Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) that meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide aerosol adhesives used on the interior of the building that meet either emissions requirements of CDPH SECTION 01350 (use the office or classroom requirements, regardless of space type) or VOC content requirements of GS-36. Provide certification or validation of indoor air quality for adhesives.

#### 2.4.2 Mechanical Fasteners

Corrosion resistant fasteners as recommended by the insulation manufacturer.

#### 2.4.3 Wire Mesh

Corrosion resistant and as recommended by the insulation manufacturer.

## PART 3 EXECUTION

### 3.1 EXISTING CONDITIONS

Before installing insulation, ensure that areas that will be in contact with the insulation are dry and free of projections which could cause voids, compressed insulation, or punctured vapor retarders. If moisture or other conditions are found that do not allow the workmanlike

installation of the insulation, do not proceed but notify Contracting Officer of such conditions.

### 3.2 PREPARATION

#### 3.2.1 Blocking Around Heat Producing Devices

Install non-combustible blocking around heat producing devices to provide the following clearances:

- a. Recessed lighting fixtures, including wiring compartments, ballasts, and other heat producing devices, unless these are certified by the manufacturer for installation surrounded by insulation: 3 inches from outside face of fixtures and devices or as required by NFPA 70 and, if insulation is to be placed above fixture or device, 24 inches above fixture.
- b. Gas Fired Appliances: Clearances as required in NFPA 54.

Blocking around flues and chimneys is not required when insulation blanket, including any attached vapor retarder, passed ASTM E136, in addition to meeting all other requirements stipulated in Part 2. Blocking is also not required if the chimneys are certified by the manufacturer for use in contact with insulating materials.

### 3.3 INSTALLATION

#### 3.3.1 Insulation

Install and handle insulation in accordance with manufacturer's instructions. Keep material dry and free of extraneous materials. Any materials that show visual evidence of biological growth due to presence of moisture must not be installed on the building project. Ensure personal protective clothing and respiratory equipment is used as required. Observe safe work practices.

##### 3.3.1.1 Electrical wiring

Do not install insulation in a manner that would sandwich electrical wiring between two layers of insulation.

##### 3.3.1.2 Continuity of Insulation

Install blanket insulation to butt tightly against adjoining blankets and to studs, rafters, joists, sill plates, headers and any obstructions. Provide continuity and integrity of insulation at corners, wall to ceiling joints, roof, and floor. Avoid creating thermal bridges.

##### 3.3.1.3 Installation at Bridging and Cross Bracing

Insulate at bridging and cross bracing by splitting blanket vertically at center and packing one half into each opening. Butt insulation at bridging and cross bracing; fill in bridged area with loose or scrap insulation.

##### 3.3.1.4 Cold Climate Requirement

Place insulation to the outside of pipes.

#### 3.3.1.5 Insulation without Affixed Vapor Retarder

Provide snug friction fit to hold insulation in place. Stuff pieces of insulation into cracks between trusses, joists, studs and other framing, such as at attic access doors, door and window heads, jambs, and sills, band joists, and headers.

#### 3.3.1.6 Sizing of Blankets

Provide only full width blankets when insulating between trusses, joists, or studs. Size width of blankets for a snug fit where trusses, joists or studs are irregularly spaced.

-- End of Section --

SECTION 07 22 00

ROOF AND DECK INSULATION  
02/16

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM C1177/C1177M	(2017) Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
ASTM C1289	(2017) Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
ASTM D312	(2000; R 2006) Standard Specification for Asphalt Used in Roofing
ASTM D41/D41M	(2011; R 2016) Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
ASTM D4586/D4586M	(2007; E 2012; R 2012) Asphalt Roof Cement, Asbestos-Free
ASTM E84	(2018a) Standard Test Method for Surface Burning Characteristics of Building Materials

FM GLOBAL (FM)

FM 4450	(1989) Approval Standard for Class 1 Insulated Steel Deck Roofs
FM APP GUIDE	(updated on-line) Approval Guide <a href="http://www.approvalguide.com/">http://www.approvalguide.com/</a>

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC	(2018) International Building Code
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SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage
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UNDERWRITERS LABORATORIES (UL)

UL 1256	(2002; Reprint Jul 2013) Fire Test of Roof Deck Constructions
UL 2818	(2013) GREENGUARD Certification Program

For Chemical Emissions For Building  
Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Insulation Board Layout and Attachment; G

Verification of Existing Conditions; G

SD-03 Product Data

Insulation; G

Cover Board; G

Fasteners; G

Asphalt Products; G

Recycled Content For Insulation; S

SD-06 Test Reports

Flame Spread Rating; G

SD-07 Certificates

Installer Qualifications; G

Indoor Air Quality For Insulation; S

SD-08 Manufacturer's Instructions

Nails and Fasteners; G

Roof Insulation; G

1.3 SHOP DRAWINGS

Submit insulation board layout and attachment indicating methods of attachment and spacing, transitions, tapered components, thicknesses of materials, and closure and termination conditions. Show locations of ridges, valleys, and crickets. Base shop drawings on verified field measurements and include verification of existing conditions. Show location and spacing of wood nailers required for securing of insulation.

1.4 PRODUCT DATA

Include data for material descriptions, recommendations for product shelf

life, requirements for cover board or coatings, and precautions for flammability and toxicity. Include data to verify compatibility of sealants with insulation.

#### 1.5 MANUFACTURER'S INSTRUCTIONS

Include field of roof and perimeter attachment requirements.

Provide a complete description of installation sequencing for each phase of the roofing system. Include weatherproofing procedures.

#### 1.6 QUALITY CONTROL

Provide certification of installer qualifications from the insulation manufacturer confirming the specific installer has the required qualifications for installing the specific roof insulation system(s) indicated.

Provide certificates of compliance for felt materials.

#### 1.7 FM APPROVAL REQUIREMENTS

Provide fastening patterns in accordance with pressures as indicated on drawings for insulation on steel decks.

#### 1.8 FIRE PERFORMANCE REQUIREMENTS

##### 1.8.1 Insulation in Roof Systems

Comply with the requirements of ICC IBC or UL 1256 or FM 4450. Roof insulation to have a flame spread rating of 75 or less when tested in accordance with ASTM E84. Additional documentation of compliance with flame spread rating is not required when insulation of the type used for this project as part of the specific roof assembly is listed and labeled as FM Class 1 approved.

##### 1.8.2 Fire Resistance Ratings for Roofs

Provide in accordance with ICC IBC Chapter 7 and Table 721.1(3) Min Fire and Smoke Protection For Floor and Roof Systems.

#### 1.9 CERTIFICATIONS

Provide products certified to meet indoor air quality requirements by UL 2818(Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification by other third-party programs. Provide current product certification documentation from certification body.

#### 1.10 DELIVERY, STORAGE, AND HANDLING

##### 1.10.1 Delivery

Deliver materials to the project site in manufacturer's unopened and undamaged standard commercial containers bearing the following legible information:

- a. Name of manufacturer
- b. Brand designation

- c. Specification number, type, and class, as applicable, where materials are covered by a referenced specification
- d. Asphalt flashpoint (FP), equiviscous temperature (EVT), and finished blowing temperature (FBT).

Deliver materials in sufficient quantity to allow continuity of the work.

#### 1.10.2 Storage and Handling

Store and handle materials in accordance with manufacturer's printed instructions. Protect from damage, exposure to open flame or other ignition sources, wetting, condensation, and moisture absorption. Keep materials wrapped and separated from off-gassing materials (such as drying paints and adhesives). Do not use materials that have visible moisture or biological growth. Store in an enclosed building or trailer that provides a dry, adequately ventilated environment. Replace damaged material with new material.

#### 1.11 ENVIRONMENTAL CONDITIONS

Do not install roof insulation during inclement weather or when air temperature is below 40 degrees F and interior humidity is 45 percent or greater, or when there is visible ice, frost, or moisture on the roof deck.

#### 1.12 PROTECTION

Provide protection as specified in 07 52 00.00 48 SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM.

##### 1.12.1 Completed Work

Cover completed work with cover board for the duration of construction. Avoid traffic on completed work particularly when ambient temperature is above 80 degrees F. Replace crushed or damaged insulation prior to roof surface installation.

### PART 2 PRODUCTS

#### 2.1 INSULATION

##### 2.1.1 Insulation Types

Provide roof insulation that is compatible with attachment methods for the specified insulation and roof membrane.

Polyisocyanurate Board: Provide in accordance with ASTM C1289 REV A Type II, fibrous felt or glass mat membrane both sides, except minimum compressive strength of 20 pounds per square inch (psi).

##### 2.1.2 Recycled Materials

Provide thermal insulation materials containing recycled content. Unless specified otherwise, the minimum required recycled content for listed materials are:

Polyisocyanurate/polyurethane:	9 percent recovered material
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Provide data identifying percentage of recycled content for insulation.

### 2.1.3 Indoor Air Quality

Provide certification of indoor air quality for insulation.

### 2.1.4 Insulation Thickness

As necessary to provide the thermal resistance (R-value) indicated on drawings. Base calculation on the R-value for aged insulation. For insulation over steel decks, satisfy both specified R-value and minimum thickness for width of rib opening recommended in insulation manufacturer's published literature.

### 2.1.5 Cants and Tapered Edge Strips

Provide preformed cants and tapered edge strips of the same material as the roof insulation. When unavailable, provide pressure-preservative treated wood, wood fiberboard, or rigid perlite board cants and edge strips as recommended by the roofing manufacturer for the specific application, unless otherwise indicated. Face of cant strips to incline at 45 degrees with a minimum vertical height of 4 inches. Taper edge strips at a rate of one to 1 1/2 inch per foot down to approximately 1/8 inch thick.

## 2.2 COVER BOARD

For use as a cover board for hot-mopped, torched-down, or adhesive-applied roofing membrane over roof insulation.

### 2.2.1 Glass Mat Gypsum Roof Board

ASTM C1177/C1177M, 0 Flame Spread and 0 Smoke Developed when tested in accordance with ASTM E84, 500 psi, Class A, non-combustible, 1/2 inch thick, 4 by 8 feet board size.

## 2.3 BITUMENS

### 2.3.1 Asphalt Primer

Provide in accordance with ASTM D41/D41M.

### 2.3.2 Asphalt

Provide in accordance with ASTM D312, Type III or IV. Asphalt flash point, finished blowing temperature, and equiviscous temperature (EVT) for mop and mechanical spreader application must be indicated on each container.

### 2.3.3 Asphalt Roof Cement

Provide in accordance with ASTM D4586/D4586M, Type I, for horizontal surfaces and surfaces sloped from 0 to 3 inches per foot. Type II for vertical and surfaces sloped more than 3 inches per foot.

## 2.4 SHEATHING PAPER FOR WOOD DECKS

Rosin-sized building paper or unsaturated felt weighing not less than 5 pounds per 100 square feet.

## 2.5 FASTENERS

Provide flush-driven fasteners through flat round or hexagonal steel or plastic plates. Provide zinc-coated steel plates, flat round not less than 1 3/8 inch diameter, hexagonal not less than 28 gage. Provide high-density plastic plates, molded thermoplastic with smooth top surface, reinforcing ribs and not less than 3 inches in diameter. Fully recess fastener head into plastic plate after it is driven. Form plates to prevent dishing. Do not use bell or cup shaped plates. Provide fasteners in accordance with insulation manufacturer's recommendations for holding power when driven, or a minimum of 120 pounds each in steel deck, whichever is the higher minimum. Provide fasteners for steel or concrete decks in accordance with FM APP GUIDE (<http://www.approvalguide.com/>) for Class I roof deck construction, and spaced to withstand uplift pressure as indicated on the drawings.

### 2.5.1 Fasteners for Steel Decks

Approved hardened penetrating fasteners or screws in accordance with FM 4450 and listed in FM APP GUIDE for Class I roof deck construction. Quantity and placement to withstand a minimum uplift pressure as indicated on the drawings.

## 2.6 WOOD NAILERS

Pressure-preservative treated as specified in Section 06 10 00 ROUGH CARPENTRY.

## PART 3 EXECUTION

### 3.1 EXAMINATION AND PREPARATION

#### 3.1.1 Surface Inspection

Ensure surfaces are clean, smooth, and dry prior to application. Check roof deck surfaces for defects before starting work.

The Contractor must inspect and approve the surfaces immediately before starting installation. Prior to installing insulation, perform the following:

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 from hollow or low spots, perform the following:

- a. Provide wood nailers of the same thickness as the insulation at eaves, edges, curbs, walls, and roof openings for securing of cant strips, gravel stops, gutters, and flashing flanges. On decks with slopes of one in 12 (1 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 width to span the width of a deck rib opening, and in accordance with fire safety requirements. Secure with piercing or self-drilling, self-tapping fasteners of quantity and placement in accordance with FM APP GUIDE. Locate insulation joints parallel to ribs of deck on solid bearing surfaces only, not over open ribs.

### 3.2 INSULATION INSTALLATION

Apply insulation in two layers with staggered joints when total required thickness of insulation exceeds 1/2 inch. Lay insulation so that continuous longitudinal joints are perpendicular to direction of roofing, as specified in Section 07 52 00.00 48 SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM, and end joints of each course are staggered with those of adjoining courses. When using multiple layers of insulation, provide joints of each succeeding layer that are parallel and offset in both directions with respect to the layer below. Keep insulation 1/2 inch clear of vertical surfaces penetrating and projecting from roof surface. Verify required slopes to each roof drain.

#### 3.2.1 Installation Using Asphalt

Firmly embed each layer in solid asphalt mopping; mop only sufficient area to provide complete embedment of one board at a time. Provide 20 to 35 lbs of asphalt per 100 square feet of roof deck for each layer of insulation. Apply asphalt when temperature is within plus or minus 25 degrees F of EVT. Do not heat asphalt above asphalt's FBT or 525 degrees F, whichever is less, for longer than 4 consecutive hours. Use thermometers to check temperatures during heating and application.

#### 3.2.2 Installation Using Asphalt on Steel Decks

Secure first layer of insulation to deck with piercing or self-drilling, self-tapping fasteners. Engage fasteners by driving them through insulation into top flange of steel deck. Use driving method prescribed by fastener manufacturer. Locate insulation joints parallel to ribs of deck on solid bearing surfaces only, not over open ribs. Secure succeeding layers with solid asphalt moppings. Where insulation is applied over steel deck, locate long edge joints so that they bear continuously on the steel deck. Insulation that can be readily lifted after installation is not considered adequately secured. Apply insulation only in quantities that can be entirely waterproofed the same day. Phased construction is not permitted. Apply impermeable faced insulation without damage to the facing.

#### 3.2.3 Installation of Protection for Asphalt Work

Before starting asphalt work, protect surrounding areas and surfaces from spillage and migration of asphalt onto other work. Provide non-combustible protective coverings at surfaces adjacent to hoists and kettles. Lap protective coverings at least 6 inches, secure against wind, and vent to prevent collection of moisture on covered surfaces. Keep protective coverings in place for the duration of asphalt work.

### 3.2.4 Installation Using Only Mechanical Fasteners

Secure total thickness of insulation with penetrating type fasteners.

### 3.2.5 Special Precautions for Installation of Foam Insulation

#### 3.2.5.1 Polyisocyanurate Insulation

Where polyisocyanurate foam board insulation is provided, install 1/2 inch glass mat gypsum roof board over top surface of foam board insulation. Stagger joints of insulation with respect to foam board insulation below.

### 3.2.6 Cant Strips

Where indicated, provide cant strips at intersections of roof with walls, parapets, and curbs extending above roof. Wood cant strips must bear on and be anchored to wood blocking. Fit cant strips flush to vertical surfaces. Where possible, nail cant strips to adjoining surfaces. Where cant strips are installed against non-nailable materials, install in heavy mopping of asphalt or set in a heavy coating of asphalt roof cement or an approved adhesive.

### 3.2.7 Tapered Edge Strips

Where indicated, provide edge strips in the right angle formed by the juncture of roof and wood nailing strips that extend above the level of the roof. Install edge strips flush to vertical surfaces of wood nailing strips. Where possible, nail edge strips to adjoining surfaces. Where installed against non-nailable materials, install in a heavy mopping of asphalt or set in a heavy coating of asphalt roof cement or an approved adhesive.

## 3.3 PROTECTION

### 3.3.1 Protection of Applied Insulation

Completely cover each day's installation of insulation with finished roofing specified in 07 52 00.00 48 SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM on same day. Phased construction is not permitted. Protect open spaces between insulation and parapets or other walls and spaces at curbs, scuttles, and expansion joints, until permanent roofing and flashing are applied. Storing, walking, wheeling, or trucking directly on insulation or on roofed surfaces is not permitted. Provide smooth, clean board or plank walkways, runways, and platforms near supports, as necessary, to distribute weight in accordance with indicated live load limits of roof construction. Protect exposed edges of insulation with cutoffs at the end of each work day or whenever precipitation is imminent. Cutoffs must be two layers of bituminous-saturated felt set in plastic bituminous cement set in roof cement. Fill all profile voids in cutoffs to prevent trapping moisture below the membrane. Remove cutoffs when work resumes.

### 3.3.2 Damaged Work and Materials

Restore work and materials that become damaged during construction to original condition or replace with new materials.

### 3.4 INSPECTION

Establish and maintain inspection procedures to assure compliance of the installed roof insulation with contract requirements. Remove, replace, correct in an approved manner, any work found not in compliance. Quality control must include, but is not limited to, the following:

- a. Observation of environmental conditions; number and skill level of insulation workers; start and end time of work.
- b. Verification of certification, listing or label compliance with FM Data Sheets. (  
<https://www.fmglobal.com/fmglobalregistration/Downloads.aspx>)
- c. Verification of proper storage and handling of insulation and vapor retarder materials before, during, and after installation.
- d. Inspection of 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 24 00

EXTERIOR INSULATION AND FINISH SYSTEMS

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 B117	(2016) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM C1186	(2008; R 2012) Standard Specification for Flat Non-Asbestos Fiber Cement Sheets
ASTM C150/C150M	(2018) Standard Specification for Portland Cement
ASTM C473	(2016) Standard Test Methods for Physical Testing of Gypsum Panel Products
ASTM C578	(2018) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C67/C67M	(2018) Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM D2247	(2015) Testing Water Resistance of Coatings in 100% Relative Humidity
ASTM D3273	(2016) Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
ASTM D968	(2017) Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM E136	(2016) Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C
ASTM E2098/E2098M	(2013) Determining Tensile Breaking Strength of Glass Fiber Reinforcing Mesh for Use in Class PB Exterior Insulation and Finish Systems (EIFS) after Exposure to a Sodium Hydroxide Solution
ASTM E2486	(2006) Standard Test Method for Impact

Resistance of Class PB and PI Exterior  
Insulation and Finish Systems (EIFS)

- ASTM E2570/E2570M (2007; R 2014; E 2014) Standard Test Methods for Evaluating Water-Resistive Barrier (WRB) Coatings Used under Exterior Insulation and Finish Systems (EIFS) or EIFS with Drainage
- ASTM E330/E330M (2014) Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
- ASTM E331 (2000; R 2016) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
- ASTM E84 (2018a) Standard Test Method for Surface Burning Characteristics of Building Materials
- ASTM G153 (2013) Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials

INTERNATIONAL CODE COUNCIL (ICC)

- ICC IBC (2018) International Building Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 268 (2012) Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source
- NFPA 285 (2012) Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

1.2 SYSTEM DESCRIPTION AND REQUIREMENTS

The exterior insulation and finish system (EIFS) must be a job-fabricated, drainable, exterior wall covering consisting of sheathing, air and moisture barrier, insulation board, reinforcing fabric, base coat, finish coat, adhesive and mechanical fasteners as applicable. The system components must be compatible with each other and with the substrate as recommended or approved by, and the products of, a single manufacturer regularly engaged in furnishing Exterior Insulation and Finish Systems. All materials must be installed by an applicator approved by the system manufacturer. EIFS must be Class PB and shall be color and finish as indicated on drawings.

### 1.2.1 System Requirements and Tests

The system must meet the performance requirements as verified by the tests listed below. Where a wall system of similar type, size, and design as specified for this project has been previously tested under the condition specified herein, the resulting test reports may be submitted in lieu of job specific tests.

#### 1.2.1.1 Water Penetration

Test the system for water penetration by uniform static air pressure in accordance with ASTM E331. There must be no penetration of water beyond the plane of the base coat/EPS board interface after 15 minutes at 6.4 psf, or 20 percent of positive design wind pressure, whichever is greater.

#### 1.2.1.2 Wind Load

Test the system for wind load by uniform static air pressure in accordance with ASTM E330/E330M (procedure A) to a minimum pressure of 50 psf. There must be no permanent deformation, delamination, or other deterioration.

#### 1.2.1.3 Full scale or intermediate scale fire test

Conduct wall fire test using apparatus, specimen, performance criteria, and procedure in accordance with NFPA 285 when required by ICC IBC 2603.5.5. The following requirements must be met:

- a. No vertical spread of flame within core of panel from one story to the next.
- b. No flame spread over the exterior surface.
- c. No vertical flame spread over the interior surface from one story to the next.
- d. No significant lateral spread of flame from compartment of fire origin to adjacent spaces.

### 1.2.2 Component Requirements and Tests

The components of the system must meet the performance requirements as verified by the tests listed below.

#### 1.2.2.1 Surface Burning Characteristics

Conduct ASTM E84 test on samples consisting of base coat, reinforcing fabric, and finish coat. Cure for 28 days. The flame spread index must be 25 or less and the smoke developed index must be 450 or less.

#### 1.2.2.2 Radiant Heat

The system must be tested in accordance with NFPA 268 on both the minimum and maximum thickness of insulation intended for use with no ignition during the 20-minute period.

#### 1.2.2.3 Impact Resistance

Class PB Systems: Hemispherical Head Test; 28 day cured specimen of PB EIFS in accordance with ASTM E2486. The test specimen must exhibit no

broken reinforcing fabric per ASTM E2486 at an impact of 100 in/lb.

### 1.2.3 Sub-Component Requirements and Tests

Unless otherwise stated, the test specimen must consist of reinforcing mesh, base coat, and finish coat applied in accordance with manufacturer's printed recommendations to the insulation board to be used on the building. For mildew resistance, only the finish coat is applied onto glass slides for testing. These specimen must be suitably sized for the apparatus used and be allowed to cure for a minimum of 28 days prior to testing.

#### 1.2.3.1 Abrasion Resistance

Test in accordance with ASTM D968, Method A. Test a minimum of two specimens. After testing, the specimens must show only very slight smoothing, with no loss of film integrity after 132 gallons of sand.

#### 1.2.3.2 Accelerated Weathering

Test in accordance with ASTM G153, Cycle 1. After 2000 hours specimens must exhibit no visible cracking, flaking, peeling, blistering, yellowing, fading, or other such deterioration.

#### 1.2.3.3 Mildew Resistance

Test in accordance with ASTM D3273. The specimen shall consist of the finish coat material, applied to clean 3 inch by 4 inch glass slides and must be allowed to cure for 28 days. After 28 days of exposure, the specimen must not show any growth.

#### 1.2.3.4 Salt Spray Resistance

Test in accordance with ASTM B117. The specimen must be a minimum of 4 inch by 6 inch and must be tested for a minimum of 300 hours. After exposure, the specimen must exhibit no observable deterioration, such as chalking, fading, or rust staining.

#### 1.2.3.5 Water Resistance

Test in accordance with ASTM D2247. The specimen must be a minimum of 4 inch by 6 inch. After 14 days, the specimen must exhibit no cracking, checking, crazing, erosion, blistering, peeling, or delamination.

#### 1.2.3.6 Absorption-Freeze/Thaw

Class PB systems must be tested in accordance with ASTM E2570/E2570M for 60 cycles of freezing and thawing. After testing, the specimen must exhibit no cracking, checking, or splitting, and negligible weight gain. Class PM systems must be tested in accordance with ASTM C67/C67M for 50 cycles of freezing and thawing. After testing, the specimens must exhibit no cracking or checking and have negligible weight gain.

#### 1.2.3.7 Sample Boards

Unless otherwise stated, provide sample EIFS Component 12 by 24 inches, on sheathing board, including finish color and texture, typical joints and sealant. If more than one color, finish, or pattern is used, provide one sample for each. The test specimen must consist of reinforcing mesh,

base coat, and finish coat applied in accordance with manufacturer's printed recommendations to the insulation board to be used on the building.

#### 1.2.4 Moisture Analysis

Perform a job specific vapor transmission analysis based on project specific climate and specified wall components and materials. Indicate the temperatures and relative humidities for the inside and outside of the building; a complete listing of the building components, their thickness, thermal resistance and permeance, as well as building location and use. If a mathematical model was used for the analysis, include the name of the model and the supplier/developer.

#### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

##### SD-02 Shop Drawings

###### Shop Drawings; G

Show wall layout, construction and expansion joints, decorative grooves, layout of sheathing board, thermal insulation board, and reinforcing mesh and strip reinforcing fabric; joint and flashing details; details at wall penetrations; types and location of fasteners; details at windows and or doors; and details at base, roof, parapet, corners, projecting features, and roof/wall intersections.

##### SD-03 Product Data

###### Sheathing Board

###### Thermal Insulation

###### Adhesive

###### Mechanical Fasteners

###### Accessories

###### Base Coat

###### Portland Cement

###### Reinforcing Fabric

###### Finish Coat

###### Joint Sealant

###### Sealant Primer

Bond Breaker

Backer Rod

Insulation Board

Recycled Content for Insulation Materials; S

Warranty

Include joint and other details, such as end conditions, corners, windows, and parapet. Include shelf life and recommended cleaning solvents in data for sealants. Include Safety Data Sheets (SDS) for all components of the EIFS. The SDS shall be available at the job site.

SD-04 Samples

Sample Boards; G

Color and Texture

SD-05 Design Data

Wind Load Calculations

Moisture Analysis Calculations

SD-06 Test Reports

Abrasion Resistance

Accelerated Weathering

Impact Resistance

Mildew Resistance

Salt Spray Resistance

Water Vapor Transmission

Absorption-Freeze-Thaw

Wall Fire Test

Water Penetration

Water Resistance

Surface Burning Characteristics

Radiant Heat

Substrate

Wind Load

SD-07 Certificates

Qualifications of EIFS Manufacturer

Qualification of EIFS Installer

Qualification of Sealant Applicator

Certify that EIFS installer meets requirements specified under paragraph "Qualification of Installer," and that sealant applicator is approved by the EIFS Manufacturer.

Qualifications of Third Party Inspector

Inspection Check List; G

Submit filled-out inspection check list as required in paragraph "Quality Control," certifying that the installation of critical items meets the requirements of this specification.

SD-08 Manufacturer's Instructions

Installation

Manufacturer's standard printed instructions for the installation of the EIFS. Include requirements for condition and preparation of substrate, installation of EIFS, and requirements for sealants and sealing.

SD-10 Operation and Maintenance Data

EIFS

Include detailed finish repair procedures and information regarding compatibility of sealants with base and finish coatings.

#### 1.4 QUALITY ASSURANCE

##### 1.4.1 Qualifications of EIFS Manufacturer

The EIFS must be the product of a manufacturer who has been in the practice of manufacturing and designing EIFS for a period of not less than 3 years, and has been involved in at least five projects similar to this project in size, scope, and complexity, in the same or a similar climate as this project.

##### 1.4.2 Qualification of EIFS Installer

The EIFS Installer must be trained by the EIFS manufacturer to perform the installation of the System and must have successfully installed at least five projects at or near the size and complexity of this project. The contractor must employ qualified workers trained and experienced in installing the manufacturer's EIFS.

##### 1.4.3 Qualification of Sealant Applicator

The sealant applicator must be experienced and competent in the installation of high performance industrial and commercial sealants and must have successfully installed at least five projects at or near the size and complexity of this project.

#### 1.4.4 Qualifications of Third Party Inspector

Submit evidence that third party inspector has current certification from the Exterior Design Institute or equal inspector certification as inspector for the installation of EIFS.

#### 1.4.5 Insulation Board

Insulation Board must be approved and labeled under third party quality program as required by applicable building code.

#### 1.4.6 Pre-Installation Conference

After approval of submittals and before commencing any work on the EIFS, including installation of any insulation, and associated work, the Contracting Officer will hold a pre-installation conference to review:

- a. Drawings, specifications, and samples;
- b. Procedure for on site inspection and acceptance of EIFS substrate and pertinent details (for example, mock-up installation);
- c. Contractor's plan for coordination of work of the various trades involved in providing EIF system and other components;
- d. Inspection procedures; and
- e. Safety requirements.

Pre-installation conference must be attended by the Contractor, EIFS Q.C. Specialist (EIFS Inspector), and all personnel directly responsible for installation of the EIF system, including sealant applicator, and personnel responsible for related work, such as flashing and sheet metal, windows and doors, and a representative of the EIFS manufacturer. Before beginning EIFS work, the contractor must confirm in writing the resolution of conflicts among those attending the pre-installation conference.

#### 1.5 DELIVERY AND STORAGE

Deliver materials to job site in original unopened packages, marked with manufacturer's name, brand name, and description of contents. Store materials off the ground and in accordance with the manufacturer's recommendations in a clean, dry, well-ventilated area. Protect stored materials from rain, sunlight, and excessive heat. Keep coating materials which would be damaged by freezing at a temperature not less than 40 degrees F. Do not expose insulation board to flame or other ignition sources.

#### 1.6 ENVIRONMENTAL CONDITIONS

- a. Do not prepare materials or apply EIFS during inclement weather unless appropriate protection is provided. Protect installed materials from inclement weather until they are dry.
- b. Apply sealants and wet materials only at ambient temperatures of 40 degrees F or above and rising, unless supplemental heat is provided. The system must be protected from inclement weather and maintain this temperature for a minimum of 24 hours after installation.

- c. Do not leave insulation board exposed to sunlight after installation.

#### 1.7 WARRANTY

Furnish manufacturer's standard warranty for the EIFS. Warranty must run directly to Government and cover a period of not less than 5 years from date Government accepted the work.

### PART 2 PRODUCTS

#### 2.1 COMPATIBILITY

Provide all materials compatible with each other and with the substrate, and as recommended by EIFS manufacturer.

#### 2.2 SHEATHING BOARD

##### 2.2.1 Fiber Reinforced Cement Sheathing Board

- a. Meet ASTM C1186, Type A, Grade I, or.
- b. Non-combustible per ASTM E136.
- c. Nail Pull Resistance: No less than 120 lb when tested in accordance with ASTM C473.
- d. Thickness no less than 1/2 inch.
- e. Water Absorption not to exceed 17 percent.

#### 2.3 ADHESIVE

Manufacturer's standard product, including primer as required, must be compatible with substrate and insulation board to which the system is applied.

#### 2.4 MECHANICAL FASTENERS

Corrosion resistant and as approved by EIFS manufacturer. Select fastener type and pattern based on applicable wind loads and substrate into which fastener will be attached, to provide the necessary pull-out, tensile, and shear strengths.

#### 2.5 THERMAL INSULATION

##### 2.5.1 Manufacturer's Recommendations

Provide only thermal insulation recommended by the EIFS manufacturer for the type of application intended.

##### 2.5.2 Insulation Board

Insulation board must be standard product of manufacturer and must be compatible with other systems components. Boards must be factory marked individually with the manufacturer's name or trade mark, the material specification number, the R-value at 75 degree F, and thickness. No layer of insulation shall be less than 3/4 inch thick. The maximum thickness of all layers must not exceed 4 inches. Insulation Board must be certified

as aged, in block form, prior to cutting and shipping, a minimum of 6 weeks by air drying, or equivalent.

- a. Thermal resistance: As indicated on drawings.
- b. Insulating material: ASTM C578 Type I as recommended by the EIFS manufacturer and treated to be compatible with other EIFS components. Age insulation by air drying a minimum of 6 weeks prior to cutting and shipping.
- c. Drainage: Preform channels into the interior face of insulation board or provide polypropylene drainage lath spacer to provide water drainage system.
- d. Recycled Content: Provide insulation material that has minimum of 10 percent recycled material. Provide data identifying percentage of recycled content for insulation materials.

## 2.6 BASE COAT

Manufacturer's standard product and compatible with other systems components.

## 2.7 PORTLAND CEMENT

Conform to ASTM C150/C150M, Type I or II as required, fresh and free of lumps, and approved by the systems manufacturer.

## 2.8 REINFORCING FABRIC

Reinforcing fabric mesh must be alkali-resistant, balanced, open weave, glass fiber fabric made from twisted multi-end strands specifically treated for compatibility with the other system materials, and comply with ASTM E2098/E2098M and as recommended by EIFS manufacturer.

## 2.9 FINISH COAT

Manufacturer's standard product conforming to the requirements in the paragraph on Sub-Component Requirements and Tests. For color consistency, use materials from the same batch or lot number.

## 2.10 SEALANT PRIMER

Non-staining, quick-drying type recommended by sealant manufacturer and EIFS manufacturer.

## 2.11 ACCESSORIES

Conform to recommendations of EIFS manufacturer, including trim, edging, anchors, and expansion joints. All metal items and fasteners to be corrosion resistant.

## 2.12 JOINT SEALANT

Non-staining, quick-drying type meeting ASTM C920, as Type S or M, minimum Grade NS, minimum Class 25 and compatible with the finish system type and grade, and recommended by both the sealant manufacturer and EIFS manufacturer.

### 2.13 BOND BREAKER

As required by EIFS manufacturer and recommended by sealant manufacturer and EIFS manufacturer.

### 2.14 BACKER ROD

Closed cell polyethylene free from oil or other staining elements and as recommended by sealant manufacturer and EIFS manufacturer. Do not use absorptive materials as backer rod. The backer rod should be sized 25 percent larger than the width of the joint.

## PART 3 EXECUTION

### 3.1 EXAMINATION

Examine substrate and existing conditions to determine that the EIFS can be installed as required by the EIFS manufacturer and that all work related to the EIFS is properly coordinated. Surface must be sound and free of oil, loose materials or protrusions which will interfere with the system installation. If deficiencies are found, notify the Contracting Officer and do not proceed with installation until the deficiencies are corrected. The substrate must be plane, with no deviation greater than 1/4 inch when tested with a 10 foot straightedge. Determine flatness, plumbness, and any other conditions for conformance to manufacturer's instructions.

### 3.2 SURFACE PREPARATION

Prepare existing surfaces for application of the EIFS to meet flatness tolerances and surface preparation according to manufacturer's installation instructions but provide a flatness of not more than 1/4 inch in 10 feet. Provide clean surfaces free of oil and loose material without protrusions adversely affecting the installation of the insulation board. For adhesively attached EIFS, existing deteriorated paint must be removed. Due to substrate conditions or as recommended by the system manufacturer, a primer may be required. Apply the primer to existing surfaces as recommended by the manufacturer. Use masking tape to protect areas adjacent to the EIFS to prevent base or finish coat to be applied to areas not intended to be covered with the EIFS. The contractor must not proceed with the installation until all noted deficiencies of the substrate are corrected.

### 3.3 INSTALLATION

Install EIFS as indicated, comply with manufacturer's instructions except as otherwise specified, and in accordance with the shop drawings. EIFS must be installed only by an applicator trained by the EIFS manufacturer. Specifically, include all manufacturer recommended provisions regarding flashing and treatment of wall penetrations. Any materials that show visual evidence of biological growth due to the presence of moisture must not be installed on the building project.

#### 3.3.1 Sheathing Board

Edges and ends of boards must be butted snugly with vertical joints staggered to provide full and even support for the insulation. Do not align sheathing board joints with wall openings. Provide support at both vertical and horizontal joints. Attach sheathing board to metal studs

with self-tapping drywall screws. Place fasteners sufficiently close to support imposed loads, but not more than:

Maximum of 8 inches apart on each supporting stud

Space fasteners more closely when required for negative wind load resistance.

### 3.3.2 Insulation Board

Unless otherwise specified by the system manufacturer, place the long edge horizontally from level base line. Stagger vertical joints and interlock at corners. Butt joints tightly. Provide flush surfaces at joints. Offset insulation board joints from joints in sheathing by at least 8 inches. Align drainage channels of integral drainage system or provide polypropylene drainage lath space to provide a path for any water weeped from behind the insulation to escape wall construction. Use L-shaped insulation board pieces at corners of openings. Joints of insulation must be butted tightly. Surfaces of adjacent insulation boards must be flush at joints. Gaps greater than 1/16 inch between the insulation boards must be filled with slivers of insulation. Uneven board surfaces with irregularities projecting more than 1/16 inch must be rasped in accordance with the manufacturer's instructions to produce an even surface. Attach insulation board as recommended by manufacturer. The adhered insulation board must be allowed to remain undisturbed for 24 hours prior to proceeding with the installation of the base coat/reinforcing mesh, or longer if necessary for the adhesive to dry. However, do not leave insulation board exposed longer than recommended by insulation manufacturer.

#### 3.3.2.1 Mechanically Fastened Insulation Boards

Fasten with manufacturer's standard corrosion resistant anchors, spaced as recommended by manufacturer, but not more than 2 feet horizontally and vertically.

#### 3.3.2.2 Adhesively Fastened Insulation Boards

Apply insulation board using adhesive spread with a notched trowel to the back of the insulation boards in accordance with the manufacturer's instructions.

### 3.3.3 Base Coat and Reinforcing Fabric Mesh,

#### 3.3.3.1 Class PB Systems

Allow the adhered insulation board to dry for 24 hours, or longer if necessary, prior to proceeding with the installation of the base coat/reinforcing fabric mesh. Install reinforcing fabric in accordance with manufacturer's instructions. Mix base coat in accordance with the manufacturer's instructions and apply to insulated wall surfaces to the thickness specified by the system manufacturer and provide any other reinforcement recommended by EIFS manufacturer. Trowel the reinforcing fabric mesh into the wet base coat material. Fully embed the mesh in the base coat. When properly worked-in, the pattern of the reinforcing fabric mesh must not be visible. Provide diagonal reinforcement at opening corners. Back-wrap or edge wrap all terminations of the EIFS. Overlap the reinforcing fabric mesh a minimum of 2.5 inches on previously installed mesh, or butted, in accordance with the manufacturer's instructions.

### 3.3.4 Finish Coat

The base coat/reinforcing mesh must be allowed to dry a minimum of 24 hours prior to application of the finish coat. Surface irregularities in the base coat, such as trowel marks, board lines, reinforcing mesh laps, etc., must be corrected prior to the application of the finish coat. Apply and level finish coat in one operation. Obtain final texture by trowels, floats, or by spray application as necessary to achieve the required finish matching approved sample. Apply the finish coat to the dry base coat maintaining a wet edge at all times to obtain a uniform appearance. The thickness of the finish coat must be in accordance with the system manufacturer's current published instructions. Apply finish coat so that it does not cover surfaces to which joint sealants are to be applied.

### 3.4 JOINT SEALING

Seal EIFS at openings as recommended by the system manufacturer. Apply sealant only to the base coat or base coat with EIFS Manufacturer's color coating. Do not apply sealant to the finish coat.

#### 3.4.1 Surface Preparation, Backer Rod, and Primer

Immediately prior to application, remove loose matter from joint. Ensure that joint is dry and free of finish coat, or other foreign matter. Install backer rod. Apply primer as required by sealant and EIFS manufacturer. Check that joint width is as shown on drawings but in no case shall it be less than 0.5 inch for perimeter seals and 0.75 inch for expansion joints. The width must not be less than 4 times the anticipated movement. Check sealant manufacturer's recommendations regarding proper width to depth ratio.

#### 3.4.2 Sealant

Do not apply sealant until all EIFS coatings are fully dry. Apply sealant in accordance with sealant manufacturer's instructions with gun having nozzle that fits joint width. Do not use sealant that has exceeded shelf life or cannot be discharged in a continuous flow. Completely fill the joint solidly with sealant without air pockets so that full contact is made with both sides of the joint. Tool sealant with a round instrument that provides a concave profile and a uniformly smooth and wrinkle free sealant surface. Do not wet tool the joint with soap, water, or any other liquid tooling aid. During inclement weather, protect the joints until sealant application. Use particular caution in sealing joints between window and door frames and the EIFS wall and at all other wall penetrations. Clean all surfaces to remove excess sealant.

### 3.5 FIELD QUALITY CONTROL

Throughout the installation, the contractor must establish and maintain an inspection procedure to assure compliance of the installed EIFS with contract requirements. Work not in compliance must be removed and replaced or corrected in an approved manner. The inspection procedures, from acceptance of deliveries through installation of sealants and final acceptance must be performed by qualified inspector trained by the manufacturer. No work on the EIFS is allowed unless the inspector is present at the job site.

3.5.1 Third Party Inspection

Provide full time third party inspection during the entire process of installing the EIFS, from examination through cleanup. The third party inspector must be certified by the Exterior Design Institute (EDI), AWCI, or by an equivalent independent party and must be trained in the proper installation of EIFS.

3.5.2 Inspection Check List

During the installation and at the completion of installation, perform inspections covering at the minimum all applicable items enumerated on the attached check list. The inspector must initial and date all applicable items, sign the check list, and submit it to the Contracting Officer at the completion of the EIFS erection.

CHECK LIST

<u>Item</u>	<u>Description</u>	<u>Appr'd/Date</u>
a.	Materials are handled and stored correctly.	_____
b.	Environmental conditions are within specified limits, including temperature not below 4 degrees C (40 degrees F), and the work is protected from the elements as required.	_____
c.	Preparation and installation is performed by qualified personnel using the correct tools.	_____
d.	Adjacent areas to which EIFS is not to be applied (such as on window and door frames) are protected with masking tape, plastic films, drop cloths, etc. to prevent accidental application of EIFS materials.	_____
e.	Control, expansion and aesthetic joints are installed as indicated or recommended. Accessories are properly installed.	_____
f.	Substrate is in-plane, properly attached, clean, dry, and free of contaminants. Concrete substrate is free of efflorescence.	_____
g.	Materials are mixed thoroughly and in proper proportions.	_____
h.	Adhesive is applied in sufficient quantity with proper-size notched trowel.	_____
i.	Mechanical attachments have proper spacing, layout and fastener depth.	_____
j.	Insulation boards are tightly abutted, in running bond pattern, with joints staggered with the sheathing, board corners interlocked, L-shaped boards around openings, edges free of adhesive, and provision for joints. Gaps are filled and surfaces rasped.	_____
k.	Insulation adhesive must be allowed to dry (a minimum of 24-hours) prior to the application of the base coat.	_____

CHECK LIST

<u>Item</u>	<u>Description</u>	<u>Appr'd/Date</u>
l.	Reinforcing fabric mesh is properly back-wrapped at terminations.	=====
m.	Reinforcing fabric mesh is fully embedded and properly placed. Corners are reinforced. Openings are diagonally reinforced. Mesh overlaps minimum 65 mm (2-1/2 inches).	=====
n.	Base coat thickness is within specified limits.	=====
o.	The base coat/reinforcing fabric mesh must be allowed to dry (a minimum of 24-hours) prior to the application of the finish coat.	=====
p.	Finish coat is applied with sufficient number of personnel and stopped at suitable points. Floats and methods of texturing are uniform.	=====
q.	All flashings are properly installed.	=====
r.	All joints are properly sealed in their entire length at time and under environmental conditions as specified by the manufacturer.	=====
s.	All scaffolding, equipment, materials, debris and temporary protection are removed from site upon completion.	=====

Name of Inspector: \_\_\_\_\_ Signed: \_\_\_\_\_  
Date: \_\_\_\_\_

3.6 CLEANUP

Upon completion, remove all scaffolding, equipment, materials and debris from site. Remove all temporary protection installed to facilitate installation of EIFS.

-- End of Section --

SECTION 07 27 10.00 10

BUILDING AIR BARRIER SYSTEM  
05/14

PART 1 GENERAL

1.1 SUMMARY

This Section specifies the construction and quality control of the installation of an air barrier system. Construct the air barrier system indicated, taking responsibility for the means, methods, and workmanship of the installation of the air barrier system. The air barrier must be contiguous and connected across all surfaces of the enclosed air barrier envelope indicated. The maximum leakage requirements of individual air barrier components and materials are specified in the other specification sections covering these items.

This section also defines the maximum allowable leakage of the final air barrier system. The workmanship must be adequate to meet the maximum allowable leakage requirements of this specification. Test the assembled air barrier system to demonstrate that the building envelope is properly sealed and insulated. Passing the air barrier system leakage test and thermography test will result in system acceptance. Conform air barrier system leakage and thermography testing and reporting to the requirements of Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS.

1.2 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM D4541 (2017) Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

1.3 DEFINITIONS

The following terms as they apply to this section:

1.3.1 Air Barrier Accessory

Products designated to maintain air tightness between air barrier materials, air barrier assemblies and air barrier components, to fasten them to the structure of the building, or both (e.g., sealants, tapes, backer rods, transition membranes, fasteners, strapping, primers).

1.3.2 Air Barrier Assembly

The combination of air barrier materials and air barrier accessories that are designated and designed within the environmental separator to act as a continuous barrier to the movement of air through the environmental separator.

### 1.3.3 Air Barrier Component

Pre-manufactured elements such as windows, doors, dampers and service elements that are installed in the environmental separator.

### 1.3.4 Air Barrier Envelope

The combination of air barrier assemblies and air barrier components, connected by air barrier accessories that are designed to provide a continuous barrier to the movement of air through an environmental separator. There may be more than one air barrier envelope in a single building. Also known as Air Barrier System.

### 1.3.5 Air Barrier Material

A building material that is designed and constructed to provide the primary resistance to airflow through an air barrier assembly.

### 1.3.6 Air Barrier System

Same as AIR BARRIER ENVELOPE.

### 1.3.7 Air Leakage Rate

The rate of airflow (CFM) driven through a unit surface area (sq.ft.) of an assembly or system by a unit static pressure difference (Pa) across the assembly. (example: 0.25 CFM/sq.ft. @ 75 Pa)

### 1.3.8 Air Leakage

The total airflow (CFM) driven through the air barrier system by a unit static pressure difference (Pa) across the air barrier envelope. (example: 6500 CFM @ 75 Pa)

### 1.3.9 Air Permeance

The rate of airflow (CFM) through a unit area (sq.ft.) of a material driven by unit static pressure difference (Pa) across the material (example: 0.004 CFM/sq.ft. @ 75 Pa).

### 1.3.10 Environmental Separator

The parts of a building that separate the controlled interior environment from the uncontrolled exterior environment, or that separate spaces within a building that have dissimilar environments. Also known as the Control Layer.

## 1.4 PREPARATORY PHASE OR PRECONSTRUCTION CONFERENCE

Organize pre-construction conferences between the air barrier inspector and the sub-contractors involved in the construction of or penetration of the air barrier system to discuss where the work of each sub-contractor begins and ends, the sequence of installation, and each sub-contractor's responsibility to ensure airtight joints, junctures, penetrations and transitions between materials. Discuss the products, and assemblies of products specified in the different sections to be installed by the different sub-contractors.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Design Review Report; G, DO

Two copies not later than 14 days after approval of the Air Barrier Inspector Qualifications.

Testing and Inspection; G, RO

SD-07 Certificates

Air Barrier Inspector; G, RO

Two copies 30 days after Notice to Proceed.

1.6 AIR BARRIER ENVELOPE SURFACE AREA AND LEAKAGE REQUIREMENTS

The building air barrier systems must meet the following leakage requirements. The allowable leakage rate and the maximum leakage are at a differential test pressure of 75 Pa.

Air Barrier Envelope 1	
Surface Area	96,415 square feet
Architectural Only Test:	
Allowable leakage rate	0.25 CFM/sq.ft
Maximum leakage	24,103.75 total CFM
Architectural Plus HVAC System Test:	
Allowable leakage rate	0.30 CFM/sq.ft
Maximum leakage	28,924.5 total CFM

Air Barrier Building with Option	
Surface Area	109,216 square feet
Architectural Only Test:	

Allowable leakage rate	0.25 CFM/sq.ft
Maximum leakage	27,304 total CFM
Architectural Plus HVAC System Test:	
Allowable leakage rate	0.30 CFM/sq.ft
Maximum leakage	32,764.8 total CFM

### 1.7 AIR BARRIER INSPECTOR

Employ a designated Air Barrier Inspector on this project. The Air Barrier Inspector performs a Design Review, oversees quality control testing specified in these specifications, performs quality control air barrier inspection as specified, interfaces with the designer and product manufacturer's representatives to assure all installation requirements are met, and coordinates efforts between all workers installing or penetrating the air barrier materials. Qualification for the Air Barrier Inspector are as follows:

- a. Training and certification as an Air Barrier Installer from the Air Barrier Association of America (ABAA) or other third party air barrier association.
- b. Experience coordinating and instructing personnel involved in the installation, joining, and sealing of air barrier materials and components.

### 1.8 DESIGN REVIEW

Review the Contract Plans and Specifications and advise the Contracting Officer of any deficiencies that would prevent the construction of an effective air barrier system. Provide a Design Review Report individually listing each deficiency and the corresponding proposed corrective action necessary for proper air barrier system.

## 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 Quality Control Testing And Inspection

Conduct the following tests and inspections as applicable in the presence of the Contracting Officer during installation of the air barrier system,

and submit quality control reports as indicated below.

- a. Provide a Daily Report of Observations with a copy to the Contracting Officer.
- b. Inspect to assure continuity of the air barrier system throughout the building enclosure and that all gaps are covered, the covering is structurally sound, and all penetrations are sealed allowing for no infiltration or exfiltration through the air barrier system.
- c. Inspect to assure structural support of the air barrier system to withstand design air pressures.
- d. Inspect to assure masonry surfaces receiving air barrier materials are smooth, clean, and free of cavities, protrusions and mortar droppings, with mortar joints struck flush or as required by the manufacturer of the air barrier material.
- e. Inspect and test to assure site conditions for application temperature, and dryness of substrates are within guidelines.
- f. Inspect to assure substrate surfaces are properly primed if applicable and in accordance with manufacturer's instructions. Priming must extend at least 2 inches beyond the air barrier material to make it obvious that the primer was applied to the substrate before the air barrier material.
- g. Inspect to assure laps in materials are at least a 2-inch minimum, shingled in the correct direction or mastic applied in accordance with manufacturer's recommendations, and with no fishmouths.
- h. Inspect to assure that a roller has been used to enhance adhesion. Identify any defects such as fishmouths, wrinkles, areas of lost adhesion, and improper curing. Note the intended remedy for the deficiencies.
- i. Measure application thickness of liquid applied materials to assure that manufacturer's specifications for the specific substrate are met.
- j. Inspect to assure that the correct materials are installed for compatibility.
- k. Inspect to assure proper transitions for change in direction and structural support at gaps.
- l. Inspect to assure proper connection between assemblies (membrane and sealants) for cleaning, preparation and priming of surfaces, structural support, integrity and continuity of seal.
- m. Perform adhesion tests for fluid-applied and self-adhered air barrier membranes to assure that the manufacturer's specified adhesion strength properties are met. Determine the bond strength of coatings to substrate in accordance with ASTM D4541.
- n. Provide cohesion tests for spray polyurethane foam (SPF). Perform the tests in accordance with the specification sections which specify these materials. Perform adhesion tests as follows: Using a coring tool remove a sample and determine the relative adhesion quality of the foam. If the foam is hard to remove and leaves small bits of foam

on the substrate it is called cohesive foam failure and is considered the best adhesion. If the foam comes away from the substrate with some force but is clean, it is called a mechanical bond. If it comes away easily from the substrate, the adhesion is poor. Cohesive foam failure and a good mechanical bond are acceptable.

o. Provide written test reports of all tests performed.

### 3.2 REPAIR AND PROTECTION

Upon completion of inspection, testing, sample removal and similar services, repair damaged construction and restore substrates, coatings and finishes. Protect construction exposed by or for quality control service activities, and protect repaired construction.

-- End of Section --

SECTION 07 27 19.01

SELF-ADHERING AIR BARRIERS

05/17

PART 1 GENERAL

1.1 REFERENCES

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

AIR BARRIER ASSOCIATION OF AMERICA (ABAA)

ABAA Accreditation	Accreditation
ABAA QAP	Quality Assurance Program

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; R 2015; E 2015) Standard Test Method for Peel Resistance of Adhesives (T-Peel Test)
ASTM D412	(2016) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D4263	(1983; R 2012) Indicating Moisture in Concrete by the Plastic Sheet Method
ASTM D4541	(2017) Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM D570	(1998; E 2010; R 2010) Standard Test Method for Water Absorption of Plastics
ASTM D903	(1998; R 2017) Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
ASTM 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 E2178	(2013) Standard Test Method for Air Permeance of Building Materials
ASTM E2357	(2017) Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

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 2016) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

ASTM E84 (2018a) Standard Test Method for Surface Burning Characteristics of Building Materials

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 285 (2012) Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

1.2 RELATED REQUIREMENTS

Coordinate the requirements of Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM, Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS and other building enclosure sections to provide a complete building air barrier system. Submit all materials, components, and assemblies of the air barrier system together as one complete submittal package.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Qualifications of Manufacturer; G

Qualifications of Installer; G

SD-02 Shop Drawings

Self-adhering Air Barrier; G

SD-03 Product Data

Self-adhering Air Barrier; G

Primers, Adhesives, and Mastics; G

Safety Data Sheets; G

SD-04 Samples

Self-adhering Air Barrier Mockup; G

SD-06 Test Reports

Field Peel Adhesion Test; G

Flame Propagation of Wall Assemblies; G

Flame Spread and Smoke Developed Index Ratings; G

Site Inspections and Testing; G

SD-07 Certificates

Self-adhering Air Barrier; G

Qualifications of Manufacturer; G

Qualifications of Installer; G

SD-08 Manufacturer's Instructions

Self-adhering Air Barrier; G

Primers, Adhesives, and Mastics; G

1.4 MISCELLANEOUS REQUIREMENTS

For self-adhering air barrier provide the following:

1.4.1 Shop Drawings

Submit self-adhering air barrier shop drawings showing locations and extent of air barrier assemblies and details of all typical conditions, intersections with other building enclosure assemblies and materials, and membrane counterflashings. Show details for bridging of gaps in construction, treatment of inside and outside corners, expansion joints, methods of attachment of materials covering the self-adhered barrier without compromising the barrier. Indicate how miscellaneous penetrations such as conduit, pipes, electric boxes, brick ties, and similar items will be sealed.

1.4.2 Product Data

Submit manufacturer's technical data indicating compliance with performance and environmental requirements, manufacturer's printed instructions for evaluating, preparing, and treating substrates, temperature and other limitations of installation conditions, safety requirements for installation, and Safety Data Sheets. Indicate flame and smoke spread ratings for all products.

1.4.3 Mockup

Provide a mockup of the self-adhering air barrier system specified. Apply product in an area designated by the Contracting Officer. Apply an area of not less than 54 square feet. Include all components specified as

representative of the complete system. Notify the Contracting Officer a minimum of 48 hours prior to the test application. Select a test area representative of conditions to be covered including window or door openings, wall to ceiling transitions, flashings, and penetrations, as applicable.

#### 1.4.4 Test Reports

Submit test reports indicating that field peel-adhesion tests on all materials have been performed and the changes made, if required, in order to achieve successful and lasting adhesion. Submit test reports for flame propagation of wall assemblies tested in accordance with NFPA 285. Submit test reports for flame spread and smoke developed index ratings of barrier system materials tested in accordance with ASTM E84.

### 1.5 DELIVERY, STORAGE, AND HANDLING

#### 1.5.1 Delivery

Deliver and store materials in sufficient quantity to allow for uninterrupted flow of work. Inspect materials delivered to the site for damage and store out of weather. Deliver materials to the jobsite in their original unopened packages, clearly marked with the manufacturer's name, brand designation, description of contents, and shelf life of containerized materials. Store and handle to protect from damage.

#### 1.5.2 Storage

Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling. Protect stored materials from direct sunlight. Keep materials sealed and separated from absorptive materials, such as wood and insulation.

### 1.6 FIELD PEEL ADHESION TEST

Perform a field peel-adhesion test on the construction mockup. Test the self-adhering air barrier for adhesion in accordance with ASTM D4541 using a Type II pull tester except use a disk that is 4 inches in diameter and cut through the membrane to separate the material attached to the dish from the surrounding material. Perform test after curing period in accordance with manufacturer's written recommendations. Record mode of failure and area which failed in accordance with ASTM D4541. Compare adhesion values with the manufacturer's established minimum values for the particular combination of material and substrate. Indicate on the inspection report whether the manufacturer's requirement has been met. Where the manufacturer has not declared a minimum adhesion value for their product and substrate combination, the inspector must record actual values.

### 1.7 AIR BARRIER TESTING

Perform air barrier testing in accordance with Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM and Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS.

## 1.8 QUALITY ASSURANCE

### 1.8.1 Qualifications of Manufacturer

Submit documentation verifying that the manufacturer of the self-adhering air barrier is currently accredited by Air Barrier Association of America (ABAA Accreditation <https://www.airbarrier.org/>).

### 1.8.2 Qualifications of Installer

Submit documentation verifying that installers of the self-adhering air barrier are currently certified in accordance with the ABAA QAP Quality Assurance Program (<https://www.airbarrier.org/qap/>).

## 1.9 PRECONSTRUCTION MEETING

Conduct a preconstruction meeting a minimum of two weeks prior to commencing work specified in this Section. Agenda must include, at a minimum, construction and testing of mockup, sequence of construction, coordination with substrate preparation, materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and details of construction. Attendance is required by representatives of related trades including covering materials, substrate materials, adjacent materials, and materials and components of the air barrier system.

## 1.10 ENVIRONMENTAL CONDITIONS

### 1.10.1 Temperature

Install air barrier within the range of ambient and substrate temperatures as recommended in writing by the air barrier manufacturer. Verify that the surface to receive self-adhering air barrier is dry for a minimum of 48 hours prior to the installation of the barrier. Do not apply air barrier to damp or wet substrates. Do not apply during inclement weather or when ice, frost, surface moisture, or visible dampness is present on surfaces to be covered, or when precipitation is imminent.

### 1.10.2 Exposure to Weather and Ultraviolet Light

Protect air barrier products from direct exposure to rain, snow, sunlight, mist, and other extreme weather conditions. Replace, at no additional cost to the government, barrier products that have been exposed to ultraviolet (sun)light longer than allowed by manufacturer's written requirements.

## PART 2 PRODUCTS

### 2.1 SELF ADHERING AIR BARRIER

Provide minimum 0.040 inch thick self-adhering, vapor retarding, air barrier membrane consisting of a cross-laminated high density polyethylene (HDPE) film, fully coated with rubberized asphalt adhesive. Provide membrane in rolls of various widths interleaved with disposable silicone release paper. Self-adhering air barrier must exhibit no visible water leakage when tested in accordance with ASTM E331 and must perform as a liquid water drainage plane flashed to discharge to the exterior any incidental condensation or water penetration. Use regular or low temperature formulation depending on site conditions, within temperature

ranges specified by manufacturer.

#### 2.1.1 Physical Properties

- a. Air Permeance (ASTM E2178): In accordance with Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM
- b. Air Leakage (ASTM E2357, ASTM E283): In accordance with Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM and Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS.
- c. Tensile Strength (ASTM D412 die C modified): Not less than 400 psi.
- d. Tensile Elongation (ASTM D412 die C modified): Not less than 200 percent.
- e. Puncture Resistance (ASTM E154/E154M): Not less than 40 lbs.
- f. Pliability (ASTM D146/D146M): Unaffected at minus 25 degrees F, 0.063 inch mandrel.
- g. Lap Adhesion (ASTM D1876 modified): Not less than 4.0 lbs per inch.
- h. Peel Adhesion (ASTM D903): Not less than 5.0 lbs per inch.
- i. Water Absorption (ASTM D570): Not to exceed 0.12 percent by weight.
- j. Flame propagation of wall assemblies (NFPA 285): Pass
- k. Surface Burning Characteristics (ASTM E84):
  - (1) Flame Spread Index Rating not higher than 75.
  - (2) Smoke Developed Index Rating not higher than 150.

#### 2.2 PRIMERS, ADHESIVES, AND MASTICS

Provide primers, adhesives, mastics and other accessory materials as recommended in writing by the manufacturer of the self-adhering air barrier for adequate bonding to each type of substrate.

#### 2.3 SHEET METAL FLASHING

Provide as specified in Section 07 62 00.00 48 FLASHING AND SHEET METAL.

#### 2.4 JOINT SEALANTS

Provide as specified in Section 07 92 00.00 48 JOINT SEALANTS. Verify compatibility with adjacent products that are or will be in contact with one another.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

Before installing air barrier, examine substrates, areas, and conditions under which air barrier assemblies will be applied, with Installer present, for compliance with requirements. Ensure the following conditions are met:

- a. Surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants.
- b. Concrete surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions.
- c. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method in accordance with ASTM D4263 and take suitable measures until substrate passes moisture test.
- d. Verify sealants used in sheathing are compatible with membrane proposed for use. Perform field peel adhesion test on materials to which sealants are adhered.

### 3.2 PREPARATION

Clean, prepare, and treat substrate in accordance with manufacturer's written instructions. Ensure clean, dust-free, and dry substrate for air barrier application.

- a. Prime masonry and concrete substrates with conditioning primer.
- b. Prime gypsum sheathing an adequate number of coats to achieve required bond, with adequate drying time between coats.
- c. Prime wood, metal, and painted substrates with primer.
- d. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through air barrier and at protrusions.

### 3.3 INSTALLATION

#### 3.3.1 Installation of Self-adhering Air Barrier

Install materials in accordance with manufacturer's recommendations and the following:

- a. Apply primer at rate recommended by manufacturer prior to membrane installation. Allow primer to dry completely before membrane application. Apply as many coats as necessary for proper adhesion.
- b. When membrane is properly positioned, press into place and roll membrane with roller immediately after placement.
- c. Apply membrane sheets to shed water naturally without interception by a sheet edge, unless that edge is sealed with permanently flexible termination mastic.
- d. Position subsequent sheets of membrane applied above so that membrane overlaps the membrane sheet below by a minimum of 2-1/2 inches, unless greater overlap is recommended by manufacturer. Roll into place with roller.
- e. Make all side laps a minimum of 2-1/2 inches and all end laps a minimum of 5 inches, unless greater overlap is recommended by manufacturer. Roll seams with roller.

- f. Roll membrane to adhere to substrate. Cover corners and joints with two layers of reinforcement by first applying a 12 inch width of membrane centered along the axis. Flash drains and projections with a second ply of membrane for a distance of 6 inches from the drain or projection.
- g. Seal around all penetrations through the air barrier resulting from pipes, vents, conduit, electrical fixtures, structural members, or other construction passing through it. Seal with termination mastic, extruded silicone sealant, membrane counterflashing or other sealing methods in accordance with manufacturer's written recommendations.
- h. Continuously connect the air barrier between walls, roof, floor and below grade assemblies to form a continuous integrated air barrier system around the entire building enclosure. Extend the air barrier membrane into rough openings such as doors, windows, louvers, and other exterior penetrations. Seal edges of barrier at junctures with rough openings.
- i. At changes in substrate plane, provide transition material (e.g. bead of sealant, mastic, extruded silicone sealant, membrane counterflashing or other material recommended by manufacturer) under membrane to eliminate all sharp 90 degree inside corners and to make a smooth transition from one plane to another.
- j. Provide mechanically fastened non-corrosive metal sheet to span gaps in substrate plane and to make a smooth transition from one plane to the other. Continuously support membrane with substrate.
- k. At deflection and control joints, provide backup for the membrane to accommodate anticipated movement.
- l. At expansion and seismic joints provide transition to the joint assemblies.
- m. Apply a bead or trowel coat of mastic along membrane seams at reverse lapped seams, rough cuts, and as recommended by the manufacturer.
- n. At end of each working day, seal top edge of membrane to substrate with termination mastic.
- o. Do not allow materials to come in contact with chemically incompatible materials.
- p. Counterflash upper edge of thru-wall flashing and air barrier. Counter flashing and thru-wall flashing are specified in Section 07 62 00.00 48 FLASHING AND SHEET METAL.

### 3.4 FIELD QUALITY CONTROL

#### 3.4.1 Site Inspections and Testing

Provide site inspections and testing in accordance with ABAA protocol to verify conformance with the manufacturer's instructions, the ABAA QAP Quality Assurance Program (<https://www.airbarrier.org/qap/>), Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM,, Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS, and this section.

- a. Conduct inspections and testing at 5, 50, and 95 percent completion of

this scope of work. Forward written site inspections and testing reports to the Contracting Officer within five working days of the inspection and test being performed.

- b. If inspections reveal any defects, promptly remove and replace defective work at no additional expense to the Government.

### 3.5 FIELD PEEL ADHESION TEST

Conduct in accordance with test protocol indicated in Part 1, paragraph FIELD PEEL ADHESION TEST.

### 3.6 PROTECTION AND CLEANING

#### 3.6.1 Protection

##### 3.6.1.1 Adjacent Surfaces

Protect exposed adjacent surfaces that could be damaged by primers and adhesives associated with air barrier membrane. Provide protection during application and the remainder of construction in accordance with manufacturer's written instructions.

##### 3.6.1.2 The Air Barrier Assembly

Protect finished portions of the air barrier assembly from damage during ongoing application and throughout the remainder of the construction period in accordance with manufacturer's written instructions. Coordinate timing of installation of materials that will cover the air barrier membrane to ensure the exposure period does not exceed that recommended by the air barrier manufacturer's written installation instructions. Remove and replace, at no additional cost to the government, membrane products that exceed the manufacturer's allowed exposure limits.

#### 3.6.2 Cleaning

Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction and as acceptable to the primary material manufacturer.

-- End of Section --

SECTION 07 27 26

FLUID-APPLIED MEMBRANE AIR BARRIERS  
05/17

PART 1 GENERAL

1.1 REFERENCES

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

AIR BARRIER ASSOCIATION OF AMERICA (ABAA)

ABAA Accreditation	Accreditation
ABAA QAP	Quality Assurance Program

ASTM INTERNATIONAL (ASTM)

ASTM C836/C836M	(2015) High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use With Separate Wearing Course
ASTM D412	(2016) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D4263	(1983; R 2012) Indicating Moisture in Concrete by the Plastic Sheet Method
ASTM D4541	(2017) Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM D5590	(2000; R 2010; E 2012) Standard Test Method for Determining the Resistance of Paint Films and Related Coatings to Fungal Defacement by Accelerated Four-Week Agar Plate Assay
ASTM E2178	(2013) Standard Test Method for Air Permeance of Building Materials
ASTM E2357	(2017) Standard Test Method for Determining Air Leakage of Air Barrier Assemblies
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 2016) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by

Uniform Static Air Pressure Difference

ASTM E84 (2018a) Standard Test Method for Surface  
Burning Characteristics of Building  
Materials

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 285 (2012) Standard Fire Test Method for  
Evaluation of Fire Propagation  
Characteristics of Exterior  
Non-Load-Bearing Wall Assemblies  
Containing Combustible Components

1.2 RELATED REQUIREMENTS

Coordinate the requirements of Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM, Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS, and other building enclosure sections to provide a complete building air barrier system. Submit all materials, components and assemblies of the air barrier system together as one complete submittal package.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Qualifications of Manufacturer; G

Qualifications of Installer; G

SD-02 Shop Drawings

Fluid-Applied Membrane Air Barrier; G

SD-03 Product Data

Fluid-Applied Membrane Air Barrier; G

Transition Membrane; G

Primers, Adhesives, and Mastics; G

Reinforcement; G

Safety Data Sheets; G

SD-04 Samples

Fluid-Applied Membrane Air Barrier Mockup; G

SD-06 Test Reports

Capillary Moisture Test; G

Field Peel Adhesion Test; G

Flame Propagation of Wall Assemblies; G

Flame Spread and Smoke Developed Index Ratings; G

Site Inspections Reports; G

SD-07 Certificates

Fluid-Applied Membrane Air Barrier; G

Transition Membrane; G

Qualifications of Manufacturer; G

Qualifications of Installer; G

SD-08 Manufacturer's Instructions

Fluid-Applied Membrane Air Barrier; G

Transition Membrane; G

Primers, Adhesives, and Mastics; G

1.4 MISCELLANEOUS REQUIREMENTS

For fluid-applied membrane air barriers provide the following:

1.4.1 Shop Drawings

Submit fluid-applied membrane air barrier shop drawings showing locations and extent of barrier assemblies, transition membranes, details of all typical conditions, intersections with other envelope assemblies and materials, and membrane counterflashings. Show details for bridging of gaps in construction, treatment of inside and outside corners, expansion joints, methods of attachment of materials covering the self-adhered barrier without compromising the barrier. Indicate how miscellaneous penetrations such as conduit, pipes, electric boxes, brick ties, and similar items will be sealed.

1.4.2 Product Data

Submit manufacturer's technical data indicating compliance with performance and environmental requirements, manufacturer's printed instructions for evaluating, preparing, and treating substrates, temperature and other limitations of installation conditions, safety requirements for installation, and Safety Data Sheets. Indicate flame and smoke spread ratings for all products.

1.4.3 Mockup

Provide a mockup of the fluid-applied membrane air barrier. Apply product in an area designated by the Contracting Officer. Apply an area of not

less than 54 square feet. Include all components specified as representative of the complete system. Notify the Contracting Officer a minimum of 48 hours prior to the test application. Select a test area representative of conditions to be covered including window or door openings, wall to ceiling transitions, flashings, and penetrations, as applicable.

#### 1.4.4 Test Reports

Submit test reports indicating that capillary moisture tests and field peel adhesion tests on all substrate materials have been performed and the changes made, if required, in order to achieve successful and lasting adhesion. Submit test reports for flame propagation of wall assemblies tested in accordance with NFPA 285. Submit test reports for flame spread and smoke developed index ratings of barrier materials tested in accordance with ASTM E84.

### 1.5 DELIVERY, STORAGE, AND HANDLING

#### 1.5.1 Delivery

Deliver and store materials in sufficient quantity to allow for uninterrupted flow of work. Inspect materials delivered to the site for damage and store out of weather. Deliver materials to the jobsite in their original unopened packages, clearly marked with the manufacturer's name, brand designation, description of contents, and shelf life of containerized materials. Store and handle to protect from damage.

#### 1.5.2 Storage

Inspect materials delivered to the site for damage; unload and store out of weather in manufacturer's original packaging. Store only in dry locations, not subject to open flames or sparks, and easily accessible for inspection and handling. Protect stored materials from direct sunlight.

### 1.6 CAPILLARY MOISTURE TEST

Perform a capillary moisture test by plastic sheet method in accordance with ASTM D4263 on the construction mockup and substrate materials. Perform test after curing period as recommended by the air barrier manufacturer. Record mode of failure and area which failed in accordance with ASTM D4263. Once the air barrier material manufacturer has established a minimum adhesion or moisture level for the product on the particular substrate, indicate on the inspection report whether this requirement has been met. Where the manufacturer has not declared a minimum adhesion or moisture value for their product and substrate combination, the inspector must record actual values.

### 1.7 FIELD PEEL ADHESION TEST

Perform a field peel adhesion test on a construction mockup. Test the applied product for adhesion in accordance with manufacturer's recommendations. Perform test after curing period recommended by the manufacturer. Record mode of failure and area which failed in accordance with ASTM D4541. When the manufacturer has established a minimum adhesion level for the product on the particular substrate, the inspection report must indicate whether this requirement has been met. Where the manufacturer has not declared a minimum adhesion value for their product/substrate combination, the inspector must record actual values.

## 1.8 AIR BARRIER TESTING

Perform air barrier testing in accordance with Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM Section and 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS.

## 1.9 QUALITY ASSURANCE

### 1.9.1 Qualifications of Manufacturer

Submit documentation verifying that manufacturer of fluid-applied membrane air barrier is currently accredited by the Air Barrier Association of America (ABAA Accreditation <https://www.airbarrier.org/>).

### 1.9.2 Qualifications of Installer

Submit documentation verifying that installers of the fluid-applied membrane air barrier are currently certified in accordance with the ABAA QAP Quality Assurance Program (<https://www.airbarrier.org/qap/>).

## 1.10 PRECONSTRUCTION MEETING

Conduct a preconstruction meeting a minimum of two weeks prior to commencing work specified in this Section. Agenda must include, at a minimum, construction and testing of construction mock up, sequence of construction, coordination with substrate preparation, materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and details of construction. Attendance is required by representatives of related trades including covering materials, substrate materials, adjacent materials, and materials and components of the fluid-applied membrane air barrier.

## 1.11 ENVIRONMENTAL CONDITIONS

### 1.11.1 Temperature

Install fluid-applied membrane air barrier within the range of ambient and substrate temperatures as recommended in writing by the fluid-applied membrane air barrier manufacturer. Do not apply fluid-applied membrane air barrier to a damp or wet substrate. Do not apply during inclement weather or when ice, frost, surface moisture, or visible dampness is present on surfaces to be covered, or when precipitation is imminent.

### 1.11.2 Exposure to Weather

Protect fluid-applied membrane air barrier products from direct exposure to rain, snow, sunlight, mist, and other extreme weather conditions. Replace, at no additional cost to the government, barrier products that have been exposed to ultraviolet (sun)light longer than allowed by manufacturer's written requirements.

## PART 2 PRODUCTS

### 2.1 FLUID-APPLIED MEMBRANE AIR BARRIER

Provide a fluid-applied, vapor retarding, air barrier. This barrier must exhibit no visible water leakage when tested in accordance with ASTM E331 and must perform as a liquid water drainage plane with thru-wall flashing

to discharge incidental condensation and water penetration to the exterior of the building enclosure. Provide products suitable for use within temperature ranges specified by manufacturer for the location of the project.

#### 2.1.1 Physical Properties

- a. Air Permeance (ASTM E2178): in accordance with Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM
- b. Air Leakage (ASTM E2357, ASTM E283): in accordance with Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM and Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS.
- c. Tensile Strength (ASTM D412): Not less than 138 psi.
- d. Elongation (ASTM D412): Not less than 300 percent.
- e. Low temperature Flexibility and Crack Bridging (ASTM C836/C836M): Pass at minus 15 degrees F.
- f. Solids by Volume: minimum 50 percent.
- g. Flame propagation of wall assemblies (NFPA 285): Pass
- h. Surface Burning Characteristics (ASTM E84):
  - (1) Flame Spread Index Rating not higher than 75.
  - (2) Smoke Developed Index Rating not higher than 150.
- i. Resistance to Mold, Mildew and Fungal Growth (ASTM D5590): 0, No growth.

#### 2.2 PRIMERS, ADHESIVES, AND MASTICS

Provide primers, adhesives, mastics, sealants and other accessories as recommended by manufacturer of fluid-applied membrane air barrier for a complete installation.

#### 2.3 TRANSITION MEMBRANE

Provide as specified in Section 07 27 19.01 SELF-ADHERING AIR BARRIERS.

#### 2.4 SHEET METAL FLASHING

Provide as specified in Section 07 62 00.00 48 FLASHING AND SHEET METAL.

#### 2.5 JOINT SEALANTS

Provide as specified in Section 07 92 00.00 48 JOINT SEALANTS.

#### 2.6 REINFORCEMENT

Provide fiberglass mesh tape, or fluid-applied air barrier manufacturer's approved comparable equal product, reinforcement at seams, edges, projections and penetrations. Reinforce all joints exceeding 1/4 inch with fiberglass mesh.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

Before installing fluid-applied membrane air barrier, examine substrates, areas, and conditions under which fluid-applied membrane air barrier assemblies will be applied, with installer present, for compliance with requirements. Ensure the following conditions are met:

- a. Surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the membranes.
- b. Concrete and masonry surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions. Do not proceed with installation until after minimum concrete curing period recommended by fluid-applied membrane air barrier manufacturer.
- c. Fill voids, gaps and spalled areas in substrate to provide an even plane. Strike masonry joints full flush.
- d. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method in accordance with ASTM D4263 and take suitable measures until substrate passes moisture test.
- e. Verify sealants used in substrates, and in joints between substrates, are compatible with fluid-applied membrane air barrier.

#### 3.2 PREPARATION

Clean, prepare, and treat substrate in accordance with manufacturer's written instructions. Ensure clean, dust-free, and dry substrate for fluid-applied membrane air barrier application.

- a. Remove dust, dirt and other contaminants from joints and cracks before coating surfaces.
- b. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through fluid-applied membrane air barrier.
- c. At changes in substrate plane, provide transition material (bead of sealant, mastic, extruded silicone sealant, membrane counterflashing or other material recommended by manufacturer) under transition membrane to eliminate all sharp 90 degree inside corners and to make a smooth transition from one plane to another.
- d. Provide mechanically fastened non-corrosive metal sheet to span gaps in substrate plane and to make a smooth transition from one plane to the other. Continuously support membrane with substrate.
- e. For exterior sheathing substrates, ensure that exterior sheathing is stabilized, with corners and edges fastened with appropriate screws. Treat all joints in accordance with the air barrier manufacturer's instructions prior to application of air barrier material. Allow sufficient time for joint treatments to fully cure before application of transition membranes and fluid-applied membrane air barrier.

- f. For concrete and masonry substrates, fill all voids and holes, particularly in mortar joints, with non-shrinking grout.
- g. Mask off and cover adjacent surfaces to protect from spillage and overspray.

### 3.3 INSTALLATION

#### 3.3.1 Installation of Transition Membrane

Install transition membrane materials in accordance with the details on the drawings, Section 07 27 19.01 SELF-ADHERING AIR BARRIERS, and the following:

- a. Install transition membrane at all required locations prior to installation of the fluid-applied membrane air barrier.
- b. Verify transition membrane is fully adhered to substrate and that its surface is clean, dry and wrinkle free prior to installation of the fluid-applied membrane air barrier.
- c. Verify transition membrane completely covers all transition areas and will provide continuity of the finished fluid-applied membrane air barrier without gaps or cracks.

#### 3.3.2 Installation of Flashing

Counterflash upper edge of thru-wall flashing and fluid-applied air barrier. Counter flashing and thru-wall flashing are specified in Section 07 62 00.00 48 FLASHING AND SHEET METAL.

#### 3.3.3 Installation of Fluid-Applied Membrane Air Barrier

Install materials in accordance with manufacturer's recommendations and the following:

- a. Apply fluid-applied membrane air barrier in single or dual coat application by spray or roller. Apply fluid-applied membrane air barrier within manufacturer's recommended temperature range for application.
- b. Apply fluid-applied membrane air barrier at rate recommended by manufacturer to yield a wet film thickness of 90 mils.
- c. Apply fluid-applied membrane air barrier around all penetrations ensuring a complete and continuous air barrier. Lap fluid-applied membrane air barrier a minimum of 3 inch over transition membrane to seal leading edge.
- d. Seal membrane terminations, heads of mechanical fasteners, masonry tie fasteners, around penetrations, HVAC assemblies, plumbing and electrical assemblies, doors, windows, louvers, and other assemblies penetrating the fluid-applied membrane air barrier with a termination sealant recommended by the fluid-applied membrane air barrier manufacturer.
- e. Notify the Contracting Officer and Testing Agency upon completion of fluid-applied membrane air barrier installation. Air barrier materials and assemblies must remain exposed until tested and

inspected by the ABAA.

- f. Do not allow materials to come in contact with chemically incompatible materials.

### 3.3.4 Installation of Reinforcement

Install reinforcement at projections, corners, joints, and penetrations where applicable.

## 3.4 FIELD QUALITY CONTROL

### 3.4.1 Site Inspections and Testing

Provide site inspections and testing in accordance with ABAA protocol to verify conformance with the manufacturer's instructions, the ABAA QAP Quality Assurance Program (<https://www.airbarrier.org/qap/>), Section 07 27 10.00 10 BUILDING AIR BARRIER SYSTEM, Section 07 05 23 PRESSURE TESTING AN AIR BARRIER SYSTEM FOR AIR TIGHTNESS, and this section.

- a. Conduct inspections and testing at 5, 50, and 95 percent completion of this scope of work. Forward written inspection reports to the Contracting Officer within five working days of the inspection and test being performed.
- b. If the inspections reveal any defects, promptly remove and replace defective work at no additional expense to the Government.

## 3.5 PROTECTION AND CLEANING

### 3.5.1 Protection

Protect fluid-applied membrane air barrier assemblies from damage during application and remainder of construction in accordance with manufacturer's written instructions.

Coordinate installation, testing, and inspection procedures to ensure exposure period does not exceed that recommended by the product manufacturer. Remove and replace, at no additional cost to the government, membrane products that exceed manufacturer's allowed exposure limits.

### 3.5.2 Cleaning of Adjacent Surfaces

Clean excess product from adjacent construction using cleaning agents and procedures as recommended in writing by the manufacturer of each type of affected construction and as acceptable to same.

## 3.6 CLEANUP OF SPILLS

Conduct cleanup of uncured product spillage in accordance with manufacturer's written safe handling instructions.

-- End of Section --

SECTION 07 52 00.00 48

SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM  
10/10

PART 1 GENERAL

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

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/SPRI ES-1 (2003) Wind Design Standard for Edge Systems Used with Low Slope Roof Systems

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE/SEI 7-10, (2010) Minimum Design Loads for Buildings and Other Structures

AMERICAN SOCIETY OF SAFETY ENGINEERS (ASSE/SAFE)

ASSE/SAFE A10.24 (2006) Roofing - Safety Requirements of Low-Sloped Roofs

ASSE/SAFE Z87.1 (2003) Standard for Occupational and Educational Eye and Face Protection

ASPHALT ROOFING MANUFACTURER'S ASSOCIATION (ARMA)

ARMA 410BUR88 (2001) Manual of Roof Maintenance and Repair

ARMA 460LSR97 (2002) NRCA/MRCA Repair Manual for Low Slope Membrane Roof Systems

ARMA PMBRG98 (1998) Quality Control Guideline for the Application of Polymer Modified Bitumen Roofing

ASTM INTERNATIONAL (ASTM)

ASTM D 1668 (1997a; R 2006) Glass Fabrics (Woven and Treated) for Roofing and Waterproofing

ASTM D 1863 (2005) Mineral Aggregate Used on Built-Up Roofs

ASTM D 2170	(2007) Kinematic Viscosity of Asphalts (Bitumens)
ASTM D 312	(2000; R 2006) Standard Specification for Asphalt Used in Roofing
ASTM D 4073	(2006) Standard Test Method for Tensile-Tear Strength of Bituminous Roofing Membranes
ASTM D 41	(2005) Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
ASTM D 4402	(2006) Viscosity Determination of Asphalt at Elevated Temperatures Using a Rotational Viscometer
ASTM D 4586	(2007) Asphalt Roof Cement, Asbestos-Free
ASTM D 4601	(2004) Asphalt-Coated Glass Fiber Base Sheet Used in Roofing
ASTM D 5147	(2007b) Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material
ASTM D 6163	(2000; R 2008) Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements
ASTM D 6298	(2005; E 2008) Fiberglass Reinforced Styrene-Butadiene-Styrene (SBS) Modified Bituminous Sheet with Factory Applied Metal Surface
ASTM E 108	(2010a) Fire Tests of Roof Coverings
FM GLOBAL (FM)	
FM 4470	(1986; R 1992) Class I Roof Covers
FM APP GUIDE	(updated on-line) Approval Guide <a href="http://www.approvalguide.com/CC_host/pages/public/custom/FM/login.cfm">http://www.approvalguide.com/CC_host/pages/public/custom/FM/login.cfm</a>
MIDWEST ROOFING CONTRACTORS ASSOCIATION (MRCA)	
CERTA	(2003) NRCA/MRCA Certified Roofing Torch Applicator Program
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)	
NFPA 241	(2009) Standard for Safeguarding Construction, Alteration, and Demolition Operations
NFPA 58	(2008; Am 08-1; Am 08-2; Am 08-3; Am 08-4) Liquefied Petroleum Gas Code

NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA)

NRCA Details (2003) NRCA Roof Perimeter Flashing  
Systems Construction Details for Class 1  
Roof Construction

NRCA 0405 (2001; R 2003, 5th Ed) Roofing and  
Waterproofing Manual

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

29 CFR 1910 Occupational Safety and Health Standards

29 CFR 1910.12 Construction Work

29 CFR 1926 Safety and Health Regulations for  
Construction

29 CFR 1926.16 Rules of Construction

UNDERWRITERS LABORATORIES (UL)

UL 790 (2004; R 2008) Standard for Test Methods  
for Fire Tests of Roof Coverings

UL RMSD (2009) Roofing Materials and Systems  
Directory

1.2 PERFORMANCE REQUIREMENTS

1.3.1 Provide a roofing system that complies with the requirements of  
Underwriters' Laboratories, Inc. for a Class A roof covering.

1.3.2 Provide a roofing system that complies with the requirements of FM  
Global for a Class 1A-90 roof covering.

1.3.3 Provide adequate fastening of the roofing system to meet or exceed  
the requirements of ASCE/SEI 7-10 "Minimum Design Loads for Buildings and  
Other Structures".

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation;  
submittals not having a "G" designation are for information only. When  
used, a designation following the "G" designation identifies the office  
that will review the submittal for the Government. Submit the following  
in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

Acceptable Manufacturer Products

Manufacturer products listed in this specification are referenced to  
establish a standard of quality. When the specific product listed is  
submitted by the Contractor that submittal will be considered For  
Information Only. When an equal to that named in this specification is  
submitted it shall be For Government Approval (G). The following  
manufacturer products are specifically mentioned in this specification:

Siplast  
1000 E Rochelle Blvd.

SBS-MODIFIED BITUMINOUS MEMBRANE  
20 year NDL Warranty (with an

Irving, TX 75062 extended 10 year option)  
(800) 922-8800  
www.siplast.com

Johns Manville SBS-MODIFIED BITUMINOUS MEMBRANE  
10100 W. Ute Avenue 20 year NDL Warranty  
Littleton, CO 80127  
(303) 978-2000  
www.jm.com

Soprema, Inc. SBS-MODIFIED BITUMINOUS MEMBRANE  
310 Quadral Drive 20 year NDL Warranty  
Wadsworth, OH 44281  
(800) 356-3521  
www.soprema.us

Georgia-Pacific DENS-DECK PRIME ROOF BOARD  
133 Peachtree Street NE  
Atlanta, GA 30303  
(404) 652-4000  
www.gp.com

Manufacturer Products submitted as an "or equal"; G, ED

#### SD-02 Shop Drawings

Tapered Insulation Shop Drawings: Submit proposed tapered insulation and cricket system for approval prior to start of work. Provide drawings for each area and include, at minimum, concise tapered layouts, material identification, typical cross sections with each board labeled, board stagger pattern, slopes and cricket widths.

Roof Vent Drawings: Submit shop drawing showing proposed roof vent layout.

#### SD-03 Product Data

Materials List: Give written notification of the brand name and manufacturer of each material proposed for use and include a statement that all proposed materials meet the specification requirements. Obtain approval prior to placing orders.

Submittal of catalog cut sheets, etc. in lieu of the materials list required above is not acceptable. Do not submit cut sheets unless specifically requested.

Submit all data required with requirements of this section. Include in Data written acceptance by the roof membrane manufacturer of the products and accessories provided. List products in the applicable wind uplift and fire rating classification listings, unless approved otherwise by the Contracting Officer.

#### SD-05 Design Data

Wind Uplift Calculations; G

Provide Engineering calculations, signed, sealed, and dated by a

qualified Engineer validating the wind resistance per ASCE/SEI 7-10, ASTM D 4073, and ANSI/SPRI ES-1 of non-rated roof system.

#### SD-07 Certificates

##### Qualification of Applicator/Installer

Applicator/Installer Certificates: Signed by roofing system manufacturer certifying that Applicator/Installer is approved, authorized, or licensed by manufacturer to apply the roofing system.

##### Qualification of Manufacturer

Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

Manufacturer Certificates: Original document signed by a responsible officer of the manufacturing firm, notarized, on manufacturer's standard letterhead, certifying materials furnished for project comply with the referenced standard. Certificate shall specifically reference the project and applicable compliance standard.

##### Qualification of Engineer of Record

Certify that the Engineer of Record is fully qualified, competent, and currently licensed to practice in the project jurisdiction.

Wind Uplift Resistance; G Submit the roof system assembly wind uplift classification listing.

Fire Resistance classification; G Submit the roof system assembly fire rating classification listing.

#### SD-08 Manufacturer's Instructions

Installation Instructions: Submit manufacturer's latest written installation instructions.

Cold Weather Conditions installation; G

Base Flashing Instructions: Submit manufacturer's base flashing installation instructions.

#### SD-11 Closeout Submittals

##### WARRANTY

Warranties: Special warranties specified in this Section.

Sample Warranty: Specimen copy of manufacturer's warranty.

##### INSPECTION REPORT

Inspection Report: Specimen copy of roofing system manufacturer's inspection report of completed roofing installation.

#### 1.4 QUALITY ASSURANCE

##### 1.4.1 Qualification of Applicator/Installer

The roofing system applicator must be approved, authorized, and licensed in writing by the roofing system manufacturer and must have a minimum of 3 years experience as an approved, authorized, and licensed applicator with the manufacturer and be approved at a level capable of providing the specified warranty.

##### 1.4.2 Qualification of Manufacturer

SBS-Modified bitumen sheet roofing system manufacturer must have a minimum of 5 years experience in manufacturing SBS-Modified bitumen roofing products.

##### 1.4.3 Qualification of Engineer of Record

Engineer of Record must be currently licensed within the jurisdiction of the project.

##### 1.4.4 Fire Resistance

Complete roof covering assembly must:

- a. Be Class A rated in accordance with ASTM E 108, 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

Complete roof covering assembly, including insulation, must be rated Class 1A-90 in accordance with FM APP GUIDE and ASTM D 4073 capable of withstanding an uplift pressures as indicated on the drawings. Non-rated systems must not be installed. Provide wind load calculations and submit engineering calculations with substantiating data to validate wind resistance of any non-rated roof system. Base all Wind uplift calculations on a design wind speed of 115 mph in accordance with ASCE/SEI 7-10, ASTM D 4073, or 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;

Field inspection and verification of all existing conditions, including all fire safety issues, existing structure, and existing materials, including concealed combustibles, which may require additional protection during installation.

- 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; and
- e. Quality control plan for the roof system installation;
- f. Safety requirements.

Coordinate prerooting 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, Registered Roof Observer, 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 all materials to site in original containers bearing manufacturers' name and type of material. Provide appropriate Underwriters' Laboratories, inc. and Factory Mutual labels on all materials.

Supply and keep all materials dry at all times prior to application.

Materials which have been prematurely exposed to the weather are subject to immediate removal and replacement with new materials at contractor's expense. Materials may be marked with paint or other indelible materials while they remain on-site.

Where materials are covered by a referenced specification, container must bear specification number, type, and class, as applicable.

Indicate on labels for roofing asphalt the asphalt type, finished blowing temperature (FBT), flash point (FP), and equiviscous temperature (EVT), that is, the temperature at which the viscosity is either 125 centistokes when tested in accordance with ASTM D 2170 or 75 centipoise when tested in accordance with ASTM D 4402. Deliver materials in sufficient quantity to allow work to proceed without interruption.

### 1.5.2 Storage

Protect materials against moisture absorption, contamination, or other damage. Avoid crushing or crinkling of roll materials.

Store all roll goods on end on clean floors or raised platforms in dry locations in enclosed buildings or trailers with adequate ventilation.. Do not use flattened rolls or rolls with ends damaged. Mark and remove wet or damaged materials from site.

Store all insulation in dry, covered storage, or on raised platforms, and with weatherproof, breathable coverings such as heavy canvas. Insulation wrappers are not sufficient. Materials which are not stored under specified covers are subject to removal from the site.

Store cartons and drums of asphalt on level surface, in upright position. Do not stack cartons. Protect open top containers from dirt and precipitation.

Store solvent bearing materials in dry, cool storage and keep lids tight on partially used containers to prevent escape of solvents.

Store all emulsions in dry storage at temperatures above 40 degrees F.

Do not store roll materials in buildings under construction until concrete, mortar, and plaster work are finished and dry.

Do not store materials outdoors unless approved by the Contracting Officer. Completely cover felts stored outdoors with waterproof canvas protective covering. Do not use polyethylene sheet as a covering.

Tie covering securely to pallets to make completely weatherproof and yet provide sufficient ventilation to prevent condensation.

Maintain roll materials at temperature above 50 degrees F for a 24-hour period immediately prior to application.

Keep aggregate dry as defined by ASTM D 1863.

Place only those materials to be used during one day's work on the roof at one time. Remove unused materials from the roof at the end of each day's work. 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 so as not to damage 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 TORCH AND HOT-MOPPED ASPHALT APPLIED MODIFIED BITUMEN MEMBRANE SAFETY

### 1.7.1 Property Protection

Take all precautions necessary to prevent ignition of combustible materials during torch application or hot-mopped asphalt application of

roofing. Immediately call the fire department if a fire commences. Review all fire safety procedures as outlined at the pre-roofing conference.

Install materials using the techniques recommended by CERTA NRCA/MRCA Certified Roofing Torch Applicator Program available from the National Roofing Contractors Association (NRCA) and the Midwest Roofing Contractors Association (MRCA) as endorsed by the Asphalt Roofing Manufacturers Association (ARMA) and the United Union of Roofers, Waterproofers and Allied Workers. Application procedures must comply with NFPA 241, OSHA 29 CFR 1910 and 29 CFR 1910.12, 29 CFR 1926.16, 29 CFR 1926 Subpart F.

Do not store flammable liquids on the roof.

Provide a minimum of two 2.65 gallon containers of water and two fully charged minimum 20 pound ABC (dry chemical) fire extinguishers in separate, easily accessible locations on the roof and within 30 foot of each torch work area or hot-mopped kettle at all times.

No Asphalt/Tar Kettles are allowed on roofs. Locate kettles and supply LP-Gas Cylinders safely and secured per NFPA 241 outside of the building's perimeter a minimum of 20 foot from the structure and any combustible materials.

Maintain a minimum separation of 20 foot between LP-Gas Cylinders and kettle. Provide protective fire retardant blanket barrier or shield between any building structure to a minimum height of 8 foot and a clear surround distance of 4 foot if operations force placement of kettle within a distance of 20 foot. Do not obstruct or place kettles or Cylinder storage within 10 foot of exits, means of egress, gates, roadways, entrances. Locate kettles downwind and away from any building air intakes.

Provide a minimum of two portable fully charged 20 pound ABC (dry chemical) fire extinguishers no closer than 5 foot and no further than 25 foot of horizontal travel distance from each kettle at all times while kettle is in operation, in easily accessible and identifiable locations. Also provide a minimum of one multipurpose 2-A:20-B:C portable fire extinguisher on the roof being covered or repaired.

Comply with the following safety procedures:

- a. Fuel containers, burners, and related appurtenances of roofing equipment in which liquefied petroleum gas is used for heating must comply with the requirements of NFPA 58.
- b. Fuel containers having capacities greater than one pound must be located a minimum of 10 foot clear distance from the burner flame.
- c. All LP-Gas Cylinders must be clearly labeled "Flammable Gas", and secured to prevent accidental tip-over.
- d. Check all pressure regulators and hoses prior to use for proper functioning and integrity.
- e. Turn off fuel supply at LP Gas Cylinder when kettle is not in use.
- f. Equip all kettles with a functioning temperature measuring device to ensure no heating in excess of 50 degrees F below the flash

point.

- g. Provide covers, lids, or tops which are close fitting, constructed of minimum No.14 manufacturer's gauge steel, and can be gravity closed on all kettles.
- h. Clean all roofing mops and rags free of excess asphalt and store safely away from all combustible materials. Store discarded roofing mops and rags in a non-combustible container and remove from site each day.
- i. Position all pump lines handling hot asphalt securely and equip all pump lines with a shut-off valve on each with a coupler which may be opened when lines are full. Do not subject pump lines to pressures in excess of safe and recommended NRCA and ARMA working pressures. Station an operator near the equipment to cut off flow and care for other emergencies while conducting heating, pumping and application operations.
- j. Asphalt/tar bucket used by roofers or workers in similar trades must be constructed of minimum No. 24 gauge or heavier sheet steel and have a metal bail of no less than 1/4 inch diameter material. The bail is to be fastened to offset ears or equivalent which have been riveted, welded, or otherwise safely and securely attached to the bucket. Soldered bail sockets are prohibited. Position workers and other employees to avoid being struck by bucket or other roofing materials, which may accidentally fall while being hoisted, lowered, or used in the roofing operation. Provide safety barriers and caution signs at all skylights or other roof holes.
- k. Do not use flammable liquids with a flash point below 100 degrees F (gasoline and similar products) for cleaning purposes.

Do not use solid fuel or Class I liquids as fuel for roofing asphalt/tar kettles. Provide a minimum of one employee fully knowledgeable of kettle operations and hazards to maintain constant surveillance during kettle operation within a minimum distance of 25 foot of the kettle.

Check all fire extinguishers prior to commencement of work, and upon completion of the day's work, to ensure fullness and operability.

Project supervisor must make daily inspections with the facility manager of all conditions and operations which could present hazards during torching or hot-mopped applications and issue directives to address all such concerns and items of the work and existing conditions.

Identify and protect all combustible roof components, possible fire traps, and hidden hazards. Seal off voids or openings in the substrate with non-combustible materials prior to installing torch-applied or hot-mopped applied materials in the area. Install protective fire retardant blankets and shields at building walls, eaves, parapets and equipments curbs constructed of combustible materials within 3 foot radius of the area of torch work or hot-mopped kettle prior to commencement of the work.

When working around intakes and openings, temporarily disconnect and block to prevent flame of torch or fumes from kettle from being drawn into the opening. Provide non-combustible shielding or flame guard protection

where gaps or voids occur in the construction in area of torch work.

#### 1.7.2 Fire Watch

All personnel on the roof during torch application or hot-mopped application must be properly trained to use a fire extinguisher. Provide a fire watch for a minimum of two hours after completion of all torch work or 30 minutes after completion of hot-mopped kettle operations at the end of each work shift. Maintain the fire watch for additional time required to ensure no potential ignition conditions exist. Utilize heat sensing meters to scan for hot spots in the work. For torch applications, provide and utilize a minimum of one certified heat detection gun per torch for use during the fire watch to verify cool, safe and non-combustible conditions exist. Provide a minimum duration fire watch of two hours conducted by personnel properly trained to survey the underside of the roof deck (where possible) and the topside of possible smoldering elements.

Do not torch in areas of poor and/or no visibility (curbs, corners, eaves, expansions joints, flashing, other voids and small penetrations) which could allow a torch flame to ignite combustible material(s) hidden from view or within the underside of the roof deck or building interior. Use cold finish applications in these areas whenever possible and per manufacturer's printed instructions, NRCA 4002, MRCA R&NW manual for "cold adhered" materials.

Do not leave the rooftop unattended during breaks in work during a work shift. Walk and scan all areas of application checking for hot spots, fumes, or smoldering, especially at wall and curb areas, prior to departure at the end of each work shift. Ensure any and all suspect conditions are eliminated prior to leaving the site each work shift.

#### 1.7.3 Open Flame Application (Torch) Equipment and Personnel Safety

Only NRCA/MRCA CERTA certified roofing applicators are allowed to operate any torching equipment. Verify that all such applicators maintain and are currently carrying a valid Certified Roofing Torch Applicator (CERTA) card.

All crew members must be trained in preventive measures for indirect and direct dangers and hazards associated with roofing work, which include, but are not limited to the following:

- a. Heat Stress: Wear light colored clothing, a hat for ultra-violet protection, and other eye protective devices. Drink sufficient quantities of non-alcoholic, non-caffeine liquids. Stage shifts for crew members to allow for breaks from heat and sun exposure without interfering with work progress.
- b. First Aid for Burns: Immediately call for an ambulance. Contact local Occupational Health Services (OHS).

All crew members must wear correct personal protective equipment (PPE), including, but not limited to the following items:

- a. Long-sleeved shirts buttoned at the collar and cuffs, and must be made of non-flammable materials. Polyester materials are not allowed.
- b. Work boots covering ankles with rubber or composite soles.

- c. Long pants without cuffs to extend over the top of the work boots, and must be made of non-flammable materials. No polyester allowed.
- d. Heavy leather gloves and/or flame retardant gauntlets which must be worn during all handling of a torch, whether operating or not.
- e. OSHA and ASSE/SAFE Z87.1 approved face shields, goggles and/or safety glasses to be worn during torching and any other applicable roofing functions.
- f. OSHA and ANSI approved hard hats.

#### 1.7.4 Wind Conditions

Use side shields with all torching operations when winds are occurring to prevent flame distortion of end burners. Use torch machine equipment with bottom shield plate to prevent flame spread on to roof deck and substrate. When high wind gusts are present, notify the safety officer and cease all use of torching equipment until wind conditions lower and authorization from the safety officer to proceed is received.

#### 1.8 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.

#### 1.9 WARRANTY

Provide roof system material and workmanship warranties meeting specified requirements. Provide revision or amendment to standard membrane manufacturer warranty to comply with the specified requirements.

##### 1.9.1 Roof Membrane Manufacturer Warranty

Furnish the roof membrane manufacturer's 20 year no dollar limit (NDL) roof system materials and installation workmanship warranty, including flashing, insulation, and accessories necessary for watertight roof system construction. Write the warranty directly to the Government commencing at the time of Government's acceptance of the roof work. Provide the following statement for such warranty:

- a. If within the warranty period the roof system, as installed for its intended use in the normal climatic and environmental conditions of the facility, becomes non-watertight, shows evidence of moisture intrusion within the assembly, blisters, splits, tears, 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. Damage to the roofing system caused by sustained winds having a velocity of 110 mph or less is covered by the warranty.
- d. Upon completion of installation, and acceptance by the Contracting Officer and Roofing System Engineer of Record, the manufacturer must supply the appropriate warranty to the Government (Owner).
- e. Installer must submit a minimum five year warranty to the membrane manufacturer from the date of acceptance, with a copy to the Contracting Officer and Roofing System Engineer of Record.

#### 1.9.2 Roofing System Applicator/Installer Warranty

The roof system Applicator/Installer must warrant for a minimum period of five years that the roof system, as applied/installed, is free from defects in application/installation workmanship, to include the roof membrane, flashing, insulation, fasteners, cover boards, substrate board, vapor retarder, accessories, attachments, and sheet metal installation integral to a complete watertight roof system assembly. Write the warranty directly to the Government. Write the warranty, on the form at end of this Section, signed by roofing Applicator/Installer, properly executed and printed on Applicator's/Installer's letterhead form, directly to the Government commencing at the time of Government's acceptance of the roof work. The roof system applicator/installer is responsible for correction of defective workmanship and replacement of damaged or affected materials. The roof system applicator/installer is responsible for all costs associated with the repair or replacement work.

#### 1.9.3 Continuance of Warranty

Repair or replacement work, ARMA 410BUR88, ARMA 460LSR97 that becomes necessary within the warranty period must be approved, as required, 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.

#### 1.10 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 ES-1 requirements. Work not specifically addressed, and any deviation from specified requirements, must be in general in 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.

#### 1.11 DESCRIPTION OF ROOF MEMBRANE SYSTEM

Minimum two-ply SBS modified bitumen roof membrane consisting of modified bitumen base sheet and cap sheet. SBS modified bitumen roof membrane must be set in hot asphalt, torch applied, or set in cold-applied adhesive.

All work must follow the NRCA 0405 guidelines and standards stated within this Section.

## PART 2 PRODUCTS

### 2.1 GENERAL

Furnish a combination of specified materials that comprise the membrane manufacturer's standard system of the number and type of plies specified. Materials provided must be approved by the roof membrane manufacturer and suitable for the service and climatic conditions of the application/installation.

Listed in this section are specifications for materials required generally for use in accomplishing the work specified. Materials not listed may also be required.

Except as specifically noted herein, all reference standards included herein are presumed to be the latest published editions of such standards available as of the issue date of these specifications.

Brand or manufacturer names are used as standards of quality where no other appropriate reference is available. Submit substitution requests under requirements listed in other Sections.

Where a generic product or a general manufacturer's product is specified and more than one such product is offered by the manufacturer, provide the manufacturer's premium materials.

LEED/EPA Requirements (on new construction and where required by local codes):

1. Roofing shall qualify for Leadership in Energy and Environmental Design (LEED) certification points as defined by the United States Green Building Council (USGBC).
2. Roofing shall comply with the requirements of the U.S. EPA Energy Star® program and meet the reflectance and emittance requirements of Title 24 Part 6 for the state of California. Contractor shall submit CRRC Product ID number.
3. Roofing for new construction shall comply with LEED-NC requirements, including minimum Solar Reflectance Index (SRI).

### 2.2 MANUFACTURERS

For purposes of these documents, the roof system manufacturer is defined as the manufacturer of the primary roof membrane. The roof system is intended to encompass, but is not necessarily limited to, all components above the deck including underlayment and/or vapor retarder components, roof insulation, roof membrane, membrane flashings and any proprietary flashing/components of the system manufacturer. Subject to compliance with the material specifications of these documents, all materials are to be supplied by the same manufacturer.

All materials used in systems to be covered by a Manufacturer's Guarantee

must be supplied by the same manufacturer, unless the manufacturer issuing the guarantee waives this requirement in writing.

The following material manufacturers are approved for this project. Such approval does not relieve the Contractor from the requirement to supply materials which meet all other requirements of these Specifications.

1. Siplast, Inc.
2. Johns Manville International, Inc.
3. Soprema, Inc.

### 2.3 BASE SHEET 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.

Fiberglass Felt Base Sheet: ASTM D 4601, ASTM D 1668, Type II, unperforated, asphalt-impregnated and coated, glass-fiber sheet, dusted with mineral surfacing on both sides.

### 2.4 MEMBRANE MATERIALS

Base Ply: ASTM D 5147 and ASTM D 6163, Type II, Grade S, SBS-modified asphalt sheet with glass fiber mat reinforcing, suitable for application method specified.

SBS Cap Sheet: ASTM D 6163; Type II, Grade G, minimum 3.7 mm (145 mils) thick at selvage edge, and as required to provide specified fire safety rating.

Flashing Sheet: ASTM D 6298, glass fiber reinforced, SBS-modified asphalt sheet; metal-foil surfaced, suitable for torch application.

Foil Finish: Aluminum.

Backer Sheet: ASTM D 4601, Type I, asphalt-impregnated and -coated, glass-fiber sheet, dusted with finer mineral surfacing on both sides.

### 2.5 BITUMINOUS MATERIALS

Cold Adhesive: Elastomeric interply adhesive provided by membrane manufacturer, low VOC.

Asphalt Primer: ASTM D 41.

Asphalt Roof Cement: ASTM D 4586, Type II, asbestos-free.

Roofing Asphalt: ASTM D 312, Type IV, extra-steep grade.

Roofing Asphalt: ASTM D 312, Type III, steep grade.

## 2.6 FASTENERS

Galvanized Steel Roofing Nails: 11 or 12 gauge hot-dipped galvanized or stainless steel with ringed shank, minimum 3/8 inch diameter head, length as required.

Masonry Anchors: Drive-pin fastener with alloy sleeve and stainless steel nail insert for use in concrete, brick, or concrete masonry units, 1/4-inch diameter, length as required, flat head.

Masonry Anchors: Stainless steel screw anchor for use in concrete, brick, or concrete masonry units manufactured with threads for cutting into walls of pre-drilled opening to provide tight friction fit, 1/4-inch diameter, length as required.

Termination Bar: Extruded aluminum bar, 1-inch wide, 1/8-inch thick, with pre-punched holes at 6-inches on center.

## 2.7 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.

## PART 3 EXECUTION

### 3.1 VERIFICATION OF CONDITIONS

Inspect all surfaces to receive work specified herein. Application of materials constitutes approval of the substrate as being satisfactory.

Do not proceed with roofing until all vents, drains, curbs, cants, blocking, nailing strips, and projections through the roof deck have been installed.

Ensure that the following conditions exist prior to application of the roofing materials:

- a. Curbs, cants, perimeter walls, roof penetrating components, and equipment supports are in place.
- b. Surfaces are rigid, clean, dry, smooth, and free of cracks, holes, and sharp changes in elevation. Joints in substrate are sealed to prevent drippage of bitumen into building or down exterior walls. Inspect surfaces and approve immediately before application of roofing and flashings. Apply the roofing and flashings to a smooth and firm surface free from ice, frost, visible moisture, dirt, projections, and foreign materials.
- 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 as indicated to provide 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-inches above finished roofing surface.
- g. Protect all combustible materials and surfaces which may contain concealed combustible or flammable materials. All fire extinguishing equipment has been placed as specified.
- h. Verify all Fire Watch personnel assignments.
- i. 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.
- j. 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 nominal 3-1/2 inches.
- k. Cast-in-place concrete substrates have been allowed to cure and the surface dryness requirements specified under paragraph entitled "Field Quality Control" have been met.
- l. Joints between precast concrete deck units are grouted, leveled, and stripped in with felt or bituminous stripping membrane set in bituminous cement prior to applying other roofing materials over the area.
- p. Roof deck and framing are sloped as indicated to provide positive drainage.

### 3.2 INSTALLATION, GENERAL

Do not apply materials on wet or damp surfaces, over dust, dirt or other foreign matter. Foaming of hot bitumen at application is evidence that the surface is too wet for application.

Do not apply bituminous materials when ambient air temperature is below 40°F unless equipment can be operated and materials handled without exceeding maximum allowable temperatures and without damage to materials, and then only with approval of the Contracting Officer.

Do not apply emulsions when ambient air temperature is below 40°F or is expected to be below freezing within 24 hours after application.

Accomplish application of roofing materials so that each area will be complete at the end of each workday.

Protect edges and incomplete flashings against water entry at all times. Remove cutoffs and temporary protection prior to resumption of work.

Prime all concrete, masonry and metal surfaces to receive bituminous materials, using approximately one gallon of primer per 100 square feet of

surface. Allow primer to dry thoroughly before application of bituminous materials.

Set insulating board cant strips and tapered edge strips in a generous bed of insulation adhesive so that they are tightly adhered to both horizontal and vertical surfaces.

Use cold adhesive for application of base sheet and/or cap sheet.

Torch apply base sheet, or cap sheet, and/or base flashing.

Keep bitumen in kettles and handling equipment within the following ranges at all times during application.

1. Type III Asphalt: Kettle temperature 500°F max, handling equipment temperature 400-425°F.
2. Type IV Asphalt: Kettle temperature 500°F max, handling equipment temperature 400-475°F.

Provide kettles with accurate working thermometers or provide a hand thermometer for the kettle operator with instructions for use. When using a hand thermometer, take kettle temperature at farthest point from burner stacks or at draw-off spigot.

If roofing bitumen is supplied with technical data posted on cartons or in a separate document, that data will govern temperature as follows:

1. Kettle temperature will be maintained below flash point (FP).
2. At no time shall kettle temperature be kept at or above final blowing temperature (FBT) for more than two hours.
3. At point of application, asphalt temperature will be the equiviscous temperature (EVT) (at 125 cps)  $\pm$  25°F.

Use the following minimum quantities of asphalt:

1. Base Ply 25 lbs./100 sq. ft.
2. Cap Sheet 25 lbs./100 sq. ft.

### 3.3 TORCH OPERATIONS

All torch operations are to comply with Certified Roofing Torch Applicator (CERTA) and NRCA requirements. Torch operators shall be fully certified by CERTA. Contractor shall provide copy of certification for all torch applicators.

1. For a minimum of two hours following daily completion of torch applications, maintain a fire watch inside and outside the building in the area of torch application. Utilize a fully-functional hand-held infrared device suitable for detecting areas of elevated temperature.
2. Contractor shall maintain two (2) fully operational fire extinguishers at the site at all times.
3. Apply two-ply base flashing backer sheet at wood curbs. Take all measures necessary to protect wood curbs from open flames.

4. Contractor shall use "torch-and-flop" method at all base flashings.

### 3.4 BASE SHEET APPLICATION

Clean deck surfaces of all dirt, dust and other foreign matter.

Apply next to deck one ply of rosin-sized sheathing paper. Lap sides 4-inches and ends 6-inches. Nail sufficiently to hold in place with appropriate fasteners.

Starting at low points in roof, apply one ply of fiber glass base sheet perpendicular to slope, lapped at least 4-inches at sides and 6-inches at ends.

Fasten base sheet through center of sheet in two staggered rows spaced approximately 11-inches apart and through laps with appropriate fasteners. Space fasteners as required by manufacturer.

Keep asphalt back approximately 4-inches from all open deck joints.

At all roof edges and openings extend base sheet far enough beyond the edge to provide an envelope fold over the top of insulation at least 4-inches wide.

Terminate base sheet at face of all vertical surfaces.

### 3.5 MEMBRANE APPLICATION

Apply new cold adhesive grade SBS modified bitumen material in strict accordance with manufacturer's latest printed instructions except as amended in this section.

Lap ends at least 6-inches and sides at least 4-inches.

Stagger end laps a minimum of 3-feet.

Cut base ply and cap sheet in strips not over 18-feet long, lay flat and allow all strips to flatten completely before using. Do not use damaged, abused or distorted roll ends.

Where stripping plies are specified, they are to be installed prior to application of cap sheet. Where base flashings are specified, terminate cap sheet neatly along top of cant and apply base flashing over cap sheet.

Check roof surface carefully for damage and application defects and make appropriate repairs and corrections.

Starting at low point in roof, apply base ply. Apply uniformly and without voids. Press into full contact with substrate.

Starting at low point in roof, apply cap sheet. Apply uniformly and without voids. Press into full contact with substrate.

Stagger side laps of base ply and cap sheet.

Install in all adhesive over-runs roofing granules matching the cap sheet surface. Finished surfaces must be reasonably uniform without streaks or

spots.

Take measures as required to ensure that base ply and cap ply are fully adhered.

Use Type IV asphalt when cap sheet is specified for application with asphalt.

### 3.6 BASE FLASHING APPLICATION

Install metal-foil (torch grade) modified bitumen flashings at all curbs, walls and vertical surfaces where other types of flashings are not specified or shown on Drawings.

Prior to application of base flashings, carefully inspect membrane plies and all surfaces to which flashings are to be applied. Clean surfaces of dust, dirt or any residue which may interfere with application or adhesion of flashings. Ensure that all plies are solidly adhered to each other and to the cant and the cant is solidly affixed to horizontal and vertical surfaces. Base flashings must be tight and fully bonded to the substrate. Loose spots, loose laps or blisters are not acceptable.

Prior to installation of base flashings at plywood substrates, furnish and install new rosin sized sheathing paper and fiber glass base sheet. Lap ends of base sheet 4-inches. Secure using specified fasteners spaced 6 inches on center in both directions.

Carefully remove all deleterious amounts of bituminous cements.

Apply new torch grade modified bitumen base flashing material in strict accordance with manufacturer's latest printed instructions except as amended herein.

Where required by manufacturer, apply an underlying strip of fiber glass felt in cold adhesive without voids extending at least 4-inches on the roof, up face of cant and up vertical surface at least 4-inches.

Secure top of base flashings with termination bar fastened 6-inches on center. Use ringshank nails with 1-inch washer at wood substrates. At masonry or concrete substrates, use drive pins with manufacturer-supplied sealing washers.

At wood substrates, fasten top of flashing with fasteners on a line approximately 1-inch below top edge and spaced not over 4-inches on center.

At masonry substrates, fasten top of flashing with fasteners through continuous termination bar on a line approximately 1-inch below top edge and spaced not over 8-inches on center.

Immediately thereafter, trowel top edge and fasteners with a continuous 1/8-inch thick coating of flashing cement.

Check all laps as required by the manufacturer's specifications. Reheat and seal as required to obtain full adhesion.

Unless specifically stated otherwise in these specifications or on Drawings, all base flashings are required to extend a minimum of 8-inches above finished roof level. Include costs for modifying parapets, equipment

curbs, expansion joint curbs, etc. to meet this requirement.

### 3.7 STRIPPING APPLICATION

Strip flange of edge metal with two plies of base ply material in accordance with membrane manufacturer's latest printed instructions. Fit stripping snugly to lip of edge metal. Use 9-inch wide stripping for first ply and 12-inch wide stripping for second ply.

### 3.8 WALKWAY APPLICATION

Install new walkway at all locations indicated on Drawings as specified herein.

Install new walkway on all sides of all major equipment (motorized equipment, scuttles, or any rooftop unit with any single dimension greater than 4 feet).

Adhere walkway units by setting in cold adhesive over cap sheet surface.

Cut strips of walkway units for installation under conduit supports from new full-size walkway units. Cut strips a minimum of 6-inches wider and longer than conduit supports to be supported.

Cut strips of walkway units for installation under conduit supports from new full-size walkway units. Cut strips a minimum of 6-inches wider and longer than base of conduit support to be supported.

Set units so that long edges are aligned and units are spaced about 2-inches apart.

-- End of Section --

PRIME CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY  
FOR  
SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM

FACILITY DESCRIPTION \_\_\_\_\_

BUILDING NUMBER: \_\_\_\_\_

CORPS OF ENGINEERS CONTRACT NUMBER: \_\_\_\_\_

CONTRACTOR

CONTRACTOR: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

POINT OF CONTACT: \_\_\_\_\_

TELEPHONE NUMBER: \_\_\_\_\_

OWNER

OWNER: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

POINT OF CONTACT: \_\_\_\_\_

TELEPHONE NUMBER: \_\_\_\_\_

CONSTRUCTION AGENT

CONSTRUCTION AGENT: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

POINT OF CONTACT: \_\_\_\_\_

TELEPHONE NUMBER: \_\_\_\_\_

PRIME CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY  
FOR  
SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM  
(continued)

THE SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM INSTALLED ON THE ABOVE NAMED BUILDING IS WARRANTED BY \_\_\_\_\_ FOR A PERIOD OF FIVE (5) YEARS AGAINST WORKMANSHIP AND MATERIAL DEFICIENCIES, WIND DAMAGE, STRUCTURAL FAILURE, AND LEAKAGE. THE ROOFING SYSTEM COVERED UNDER THIS WARRANTY SHALL INCLUDE, BUT SHALL NOT BE LIMITED TO, THE FOLLOWING: BOARD GOODS, VAPOR RETARDER, INSULATION, BASE SHEETS, FELTS, FLASHING, BITUMINOUS MATERIALS, AGGREGATE SURFACING, FASTENERS, ADHESIVES, CONNECTORS, ROOF SECUREMENT COMPONENTS, TRIM, AND ALL MISCELLANEOUS COMPONENTS AND ACCESSORIES SUPPLIED BY THE MANUFACTURER (EITHER DIRECTLY OR THROUGH HIS SUBCONTRACTOR). THIS INCLUDES ROOF PENETRATION ITEMS SUCH AS VENTS, CURBS, SKYLIGHTS; INTERIOR OR EXTERIOR GUTTERS AND DOWNSPOUTS AND OTHER ROOF SYSTEM FLASHINGS INSTALLED AND ANY OTHER COMPONENTS SPECIFIED WITHIN THIS CONTRACT TO PROVIDE A WEATHERTIGHT ROOF SYSTEM; AND ITEMS SPECIFIED IN OTHER SECTIONS OF THE SPECIFICATIONS THAT ARE PART OF THE SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM.

ALL MATERIAL DEFICIENCIES, WIND DAMAGE, STRUCTURAL FAILURE, AND LEAKAGE ASSOCIATED WITH THE ROOFING SYSTEM COVERED UNDER THIS WARRANTY SHALL BE REPAIRED AS APPROVED BY THE CONTRACTING OFFICER. THIS WARRANTY SHALL COVER THE ENTIRE COST OF REPAIR OR REPLACEMENT, INCLUDING ALL MATERIAL, LABOR, AND RELATED MARKUPS. THE ABOVE REFERENCED WARRANTY COMMENCED ON THE DATE OF FINAL ACCEPTANCE ON \_\_\_\_\_ AND WILL REMAIN IN EFFECT FOR STATED DURATION FROM THIS DATE.

SIGNED, DATED, AND NOTARIZED (BY COMPANY PRESIDENT)

\_\_\_\_\_  
(Company President) (Date)

PRIME CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY  
FOR  
SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM  
(continued)

THE CONTRACTOR SHALL SUPPLEMENT THIS WARRANTY WITH WRITTEN WARRANTIES FROM THE MANUFACTURER AND/OR INSTALLER OF THE ROOFING SYSTEM, WHICH SHALL BE SUBMITTED ALONG WITH THE CONTRACTOR'S WARRANTY. HOWEVER, THE PRIME CONTRACTOR WILL BE ULTIMATELY RESPONSIBLE FOR THIS WARRANTY AS OUTLINED IN THE SPECIFICATIONS AND AS INDICATED IN THIS WARRANTY EXAMPLE.

EXCLUSIONS FROM COVERAGE

1. NATURAL DISASTERS, ACTS OF GOD (LIGHTNING, FIRE, EXPLOSIONS, SUSTAINED WIND FORCES IN EXCESS OF THE DESIGN CRITERIA, EARTHQUAKES, AND HAIL).
2. ACTS OF NEGLIGENCE OR ABUSE OR MISUSE BY GOVERNMENT OR OTHER PERSONNEL, INCLUDING ACCIDENTS, VANDALISM, CIVIL DISOBEDIENCE, WAR, OR DAMAGE CAUSED BY FALLING OBJECTS.
3. DAMAGE BY STRUCTURAL FAILURE, SETTLEMENT, MOVEMENT, DISTORTION, WARPAGE, OR DISPLACEMENT OF THE BUILDING STRUCTURE OR ALTERATIONS MADE TO THE BUILDING.
4. CORROSION CAUSED BY EXPOSURE TO CORROSIVE CHEMICALS, ASH OR FUMES GENERATED OR RELEASED INSIDE OR OUTSIDE THE BUILDING FROM CHEMICAL PLANTS, FOUNDRIES, PLATING WORKS, KILNS, FERTILIZER FACTORIES, PAPER PLANTS, AND THE LIKE.
5. FAILURE OF ANY PART OF THE ROOFING SYSTEM DUE TO ACTIONS BY THE OWNER TO INHIBIT FREE DRAINAGE OF WATER FROM THE ROOF AND GUTTERS AND DOWNSPOUTS OR ALLOW PONDING WATER TO COLLECT ON THE ROOF SURFACE. CONTRACTOR'S DESIGN SHALL INSURE FREE DRAINAGE FROM THE ROOF AND NOT ALLOW PONDING WATER.
6. THIS WARRANTY APPLIES TO THE SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM. IT DOES NOT INCLUDE ANY CONSEQUENTIAL DAMAGE TO THE BUILDING INTERIOR OR CONTENTS WHICH IS COVERED BY THE WARRANTY OF CONSTRUCTION CLAUSE INCLUDED IN THIS CONTRACT.
7. THIS WARRANTY IS TRANSFERABLE TO ANOTHER OWNER WITHOUT WRITTEN CONSENT OF THE CONTRACTOR; AND THIS WARRANTY AND THE CONTRACT PROVISIONS WILL TAKE PRECEDENCE OVER ANY CONFLICTS WITH STATE STATUTES.

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PRIME CONTRACTOR'S FIVE (5) YEAR NO PENAL SUM WARRANTY  
FOR  
SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM  
(continued)

\*\*REPORTS OF LEAKS AND ROOF SYSTEM DEFICIENCIES SHALL BE RESPONDED TO WITHIN 48 HOURS OF RECEIPT OF NOTICE, BY TELEPHONE OR IN WRITING, FROM EITHER THE OWNER OR CONTRACTING OFFICER. EMERGENCY REPAIRS TO PREVENT FURTHER ROOF LEAKS SHALL BE INITIATED IMMEDIATELY; A WRITTEN PLAN SHALL BE SUBMITTED FOR APPROVAL TO REPAIR OR REPLACE THIS ROOF SYSTEM WITHIN SEVEN (7) CALENDAR DAYS. ACTUAL WORK FOR PERMANENT REPAIRS OR REPLACEMENT SHALL BE STARTED WITHIN 30 DAYS AFTER RECEIPT OF NOTICE, AND COMPLETED WITHIN A REASONABLE TIME FRAME. IF THE CONTRACTOR FAILS TO ADEQUATELY RESPOND TO THE WARRANTY PROVISIONS, AS STATED IN THE CONTRACT AND AS CONTAINED HEREIN, THE CONTRACTING OFFICER MAY HAVE THE SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM REPAIRED OR REPLACED BY OTHERS AND CHARGE THE COST TO THE CONTRACTOR.

IN THE EVENT THE CONTRACTOR DISPUTES THE EXISTENCE OF A WARRANTABLE DEFECT, THE CONTRACTOR MAY CHALLENGE THE OWNER'S DEMAND FOR REPAIRS AND/OR REPLACEMENT DIRECTED BY THE OWNER OR CONTRACTING OFFICER EITHER BY REQUESTING A CONTRACTING OFFICER'S DECISION UNDER THE CONTRACT DISPUTES ACT, OR BY REQUESTING THAT AN ARBITRATOR RESOLVE THE ISSUE. THE REQUEST FOR AN ARBITRATOR MUST BE MADE WITHIN 48 HOURS OF BEING NOTIFIED OF THE DISPUTED DEFECTS. UPON BEING INVOKED, THE PARTIES SHALL, WITHIN TEN (10) DAYS, JOINTLY REQUEST A LIST OF FIVE (5) ARBITRATORS FROM THE FEDERAL MEDIATION AND CONCILIATION SERVICE. THE PARTIES SHALL CONFER WITHIN TEN (10) DAYS AFTER RECEIPT OF THE LIST TO SEEK AGREEMENT ON AN ARBITRATOR. IF THE PARTIES CANNOT AGREE ON AN ARBITRATOR, THE CONTRACTING OFFICER AND THE PRESIDENT OF THE CONTRACTOR'S COMPANY WILL STRIKE ONE (1) NAME FROM THE LIST ALTERNATIVELY UNTIL ONE (1) NAME REMAINS. THE REMAINING PERSON SHALL BE THE DULY SELECTED ARBITRATOR. THE COSTS OF THE ARBITRATION, INCLUDING THE ARBITRATOR'S FEE AND EXPENSES, COURT REPORTER, COURTROOM OR SITE SELECTED, ETC., SHALL BE BORNE EQUALLY BETWEEN THE PARTIES. EITHER PARTY DESIRING A COPY OF THE TRANSCRIPT SHALL PAY FOR THE TRANSCRIPT. A HEARING WILL BE HELD AS SOON AS THE PARTIES CAN MUTUALLY AGREE. A WRITTEN ARBITRATOR'S DECISION WILL BE REQUESTED NOT LATER THAN 30 DAYS FOLLOWING THE HEARING. THE DECISION OF THE ARBITRATOR WILL NOT BE BINDING; HOWEVER, IT WILL BE ADMISSIBLE IN ANY SUBSEQUENT APPEAL UNDER THE CONTRACT DISPUTES ACT.

A FRAMED COPY OF THIS WARRANTY SHALL BE POSTED IN THE MECHANICAL ROOM OR OTHER APPROVED LOCATION DURING THE ENTIRE WARRANTY PERIOD.

MANUFACTURER'S NO PENAL SUM WARRANTY  
FOR  
SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM

FACILITY DESCRIPTION \_\_\_\_\_

BUILDING NUMBER: \_\_\_\_\_

CORPS OF ENGINEERS CONTRACT NUMBER: \_\_\_\_\_

CONTRACTOR

CONTRACTOR: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

POINT OF CONTACT: \_\_\_\_\_

TELEPHONE NUMBER: \_\_\_\_\_

OWNER

OWNER: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

POINT OF CONTACT: \_\_\_\_\_

TELEPHONE NUMBER: \_\_\_\_\_

CONSTRUCTION AGENT

CONSTRUCTION AGENT: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

POINT OF CONTACT: \_\_\_\_\_

TELEPHONE NUMBER: \_\_\_\_\_

MANUFACTURER'S NO PENAL SUM WARRANTY  
FOR  
SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM  
(continued)

THE SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM INSTALLED ON THE ABOVE NAMED BUILDING IS WARRANTED BY \_\_\_\_\_ FOR A PERIOD OF TWENTY (20) YEARS AGAINST WORKMANSHIP AND MATERIAL DEFICIENCIES. ROOFING SYSTEM COMPONENTS COVERED UNDER THIS WARRANTY SHALL INCLUDE, BUT SHALL NOT BE LIMITED TO, THE FOLLOWING: BOARD GOODS, VAPOR RETARDER, INSULATION, BASE SHEETS, FELTS, FLASHING, BITUMINOUS MATERIALS, AGGREGATE SURFACING, FASTENERS, ADHESIVES, CONNECTORS, ROOF SECUREMENT COMPONENTS, TRIM, AND ALL MISCELLANEOUS COMPONENTS AND ACCESSORIES SUPPLIED BY THE MANUFACTURER (EITHER DIRECTLY OR THROUGH HIS SUBCONTRACTOR).

ALL MANUFACTURED MATERIAL DEFICIENCIES, ASSOCIATED WITH THE ROOFING SYSTEM COVERED UNDER THIS WARRANTY SHALL BE REMOVED AND REPLACED AS APPROVED BY THE CONTRACTING OFFICER. THIS WARRANTY SHALL COVER THE ENTIRE COST OF REMOVAL AND REPLACEMENT, INCLUDING ALL MATERIAL, LABOR, AND RELATED MARKUPS. THE ABOVE REFERENCED WARRANTY COMMENCED ON THE DATE OF FINAL ACCEPTANCE ON \_\_\_\_\_ AND WILL REMAIN IN EFFECT FOR STATED DURATION FROM THIS DATE.

SIGNED, DATED, AND NOTARIZED (BY COMPANY PRESIDENT)

\_\_\_\_\_  
(Company President) (Date)

MANUFACTURER'S NO PENAL SUM WARRANTY  
FOR  
SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM  
(continued)

THE MANUFACTURER SHALL SUPPLEMENT THIS WARRANTY WITH WRITTEN WARRANTIES FROM THE CONTRACTOR AND/OR INSTALLER OF THE ROOFING SYSTEM, WHICH SHALL BE SUBMITTED ALONG WITH THE CONTRACTOR'S WARRANTY. HOWEVER, THE MANUFACTURER WILL BE ULTIMATELY RESPONSIBLE FOR THIS WARRANTY AS OUTLINED IN THE SPECIFICATIONS AND AS INDICATED IN THIS WARRANTY EXAMPLE.

EXCLUSIONS FROM COVERAGE

1. NATURAL DISASTERS, ACTS OF GOD (LIGHTNING, FIRE, EXPLOSIONS, SUSTAINED WIND FORCES IN EXCESS OF THE DESIGN CRITERIA, EARTHQUAKES, AND HAIL).
2. ACTS OF NEGLIGENCE OR ABUSE OR MISUSE BY GOVERNMENT OR OTHER PERSONNEL, INCLUDING ACCIDENTS, VANDALISM, CIVIL DISOBEDIENCE, WAR, OR DAMAGE CAUSED BY FALLING OBJECTS.
3. DAMAGE BY STRUCTURAL FAILURE, SETTLEMENT, MOVEMENT, DISTORTION, WARPAGE, OR DISPLACEMENT OF THE BUILDING STRUCTURE OR ALTERATIONS MADE TO THE BUILDING.
4. CORROSION CAUSED BY EXPOSURE TO CORROSIVE CHEMICALS, ASH OR FUMES GENERATED OR RELEASED INSIDE OR OUTSIDE THE BUILDING FROM CHEMICAL PLANTS, FOUNDRIES, PLATING WORKS, KILNS, FERTILIZER FACTORIES, PAPER PLANTS, AND THE LIKE.
5. FAILURE OF ANY PART OF THE ROOFING SYSTEM DUE TO ACTIONS BY THE OWNER TO INHIBIT FREE DRAINAGE OF WATER FROM THE ROOF AND GUTTERS AND DOWNSPOUTS OR ALLOW PONDING WATER TO COLLECT ON THE ROOF SURFACE. CONTRACTOR'S DESIGN SHALL INSURE FREE DRAINAGE FROM THE ROOF AND NOT ALLOW PONDING WATER.
6. THIS WARRANTY APPLIES TO THE SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM. IT DOES NOT INCLUDE ANY CONSEQUENTIAL DAMAGE TO THE BUILDING INTERIOR OR CONTENTS WHICH IS COVERED BY THE WARRANTY OF CONSTRUCTION CLAUSE INCLUDED IN THIS CONTRACT.
7. THIS WARRANTY IS TRANSFERABLE TO ANOTHER OWNER WITHOUT WRITTEN CONSENT OF THE CONTRACTOR; AND THIS WARRANTY AND THE CONTRACT PROVISIONS WILL TAKE PRECEDENCE OVER ANY CONFLICTS WITH STATE STATUTES.

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MANUFACTURER'S NO PENAL SUM WARRANTY  
FOR  
SBS-MODIFIED BITUMINOUS MEMBRANE ROOFING SYSTEM  
(continued)

\*\*THE MANUFACTURER SHALL COORDINATE A SITE VISIT WITHIN TEN (10) WORKING DAYS AFTER RECEIVING WRITTEN NOTIFICATION FROM THE CONTRACTING OFFICER. WITHIN FIVE (5) WORKING DAYS FOLLOWING THE SITE VISIT THE MANUFACTURER SHALL SUBMIT A WRITTEN REPORT OUTLINING REMEDIAL PROCEDURES WITH A TIMELINE FOR REMOVAL AND REPLACEMENT OF THE DEFICIENCIES. THIS REPORT SHALL BE REVIEWED AND APPROVED BY THE CONTRACTING OFFICER. AGREED UPON CORRECTIONS TO THE REPORT AND TIMELINE FOR REMEDIATION, BETWEEN THE CONTRACTING OFFICER AND THE MANUFACTURER, SHALL BE RESUBMITTED BY THE MANUFACTURER WITHIN FIVE (5) WORKING DAYS. ACTUAL WORK FOR PERMANENT REPLACEMENT SHALL BE NEGOTIATED BETWEEN THE CONTRACTING OFFICER AND THE MANUFACTURER, AND COMPLETED WITHIN A REASONABLE TIME FRAME. IF THE MANUFACTURER FAILS TO ADEQUATELY RESPOND TO THE WARRANTY PROVISIONS, AS STATED IN THE CONTRACT AND AS CONTAINED HEREIN, THE CONTRACTING OFFICER MAY HAVE THE DEFICIENCIES SATISFIED BY OTHERS AND CHARGE THE COST TO THE CONTRACTOR.

IN THE EVENT THE MANUFACTURER DISPUTES THE EXISTENCE OF A WARRANTABLE DEFECT, HE MAY CHALLENGE THE CONTRACTING OFFICER'S DEMAND FOR REMEDIATION BY REQUESTING THAT AN ARBITRATOR RESOLVE THE ISSUE. THE REQUEST FOR AN ARBITRATOR MUST BE MADE WITHIN 48 HOURS OF BEING NOTIFIED OF THE DISPUTED DEFECTS. UPON BEING INVOKED, THE PARTIES SHALL, WITHIN TEN (10) WORKING DAYS, JOINTLY REQUEST A LIST OF FIVE (5) ARBITRATORS FROM THE FEDERAL MEDIATION AND CONCILIATION SERVICE. THE PARTIES SHALL CONFER WITHIN TEN (10) WORKING DAYS AFTER RECEIPT OF THE LIST TO SEEK AGREEMENT ON AN ARBITRATOR. IF THE PARTIES CANNOT AGREE ON AN ARBITRATOR, THE CONTRACTING OFFICER AND A REPRESENTATIVE FROM THE MANUFACTURER WILL STRIKE ONE (1) NAME FROM THE LIST ALTERNATIVELY UNTIL ONE (1) NAME REMAINS. THE REMAINING PERSON SHALL BE THE DULY SELECTED ARBITRATOR. THE COSTS OF THE ARBITRATION, INCLUDING THE ARBITRATOR'S FEE AND EXPENSES, COURT REPORTER, COURTROOM OR SITE SELECTED, ETC., SHALL BE BORNE EQUALLY BETWEEN THE PARTIES. EITHER PARTY DESIRING A COPY OF THE TRANSCRIPT SHALL PAY FOR THE TRANSCRIPT. A HEARING WILL BE HELD AS SOON AS THE PARTIES CAN MUTUALLY AGREE. A WRITTEN ARBITRATOR'S DECISION WILL BE REQUESTED NOT LATER THAN 30 DAYS FOLLOWING THE HEARING. THE DECISION OF THE ARBITRATOR WILL NOT BE BINDING; HOWEVER, IT WILL BE ADMISSIBLE IN ANY SUBSEQUENT APPEAL UNDER THE CONTRACT DISPUTES ACT.

A FRAMED COPY OF THIS WARRANTY SHALL BE POSTED IN THE MECHANICAL ROOM OR OTHER APPROVED LOCATION DURING THE ENTIRE WARRANTY PERIOD.

SECTION 07 62 00.00 48.00 48

FLASHING AND SHEET METAL  
10/10

PART 1 GENERAL

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section

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/SPRI ES-1 (2003) Wind Design Standard for for Edge Systems Used with Low Slope Roofing Systems

ASTM INTERNATIONAL (ASTM)

ASTM A 167 (1999; R 2009) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

ASTM A 653/A 653M (2009a) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM A 792/A 792M (2009a) Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process

ASTM B 209 (2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

ASTM B 221 (2008) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

ASTM B 69 (2008) Standard Specification for Rolled Zinc

ASTM C 920 (2010) Elastomeric Joint Sealants

ASTM D 1784 (2008) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

ASTM D 1970 (2009) Self-Adhering Polymer Modified

Bituminous Sheet Materials Used as Steep  
Roofing Underlayment for Ice Dam Protection

ASTM D 41 (2005) Asphalt Primer Used in Roofing,  
Dampproofing, and Waterproofing

ASTM D 4586 (2007) Asphalt Roof Cement, Asbestos-Free

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION  
(SMACNA)

SMACNA 1793 (2006) Architectural Sheet Metal Manual,  
Sixth Edition, Second Printing

## 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.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

Do not purchase, fabricate or install any sheet metal item until all required shop drawings and related submittals for each item are approved. Items purchased, fabricated and/or installed which are not in compliance with approved shop drawings are subject to immediate removal from the project at contractor's expense.

Obtain approval of shop drawings, samples and certifications prior to fabrication and installation.

### Acceptable Manufacturer Products

Manufacturer products listed in this specification are referenced to establish a standard of quality. When the specific product listed is submitted by the Contractor that submittal will be considered For Information Only. When an equal to that named in this specification is submitted it shall be For Government Approval (G). The following manufacturer products are specifically mentioned in this specification:

ARKEMA Inc.  
2000 Market Street  
Philadelphia, PA 19103  
(800) 596-2750  
www.arkema.com

Galvanized Steel Sheet Finish  
KYNAR 500

Grace Construction Products  
62 Whittemore Avenue  
Cambridge, MA 02140

Self-Adhering Membrane  
Grace Ultra

(866)333-37266832  
www.graceconstruction.com

Manufacturer Products submitted as an "or equal"; **G, ED**

#### SD-02 Shop Drawings

Covering on flat, sloped, or curved surfaces; G

Gutters; G

Downspouts; G

Expansion joints; 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

Submit shop drawings of all specified types of metal shapes, showing details of proposed installation, including complete dimensions, metal types and fastening, where appropriate.

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-03 Product Data

Materials List: Give written notification of the brand name and manufacturer of each material proposed for use and include a statement that all proposed materials meet the specification requirements. Obtain approval prior to placing orders.

Submittal of catalog cut sheets, etc. in lieu of the materials list required above is not acceptable. Do not submit cut sheets unless specifically requested.

#### SD-04 Samples

Submit two 6 inch long samples of each metal shape.

Color Chart: Manufacturer's standard range of colors for prefinished metals, including available gauges.

## SD-07 Certificates

### Manufacturer Certificates

Provide an original document signed by a responsible officer of the manufacturing firm, notarized, on manufacturer's standard letterhead, certifying materials furnished for project comply with the referenced standard. Certificate shall specifically reference the project and applicable compliance standard.

## 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.

Restrict on-site storage to minimum for work in progress. Protect all stored metal from exposure to weather and physical damage.

## PART 2 PRODUCTS

### 2.1 MATERIALS

Do not use lead, lead-coated metal, or galvanized steel. 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, except that if copper is selected for any exposed item, all exposed items must be copper.

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, or thickness 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.

### 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. In addition to the metals listed in Table I, lead-coated copper may be used for such items.

### 2.1.3 Lead Sheet

Minimum weight 4 pounds per square foot, soft lead.

### 2.1.4 Aluminum-Zinc (Galvalume) Alloy-Coated Steel Sheet:

ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40 (Class AZM150 coating designation, Grade 275); structural quality.

### 2.1.5 Steel Sheet, Zinc-Coated (Galvanized)

Sheet metal shall be hot-dipped galvanized steel sheets conforming to ASTM A 653/A 653M using approved manufacturer. Weight of galvanized coating shall be not less than 1.25 ounces per square foot, "commercial". Unless otherwise indicated, galvanized sheet metal shall not be lighter than 24-gauge (0.0250 inch).

#### 2.1.5.1 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. Refer to drawings for color.

### 2.1.6 Zinc Sheet and Strip

ASTM B 69, Type I, a minimum of 0.024 inch thick.

### 2.1.7 Stainless Steel

ASTM A 167, Type 302 or 304, 2D Finish, fully annealed, dead-soft temper.

### 2.1.8 Aluminum Alloy Sheet and Plate

ASTM B 209, anodized clear form alloy, and temper appropriate for use.

#### 2.1.8.1 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. Refer to drawings for color.

### 2.1.9 Aluminum Alloy, Extruded Bars, Rods, Shapes, and Tubes

ASTM B 221.

2.1.10 Polyvinyl Chloride Reglet

ASTM D 1784, Type II, Grade 1, Class 14333-D, 0.075 inch minimum thickness.

2.1.11 Polyvinyl Chloride Stripping

Polyvinyl Chloride Stripping, 20 mil.

2.1.12 Elastomeric Joint Sealants

Sealant: ASTM C 920, Type S, Grade NS, Class 25, one-part polyurethane sealant.

2.1.13 Self-Adhering Membrane

Self-Adhering Membrane: ASTM D 1970, polyethylene film laminated to a layer of high temp rubberized asphalt adhesive, with slip-resistant surface and release paper backing.

2.1.14 Asphalt Roofing Cement

ASTM D 4586, Type II, asbestos-free.

2.1.15 Asphalt Primer

ASTM D 41.

2.1.16 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, GENERAL

Inspect all surfaces to which metal will be applied. Do not install metal unless surfaces are even, sound, clean, dry and free from defects that might affect the application.

Follow recommendations of SMACNA 1793, Architectural Sheet Metal Manual, Sixth Edition, Second Printing, for fabricating in-shop and on-site, and for installation, unless otherwise specified herein or on Drawings.

Low slope membrane roof metal edge securement, except gutters, shall be formed for wind resistance in accordance with ANSI/SPRI ES-1.

Follow published instructions of the product manufacturer for installation of extruded or proprietary metal products, unless otherwise specified herein or on Drawings.

Use nails, screws, bolts, cleats or other fasteners of the same material or, if approved by ARMY RESERVE, of material chemically compatible with the contacted metal.

Fabricate cleats to be a minimum of one gauge heavier than fascia metal.

Secure cleats to substrate with fasteners specifically manufactured for the purpose at spacings of 6-inch on center. Provide ring shank fasteners

or screws at wood substrates. Locate fasteners as close to hem of cleat as practical but no more than 2 inches from hem unless specifically indicated otherwise herein or on Drawings.

Do not place dissimilar metals in direct contact or in positions where water sheds across both metals.

Where aluminum is in contact with masonry or concrete, coat the contacting surface with bituminous paint.

Install metal to be water and weather tight with lines, arrises and angles sharp and true and with plane surfaces free of waves or buckles. Hem all raw edges of exposed or finish sheet metal.

Install shop-formed metal in 10-foot lengths maximum and with minimum number of pieces in each straight run.

Miter and seal all inside and outside corners of coping cap. Shop fabricated corner pieces are preferable.

Shop form all metal shapes, which are to be formed of prefinished metal, with protective plastic film in place. Do not remove plastic film until just prior to (or, if possible, after) installation.

At all corners, shop form corner pieces of coping cap with 18-inch legs (joints no more than 18-inches from corner). Seal joint of corner piece.

Form faces of drip edge or coping cap with vertical faces of sufficient width to extend a minimum of 2-inch below wood blocking.

Prime all metal components that will be in contact with bituminous materials.

### 3.2 COUNTERFLASHING INSTALLATION

Install new counterflashings at locations shown on drawings as specified herein. Refer to SMACNA 1793, Architectural Sheet Metal Manual, Sixth Edition, Second Printing.

Refer to Table I, Sheet Metal Schedule, for gauge and metal type.

Install new counterflashing at all roof mounted equipment. Extend new counterflashing across top of curb beneath seating flange of unit. Extend flange down a minimum of 4-inches over base flashing. Secure counterflashing to top of curb, or to integral flange of unit with appropriate fasteners at 4-inches on center.

Insert upper edge of receiver, or counterflashing, into reglet. Secure with driven lead wedges not over 18-inches on center. Fabricate wedges from lead wool.

Insert upper edge of counterflashing in metal receiver. Bend receiver neatly and snugly to face of counterflashing.

Secure counterflashing to metal receiver with stainless steel fasteners spaced no more than 8-inches on center.

Secure counterflashing to vertical surface with appropriate fasteners.

Notch and seal receiver at corners.

Notch and lap joints and inside corners. Notch and seam outside corners. Do not rivet or otherwise secure joints and corners.

Fill reglet or sealant cove to full depth with permanent, non-shrinking sealant.

Lap ends of counterflashing 4-inches. Crimp hem of overlapping section around hem of underlapping section.

### 3.3 BASE FLASHING CLOSURE INSTALLATION

Install new base flashing closures where base flashings abruptly end as specified herein. Refer to Drawings.

Refer to Table I, Sheet Metal Schedule, for gauge and metal type.

Completely seal all joints to be watertight.

Install closures over roof membrane and under base flashings.

Extend closures up under counterflashings, where present or specified.

Install closures to completely seal ends of base flashings, membrane and cants as well as end joints of gravel stop-fascia or drip edge, if present.

### 3.4 COPING CAP INSTALLATION

Install new coping cap at location as shown on drawings as specified herein. Refer to SMACNA 1793, Architectural Sheet Metal Manual, Sixth Edition, Second Printing, Figure 3-4.

Refer to Table I, Sheet Metal Schedule, for gauge and metal type.

Prior to installation of coping cap, apply a strip of self-adhering membrane across the top of the blocking and extending down the outside and inside face approximately the width of the vertical sections of the coping cap. Use strips as long as practical, lapping the ends 6-inches.

Secure both vertical sections with a continuous cleat nailed to wood blocking.

Refer to SMACNA 1793, Architectural Sheet Metal Manual, Sixth Edition, Second Printing, Chapter 3, COPINGS, for cleat and coping hem dimensions.

Join sections with 1-inch vertical single-lock standing seams and caulk with approved sealant. Refer to SMACNA 1793, Architectural Sheet Metal Manual, Sixth Edition, Second Printing, Figure 3-3, Seam 22.

Join sections with double "S" seams and caulk with approved sealant. Refer to SMACNA 1793, Architectural Sheet Metal Manual, Sixth Edition, Second Printing, Figure 3-2, Seam 7.

### 3.5 MISCELLANEOUS FLANGED FLASHING INSTALLATION

Set flange on top of roofing membrane in solid bed of asphalt roof cement.

Set flange in solid bed of asphalt roof cement. If flange width exceeds 12-inches, secure to deck with sheet metal screws or other suitable fasteners placed near each corner and at center of each side.

Except at plumbing vents, or other locations where flashing is turned into top of pipe, or otherwise integrally secured against water entry, install bonnet flashing extending below and beyond edges of flashing riser and secure mechanically to roof penetration so that connection is watertight. Securing by sealant alone is not acceptable.

At sanitary vents using lead sleeve flashing, turn top sleeves neatly into inside of pipe at least one inch. Prefabricated sleeve caps may be used. Refer to SMACNA 1793, Architectural Sheet Metal Manual, Sixth Edition, Second Printing, Figure 4-15B and 4-15C.

### 3.6 GUTTER INSTALLATION

Install new gutters at locations as shown on drawings as specified herein. Refer to SMACNA 1793, Architectural Sheet Metal Manual, Sixth Edition, Second Printing, Figure 1-1, 1-2.

Refer to Table I, Sheet Metal Schedule, for gauge and metal type.

Size gutters to be as shown on drawings.

Provide lap-type expansion joints in gutters at spacings required for the type material used to fabricate gutters at locations shown on Drawings. Refer to SMACNA 1793, Architectural Sheet Metal Manual, Sixth Edition, Second Printing, Figure 1-5 and 1-6.

Provide gutter brackets sized as required spaced 3-feet on center. Refer to SMACNA 1793, Architectural Sheet Metal Manual, Sixth Edition, Second Printing.

Provide gutter spacers sized at 1 inch by 1/8-inch spaced 3-feet on center. Refer to SMACNA 1793, Architectural Sheet Metal Manual, Sixth Edition, Second Printing.

Secure gutter to wood blocking and/or fascia with spikes and ferrules at 3-feet on center. Refer to SMACNA 1793, Architectural Sheet Metal Manual, Sixth Edition, Second Printing.

### 3.7 DOWNSPOUT INSTALLATION

Install new downspouts at locations shown on drawings as specified herein. Refer to SMACNA 1793, Architectural Sheet Metal Manual, Sixth Edition, Second Printing, Figure 1-31.

Refer to Table I, Sheet Metal Schedule, for gauge and metal type.

Size downspouts to be as shown on drawings.

Install downspouts at locations shown on Drawings.

Form downspout hangers from the same material as downspouts using material not less than 2 gauges heavier than downspouts.

Secure downspouts to wall with hangers spaced not more than 5-feet on center. Refer to SMACNA 1793, Architectural Sheet Metal Manual, Sixth

Edition, Second Printing, Figure 1-35.

Connect downspouts to outlet tubes. Refer to SMACNA 1793, Architectural Sheet Metal Manual, Sixth Edition, Second Printing, Figures 1-24C and 1-33.

Where downspouts terminate at grade, provide new precast concrete splash blocks. Set blocks on grade with uniform solid support. Provide elbows at base of downspouts which turn out at 45°.

Where downspouts terminate at grade, extend downspout to curb.

### 3.8 PAINTING

Field-paint sheet metal for separation of dissimilar materials.

#### 3.8.1 Aluminum Surfaces

Shall be solvent cleaned and given one coat of zinc-molybdate primer and one coat of aluminum paint.

### 3.9 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.

### 3.10 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.

### 3.11 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.

#### 3.11.1 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 SCHEDULE**

Counterflashing:	0.050 inch prefinished aluminum.
Base Flashing Closure:	22 gage prefinished steel.
Base Flashing Closure:	0.050 prefinished aluminum.
Gutters:	0.050 inch prefinished aluminum.
Downspouts:	0.050 inch prefinished aluminum.
Coping Caps:	20 gage prefinished steel.
Splash Pans:	24 gage prefinished steel.

-- End of Section --

SECTION 07 84 00

FIRESTOPPING  
05/10

PART 1 GENERAL

1.1 SUMMARY

Furnish and install tested and listed firestopping systems, combination of materials, or devices to form an effective barrier against the spread of flame, smoke and gases, and maintain the integrity of fire resistance rated walls, partitions, floors, and ceiling-floor assemblies, including through-penetrations and construction joints and gaps.

- a. Through-penetrations include the annular space around pipes, tubes, conduit, wires, cables and vents.
- b. Construction joints include those used to accommodate expansion, contraction, wind, or seismic movement; firestopping material shall not interfere with the required movement of the joint.

Gaps requiring firestopping include gaps between the curtain wall and the floor slab and between the top of the fire-rated walls and the roof or floor deck above and at the intersection of shaft assemblies and adjoining fire resistance rated assemblies.

1.2 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM E119	(2018) Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E1399/E1399M	(1997; R 2017) Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems
ASTM E1966	(2015) Fire-Resistive Joint Systems
ASTM E2174	(2014b) Standard Practice for On-Site Inspection of Installed Fire Stops
ASTM E2307	(2015a) Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus
ASTM E2393	(2010a) Standard Practice for On-Site Inspection of Installed Fire Resistive

Joint Systems and Perimeter Fire Barriers

ASTM E814 (2013a; R 2017) Standard Test Method for Fire Tests of Penetration Firestop Systems

ASTM E84 (2018a) Standard Test Method for Surface Burning Characteristics of Building Materials

FM GLOBAL (FM)

FM 4991 (2013) Approval of Firestop Contractors

FM APP GUIDE (updated on-line) Approval Guide  
<http://www.approvalguide.com/>

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2018) International Building Code

UNDERWRITERS LABORATORIES (UL)

UL 1479 (2015) Fire Tests of Through-Penetration Firestops

UL 2079 (2004; Reprint Dec 2014) Tests for Fire Resistance of Building Joint Systems

UL 723 (2018) UL Standard for Safety Test for Surface Burning Characteristics of Building Materials

UL Fire Resistance (2014) Fire Resistance Directory

1.3 SEQUENCING

Coordinate the specified work with other trades. Apply firestopping materials, at penetrations of pipes and ducts, prior to insulating, unless insulation meets requirements specified for firestopping. Apply firestopping materials at building joints and construction gaps, prior to completion of enclosing walls or assemblies. Cast-in-place firestop devices shall be located and installed in place before concrete placement. Pipe, conduit or cable bundles shall be installed through cast-in-place device after concrete placement but before area is concealed or made inaccessible. Firestop material shall be inspected and approved prior to final completion and enclosing of any assemblies that may conceal installed firestop.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Firestopping System; G

SD-03 Product Data

Firestopping Materials; G

SD-06 Test Reports

Inspection; G

SD-07 Certificates

Manufacturer Technical Representative; G

Firestopping Materials; G

Installer Qualifications; G

## 1.5 QUALITY ASSURANCE

### 1.5.1 Installer

Engage an experienced Installer who is:

- a. FM Research approved in accordance with FM 4991, operating as a UL Certified Firestop Contractor, or
- b. Certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary staff, training, and a minimum of 3 years experience in the installation of manufacturer's products in accordance with specified requirements. Submit documentation of this experience. A manufacturer's willingness to sell its firestopping products to the Contractor or to an installer engaged by the Contractor does not in itself confer installer qualifications on the buyer. The Installer shall have been trained by a direct representative of the manufacturer (not distributor or agent) in the proper selection and installation procedures. The installer shall obtain from the manufacturer and submit written certification of training, and retain proof of certification for duration of firestop installation.

### 1.5.2 Manufacturer Technical Representative

The manufacturer's technical representative shall be a direct representative of the manufacturer (not a distributor or an agent). Provide current documentation from the manufacturer that he or she is a direct representative of the manufacturer and is qualified to perform the specified inspections and certify the firestopping installations.

## 1.6 DELIVERY, STORAGE, AND HANDLING

Deliver materials in the original unopened packages or containers showing name of the manufacturer and the brand name. Store materials off the ground, protected from damage and exposure to elements and temperatures in accordance with manufacturer requirements. Remove damaged or deteriorated materials from the site. Use materials within their indicated shelf life.

## PART 2 PRODUCTS

### 2.1 FIRESTOPPING SYSTEM

Submit detail drawings including manufacturer's descriptive data, typical details conforming to UL Fire Resistance or other details certified by another nationally recognized testing laboratory, installation instructions or UL listing details for a firestopping assembly in lieu of fire-test data or report. For those firestop applications for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgment, derived from similar UL system designs or other tests, shall be submitted for review and approval prior to installation. Submittal must indicate the firestopping material to be provided for each type of application. When more than a total of 5 penetrations and/or construction joints are to receive firestopping, provide drawings that indicate location, "F" "T" and "L" ratings, and type of application.

Also, submit a written report indicating locations of and types of penetrations and types of firestopping used at each location; record type by UL list printed numbers.

### 2.2 FIRESTOPPING MATERIALS

Provide firestopping materials, supplied from a single domestic manufacturer, consisting of commercially manufactured, asbestos-free, nontoxic products FM APP GUIDE approved, or UL listed, for use with applicable construction and penetrating items, complying with the following minimum requirements:

#### 2.2.1 Fire Hazard Classification

Material shall have a flame spread of 25 or less, and a smoke developed rating of 50 or less, when tested in accordance with ASTM E84 or UL 723. Material shall be an approved firestopping material as listed in UL Fire Resistance or by a nationally recognized testing laboratory.

#### 2.2.2 Toxicity

Material shall be nontoxic and carcinogen free to humans at all stages of application or during fire conditions and shall not contain hazardous chemicals or require harmful chemicals to clean material or equipment.

#### 2.2.3 Fire Resistance Rating

Firestop systems shall be UL Fire Resistance listed or FM APP GUIDE approved with "F" rating at least equal to fire-rating of fire wall or floor in which penetrated openings are to be protected. Where required, firestop systems shall also have "T" rating at least equal to the fire-rated floor in which the openings are to be protected.

##### 2.2.3.1 Through-Penetrations

Firestopping materials for through-penetrations, as described in paragraph SUMMARY, shall provide "F", "T" and "L" fire resistance ratings in accordance with ASTM E814 or UL 1479. Fire resistance ratings shall be as follows:

#### 2.2.3.1.1 Penetrations of Fire Resistance Rated Walls and Partitions

F Rating = Rating of wall or partition being penetrated.

#### 2.2.3.1.2 Penetrations of Fire Resistance Rated Floors, Floor-Ceiling Assemblies and the Ceiling Membrane of Roof-Ceiling Assemblies

F Rating = Rating of wall or partition being penetrated. Where the penetrating item is outside of a wall cavity the F rating must be equal to the fire resistance rating of the floor penetrated, and the T rating shall be in accordance with the requirements of ICC IBC.

#### 2.2.3.2 Construction Joints and Gaps

Fire resistance ratings of construction joints, as described in paragraph SUMMARY, and gaps such as those between floor slabs and curtain walls shall be the same as the construction in which they occur. Construction joints and gaps shall be provided with firestopping materials and systems that have been tested in accordance with ASTM E119, ASTM E1966 or UL 2079 to meet the required fire resistance rating. Curtain wall joints shall be provided with firestopping materials and systems that have been tested in accordance with ASTM E2307 to meet the required fire resistance rating. Systems installed at construction joints shall meet the cycling requirements of ASTM E1399/E1399M or UL 2079. All joints at the intersection of the top of a fire resistance rated wall and the underside of a fire-rated floor, floor ceiling, or roof ceiling assembly shall provide a minimum class II movement capability.

#### 2.2.4 Material Certification

Submit certificates attesting that firestopping material complies with the specified requirements. For all intumescent firestop materials used in through penetration systems, manufacturer shall provide certification of compliance with UL 1479.

### PART 3 EXECUTION

#### 3.1 PREPARATION

Areas to receive firestopping must be free of dirt, grease, oil, or loose materials which may affect the fitting or fire resistance of the firestopping system. For cast-in-place firestop devices, formwork or metal deck to receive device prior to concrete placement must be sound and capable of supporting device. Prepare surfaces as recommended by the manufacturer.

#### 3.2 INSTALLATION

Completely fill void spaces with firestopping material regardless of geometric configuration, subject to tolerance established by the manufacturer. Firestopping systems for filling floor voids 4 inches or more in any direction must be capable of supporting the same load as the floor is designed to support or be protected by a permanent barrier to prevent loading or traffic in the firestopped area. Install firestopping in accordance with manufacturer's written instructions. Provide tested and listed firestop systems in the following locations, except in floor slabs on grade:

- a. Penetrations of duct, conduit, tubing, cable and pipe through floors

and through fire-resistance rated walls, partitions, and ceiling-floor assemblies.

- b. Penetrations of vertical shafts such as pipe chases, elevator shafts, and utility chutes.
- c. Gaps at the intersection of floor slabs and curtain walls, including inside of hollow curtain walls at the floor slab.
- d. Gaps at perimeter of fire-resistance rated walls and partitions, such as between the top of the walls and the bottom of roof decks.
- e. Construction joints in floors and fire rated walls and partitions.
- f. Other locations where required to maintain fire resistance rating of the construction.

### 3.2.1 Insulated Pipes and Ducts

Thermal insulation shall be cut and removed where pipes or ducts pass through firestopping, unless insulation meets requirements specified for firestopping. Replace thermal insulation with a material having equal thermal insulating and firestopping characteristics.

### 3.2.2 Fire Dampers

Install and firestop fire dampers in accordance with Section 23 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 degrees F at 0 percent to 100 percent visual fill.

#### 3.2.3.2 Re-Sealable Products

Provide firestopping pre-manufactured modular products, containing self-sealing intumescent inserts. Firestopping products shall allow for cable moves, additions or changes. Devices shall be capable of maintaining the fire resistance rating of the penetrated membrane at 0 percent to 100 percent visual fill of penetrants.

### 3.3 INSPECTION

#### 3.3.1 General Requirements

The firestopped areas shall not be covered or enclosed until inspection is complete and approved by the Manufacturer's Technical Representative. The Manufacturer's Technical Representative 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 with ASTM E2393 and ASTM E2174 for firestop inspection, and document inspection results to be submitted.

-- End of Section --

SECTION 07 92 00.00 48

JOINT SEALANTS  
10/10

PART 1 GENERAL

Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section

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 C 1311	(2002) Standard Specification for Solvent Release Agents
ASTM C 509	(2006) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM C 734	(2006) Low-Temperature Flexibility of Latex Sealants After Artificial Weathering
ASTM C 919	(2008) Use of Sealants in Acoustical Applications
ASTM C 920	(2008) Standard Specification for Elastomeric Joint Sealants
ASTM D 1056	(2007) Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
ASTM D 1667	(2005) Flexible Cellular Materials - Poly (Vinyl Chloride) Foam (Closed-Cell)
ASTM D 217	(2002; R 2008) Cone Penetration of Lubricating Grease
ASTM E 84	(2009c) Standard Test Method for Surface Burning Characteristics of Building Materials

1.2 PERFORMANCE REQUIREMENTS

1.3.1 Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

#### Acceptable Manufacturer Products

Manufacturer products listed in this specification are referenced to establish a standard of quality. When the specific product listed is submitted by the Contractor that submittal will be considered For Information Only. When an equal to that named in this specification is submitted it shall be For Government Approval (G). The following manufacturer products are specifically mentioned in this specification:

Brock White Company, LLC General Offices 2575 Kasota Avenue St. Paul, MN 55108 (651) 647-0950 www.brockwhite.com	Sonneborn NP-1
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Manufacturer Products submitted as an "or equal"; **G, ED**

#### SD-03 Product Data

Materials List: Give written notification of the brand name and manufacturer of each material proposed for use and include a statement that all proposed materials meet the specification requirements. Obtain approval prior to placing orders.

Submittal of catalog cut sheets, etc. in lieu of the materials list required above is not acceptable. Do not submit cut sheets unless specifically requested.

#### SD-07 Certificates

##### Installer Certificates

Provide an installer certificate(s) signed by sealant system manufacturer certifying that installer is approved, authorized, or licensed by manufacturer to install sealant system.

##### Manufacturer Certificates

Provide an original document signed by a responsible officer of the manufacturing firm, notarized, on manufacturer's standard letterhead, certifying materials furnished for project comply with the referenced standard. Certificate shall specifically reference the project and applicable compliance standard.

#### SD-08 Manufacturer's Instructions

Sealants

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).

SD-11 Closeout Submittals

Warranties

Special warranties specified in this Section.

Instructions To Government Personnel

Include copies of Material Safety Data Sheets for each solvent, primer, or sealant material.

#### 1.4 ENVIRONMENTAL CONDITIONS

1.5.1 Apply sealant when the ambient temperature is between 40 and 90 degrees F.

1.5.2 Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer, or when ambient air temperature is below 40°F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. When contaminants capable of interfering with adhesion have not yet been removed from joint substrates.
5. Do not use wet or damaged materials or materials contaminated due to wet or damaged containers.

#### 1.5 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 40 degrees F.

#### 1.6 QUALITY ASSURANCE

##### 1.6.1 Compatibility with Substrate

Verify that each of the sealants are compatible for use with joint substrates.

### 1.6.2 Joint Tolerance

Provide joint tolerances in accordance with manufacturer's printed instructions.

### 1.6.3 Mock-Up

Project personnel are responsible for installing sealants in mock-up prepared by other trades, using materials and techniques approved for use on the project.

## 1.7 SPECIAL WARRANTIES

Installer's Warranty: Installer's warranty, on form at end of this Section, signed by sealant Installer, properly executed and printed on installer's letterhead form. Warranty period is for five years (5-yrs) from date of Substantial Completion.

## PART 2 PRODUCTS

Listed in this section are specifications for materials required generally for use in accomplishing the work specified. Materials not listed may also be required.

### 2.1 SEALANTS

Provide sealant that has been tested and found suitable for the substrates to which it will be applied.

#### 2.1.1 Interior Sealant

Provide ASTM C 920, Type S or M, Grade NS, Class 12.5, Use NT. Location(s) and color(s) of sealant for the following:

LOCATION	COLOR
a. Small voids between walls or partitions and adjacent lockers, casework, shelving, door frames, built-in or surface-mounted equipment and fixtures, and similar items.	Match adjacent surface color
b. Perimeter of frames at doors, windows, and access panels which adjoin exposed interior concrete and masonry surfaces.	Match adjacent surface color
c. Joints of interior masonry walls and partitions which adjoin columns, pilasters, concrete walls, and exterior walls unless otherwise detailed.	Match adjacent surface color
d. Joints between edge members for acoustical tile and adjoining vertical surfaces.	Match adjacent surface color
e. Interior locations, not otherwise indicated or specified, where small voids exist between materials specified to be painted.	Match adjacent surface color
f. Joints between shower receptors and ceramic tile; joints formed where nonplaner tile	Match adjacent surface color

LOCATION	COLOR
surfaces meet.	
g. Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occurring where substrates change.	Match adjacent surface color
h. Behind escutcheon plates at valve pipe penetrations and showerheads in showers.	Match adjacent surface color

#### 2.1.2 Exterior Sealant

For joints in vertical surfaces, provide ASTM C 920, Type S or M, Grade NS, Class 25, Use NT. For joints in horizontal surfaces, provide ASTM C 920, Type S or M, Grade P, Class 25, Use T. 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.	Match adjacent surface color
b. Joints between new and existing exterior masonry walls.	Match adjacent surface color
c. Masonry joints where shelf angles occur.	Match adjacent surface color
d. Expansion and control joints.	Match adjacent surface color
e. Interior face of expansion joints in exterior concrete or masonry walls where metal expansion joint covers are not required.	Match adjacent surface color
f. Voids where items pass through exterior walls.	Match adjacent surface color
g. Metal reglets, where flashing is inserted into masonry joints, and where flashing is penetrated by coping dowels.	Match adjacent surface color
h. Metal-to-metal joints where sealant is indicated or specified.	Match adjacent surface color
i. Joints between ends of gravel stops, fascias, copings, and adjacent walls.	Match adjacent surface color

#### 2.1.3 Floor Joint Sealant

ASTM C 920, 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.	Match adjacent surface color
b. Control and expansion joints in floors, slabs, ceramic tile, and walkways.	Match adjacent surface color

#### 2.1.4 Acoustical Sealant

Rubber or polymer-based acoustical sealant conforming to ASTM C 919 must have a flame spread of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E 84. Acoustical sealant must have a consistency of 250 to 310 when tested in accordance with ASTM D 217, and must remain flexible and adhesive after 500 hours of accelerated weathering as specified in ASTM C 734, and must be non-staining.

#### 2.1.5 Preformed Sealant

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.

##### 2.1.5.1 Tape

Tape sealant: Provide cross-section dimensions of necessary for specific application.

##### 2.1.5.2 Bead

Bead sealant: Provide cross-section dimensions of necessary for specific application.

##### 2.1.5.3 Foam Strip

Provide foam strip of polyurethane foam; with cross-section dimensions of necessary for specific application. Provide foam strip capable of sealing out moisture, air, and dust when installed and compressed as recommended by the manufacturer. Service temperature must be minus 40 to plus 275 degrees F. Furnish untreated strips with adhesive to hold them in place. Do not allow adhesive to stain or bleed into adjacent finishes. Saturate treated strips with butylene waterproofing or impregnated with asphalt.

#### 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 or other materials impregnated with oil, bitumen or similar types of absorptive materials as backstops.

#### 2.4.1 Rubber

Conform to ASTM D 1056, Type 1, open cell, or Type 2, closed cell, Class A, Grade, round cross section for cellular rubber sponge backing.

#### 2.4.2 PVC

Conform to ASTM D 1667, Grade VO 12, open-cell foam, round cross section for Polyvinyl chloride (PVC) backing.

#### 2.4.3 Synthetic Rubber

Conform to ASTM C 509, Option I, Type I preformed rods or tubes for Synthetic rubber backing.

#### 2.4.4 Neoprene

Conform to ASTM D 1056, closed cell expanded neoprene cord Type 2, Class C, Grade 2C2 for Neoprene backing.

#### 2.4.5 Butyl Rubber Based

Provide Butyl Rubber Based Sealants of single component, solvent release, color to match adjacent surface color, conforming to ASTM C 1311.

#### 2.4.6 Silicon Rubber Based

Provide Silicon Rubber Based Sealants of single component, solvent release, color to match adjacent surface color, conforming to ASTM C 920.

### 2.5 CLEANING SOLVENTS

Provide type(s) recommended by the sealant manufacturer.

## PART 3 EXECUTION

Note: Do not place polyurethane sealants in contact with silicone sealants during application. Do not apply sealants in unpainted wood joints. Notify COE Representative prior to application of materials. Use solvents that are recommended by the sealant manufacturer to clean equipment, tools and smears. Solvents such as mineral spirits, kerosene or paint thinner shall not be used. Such cleaning should be accomplished as work progresses.

### 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.

Remove all existing sealant and bond breaker down to original substrate. Removal of sealant with knife alone is not acceptable. Wire brush or grind all concrete or masonry joints and solvent wipe metal joints.

Remove lacquer coating from new metal surface joints with a solvent wipe.

Do not use an air blower to clean out dust and debris. Use only clean rags or brushes.

Joint Priming: Prime all joints to be sealed with sealant manufacturer's approved primer. Do not apply excessive amounts of primer to joints. Allow primer sufficient time to dry.

Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.1.1 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:

<u>JOINT WIDTH</u>	<u>JOINT DEPTH</u>	
	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, or masonry:		
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
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 backer rod with a blunt object. Replace damaged backer rod with new material.

Do not lap ends of backer rod. Do not leave gaps greater than 1/8 inch between sections.

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.

Do not apply any more bond breaker material than can be sealed in a day's time.

Install bond breaker tape to back side of joint to exact width of joint. Do not lap or otherwise stretch tape. Seal end joints of 1/8-inch width at corners with a small dab of sealant.

### 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.

Apply new sealant under pressure with power actuated or manual gun. Gun must have correct nozzle size and pressure to fill joint completely.

Use manual or air-operated caulking guns adaptable for either cartridge or bulk loading.

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.

Tool joints immediately with a rounded wood or metal spatula. Do not use wet tool method. Tooling must be accomplished before sealant begins to skin.

All finished work must be uniform, clean, neat and free of overlapping.

## 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 --

**SEALANT WARRANTY**

Owner: \_\_\_\_\_

Installer: \_\_\_\_\_

Location of Building: \_\_\_\_\_

Name of Building: \_\_\_\_\_  
Areas: \_\_\_\_\_

Date of Substantial Completion: \_\_\_\_\_

Installer as defined above, having furnished labor, materials, equipment or supplies, installed new bond breaker, backer rod, sealant and certain other work on areas identified above under contract between the Government (Owner) and Contractor, warrant to the Government (Owner), with respect to said work that for a period of five years from date of Substantial Completion of said work, the joint sealant, bond breaker, backer rod and related materials shall be absolutely watertight, airtight and free from all leaks, provided however that the following are excluded from this warranty:

Defects or failures resulting from abuse by the Owner.

Defects in design involving failure of (1) structural frame, (2) load-bearing walls, and (3) foundations.

Damage caused by fire, tornado, hail, hurricane, acts of God, wars riots or civil commotion.

We, Installer, agree that should any leaks occur in the building joint sealant we will promptly remedy said leaks in a manner to restore the roof to a watertight and airtight condition by methods compatible to the system and acceptable under industry standards and general practice.

We, Installer, further agree that for a period of five years from date of Substantial Completion referred to above, we will make repairs at no expense to the Owner, to any defects which may develop in the work including but not limited to cohesive and adhesive failure, outgassing, voids and staining in a manner compatible to the system and acceptable under industry standards and general practice.

IN WITNESS WHEREOF, we have caused this instrument to be duly executed, this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

\_\_\_\_\_  
(Installer)

WITNESS:

by \_\_\_\_\_  
President

\_\_\_\_\_  
Notary Public

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 within the text by the basic designation only.

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2015; Errata 1 2015; Errata 2 2016)  
Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A653/A653M (2017) 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 (2017a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

ASTM C578 (2018) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation

ASTM C591 (2017) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation

ASTM C612 (2014) Mineral Fiber Block and Board Thermal Insulation

ASTM D2863 (2017a) Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)

ASTM E1300 (2016) Standard Practice for Determining Load Resistance of Glass in Buildings

ASTM F2248 (2012) Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.115 (2016) Hardware Preparation in Steel Doors and Steel Frames

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 252 (2017) Standard Methods of Fire Tests of Door Assemblies

NFPA 80 (2016; TIA 16-1) 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 (2016) UL Standard for Safety Positive Pressure Fire Tests of Door Assemblies

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Doors; G

Recycled Content for Steel Door Product; S

Frames; G

Recycled Content for Steel Frame Product; S

#### Accessories

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

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. Strap knock-down frames in bundles. 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. Provide exterior doors with top edge closed flush and sealed to prevent water intrusion. Provide doors at 1-3/4 inch thick, unless otherwise indicated. Provide door material that uses a minimum of 25 percent recycled content. Provide data indicating percentage of recycled content for steel door product. Provide exterior glazing in accordance with ASTM F2248 and ASTM E1300.

#### 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 with core construction as required by the manufacturer for indicated exterior doors, of size(s) and design(s) indicated. Where vertical stiffener cores are required, the space between the stiffeners must be filled with mineral board insulation.

## 2.2 ACCESSORIES

### 2.2.1 Astragals

For pairs of exterior steel doors which will not have aluminum astragals or removable mullions, as specified in Section 08 71 00 DOOR HARDWARE provide overlapping steel astragals with the doors.

### 2.2.2 Moldings

Provide moldings around glass of interior and exterior doors and louvers of interior doors. Provide nonremovable moldings on outside of exterior doors and on corridor side of interior doors. Other moldings may be stationary or removable. Secure inside moldings to stationary moldings, or provide snap-on moldings. Provide muntins that interlock at intersections and are fitted plus welded to stationary moldings.

## 2.3 INSULATION CORES

Provide insulating cores of the type specified, and provide an apparent U-factor of .48 in accordance with SDI/DOOR 113 and conforming to:

- a. Rigid Cellular Polyisocyanurate Foam: ASTM C591, Type I or II, foamed-in-place or in board form, with oxygen index of not less than 22 percent when tested in accordance with ASTM D2863; or
- b. Rigid Polystyrene Foam Board: ASTM C578, Type I or II; or
- c. Mineral board: ASTM C612, Type I.

## 2.4 STANDARD STEEL FRAMES

SDI/DOOR A250.8, Level 3, except as otherwise specified. Form frames to sizes and shapes indicated, with welded corners or knock-down field-assembled corners. Provide steel frames for doors, sidelights, mullions, unless otherwise indicated. Provide frame product that uses a minimum of 25 percent recycled content. Provide data indicating percentage of recycled content for steel frame product.

### 2.4.1 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.

### 2.4.2 Knock-Down Frames

Design corners for simple field assembly by concealed tenons, splice plates, or interlocking joints that produce square, rigid corners and a tight fit and maintain the alignment of adjoining members. Provide locknuts for bolted connections.

### 2.4.3 Mullions and Transom Bars

Provide mullions and transom bars of closed or tubular construction with heads and jambs butt-welded together or knock-down for field assembly.

Bottom of door mullions must have adjustable floor anchors and spreader connections.

#### 2.4.4 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.

#### 2.4.5 Terminated Stops

Where indicated, terminate interior door frame stops 6 inch above floor.

#### 2.4.6 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.

##### 2.4.6.1 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

##### 2.4.6.2 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.

#### 2.5 FIRE DOORS AND FRAMES

NFPA 80 and this specification. The requirements of NFPA 80 takes precedence over details indicated or specified.

##### 2.5.1 Labels

Provide fire doors and frames bearing the label of Underwriters Laboratories (UL), Factory Mutual Engineering and Research (FM), or Warnock Hersey International (WHI) attesting to the rating required. Testing must be in accordance with NFPA 252 or UL 10C. Provide labels that are metal with raised letters, bearing the name or file number of the

door and frame manufacturer. Labels must be permanently affixed at the factory to frames and to the hinge edge of the door. Do not paint door and labels.

#### 2.5.2 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.

#### 2.5.3 Astragal on Fire Doors

On pairs of labeled fire doors, conform to NFPA 80 and UL requirements.

#### 2.6 WEATHERSTRIPPING

As specified in Section 08 71 00 DOOR HARDWARE.

#### 2.7 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 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.

#### 2.8 FINISHES

##### 2.8.1 Factory-Primed Finish

Thoroughly clean all surfaces of doors and frames then chemically treat and factory prime with a rust inhibiting coating as specified in SDI/DOOR A250.8, or paintable A25 galvanized steel without primer. Where coating is removed by welding, apply touchup of factory primer.

##### 2.8.2 Hot-Dip Zinc-Coated and Factory-Primed Finish

Fabricate exterior doors and frames from hot dipped zinc coated steel, alloyed type, that complies with ASTM A924/A924M and ASTM A653/A653M. The coating weight must meet or exceed the minimum requirements for coatings having 0.4 ounces per square foot, total both sides, i.e., A40. Repair damaged zinc-coated surfaces by the application of zinc dust paint. Thoroughly clean and chemically treat to insure maximum paint adhesion. Factory prime as specified in SDI/DOOR A250.8.

##### 2.8.3 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.

## 2.9 FABRICATION AND WORKMANSHIP

Provide finished doors and frames that are strong and rigid, neat in appearance, and free from defects, waves, scratches, cuts, dents, ridges, holes, warp, and buckle. Provide molded members that are clean cut, straight, and true, with joints coped or mitered, well formed, and in true alignment. Dress exposed welded and soldered joints smooth. Design door frame sections for use with the wall construction indicated. Corner joints must be well formed and in true alignment. Conceal fastenings where practicable. On wraparound frames for masonry partitions, provide a throat opening 1/8 inch larger than the actual masonry thickness. Design frames in exposed masonry walls or partitions to allow sufficient space between the inside back of trim and masonry to receive caulking compound.

### 2.9.1 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.

## 2.10 PROVISIONS FOR GLAZING

Materials are specified in Section 08 81 00.00 48, GLAZING.

## PART 3 EXECUTION

### 3.1 INSTALLATION

#### 3.1.1 Frames

Set frames in accordance with SDI/DOOR A250.11. Plumb, align, and brace securely until permanent anchors are set. Anchor bottoms of frames with expansion bolts or powder-actuated fasteners. Build in or secure wall anchors to adjoining construction. Where frames require ceiling struts or overhead bracing, anchor frames to the struts or bracing. Backfill frames with mortar. Coat inside of frames with corrosion-inhibiting bituminous material. For frames in exterior walls, ensure that stops are filled with rigid insulation before grout is placed.

#### 3.1.2 Doors

Hang doors in accordance with clearances specified in SDI/DOOR A250.8. After erection and glazing, clean and adjust hardware.

#### 3.1.3 Fire Doors and Frames

Install fire doors and frames, including hardware, in accordance with NFPA 80.

### 3.2 PROTECTION

Protect doors and frames from damage. Repair damaged doors and frames prior to completion and acceptance of the project or replace with new, as directed. Wire brush rusted frames until rust is removed. Clean thoroughly. Apply an all-over coat of rust-inhibitive paint of the same type used for shop coat.

### 3.3 CLEANING

Upon completion, clean exposed surfaces of doors and frames thoroughly.  
Remove mastic smears and other unsightly marks.

-- End of Section --

SECTION 08 11 16

ALUMINUM DOORS AND FRAMES

05/17

PART 1 GENERAL

1.1 REFERENCES

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

ALUMINUM ASSOCIATION (AA)

AA DAF45 (2003; Reaffirmed 2009) Designation System  
for Aluminum Finishes

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING  
ENGINEERS (ASHRAE)

ASHRAE 90.1 - IP (2013) Energy Standard for Buildings  
Except Low-Rise Residential Buildings

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 B209M (2014) Standard Specification for Aluminum  
and Aluminum-Alloy Sheet and Plate (Metric)

ASTM B221 (2014) Standard Specification for Aluminum  
and Aluminum-Alloy Extruded Bars, Rods,  
Wire, Profiles, and Tubes

ASTM B221M (2013) Standard Specification for Aluminum  
and Aluminum-Alloy Extruded Bars, Rods,  
Wire, Profiles, and Tubes (Metric)

ASTM 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 E1996 (2014a) Standard Specification for  
Performance of Exterior Windows, Curtain  
Walls, Doors, and Impact Protective  
Systems Impacted by Windborne Debris in  
Hurricanes

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 2016) Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM F1642/F1642M	(2017) Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings
ASTM F1643	(2012) Standard Test Methods for Detention Sliding Door Locking Device Assembly
ASTM F2247	(2011; R 2017) Standard Test Method for Metal Doors Used in Blast Resistant Applications (Equivalent Static Load Method)
ASTM F2927	(2012) Standard Test Method for Door Systems Subject to Airblast Loadings

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

NFRC 100	(2014) Procedure for Determining Fenestration Product U-Factors
NFRC 200	(2014) Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

1.2 PERFORMANCE REQUIREMENTS

1.2.1 Structural Calculations

1.2.1.1 Minimum Antiterrorism Performance

Provide doors meeting the minimum antiterrorism performance as specified in the paragraphs below.

a. Dynamic Design Analysis Method

As an alternative to the static equivalent load design approach described above, glazed opening framing members, anchors, and glazing may be designed using a dynamic analysis to prove the glazed opening system will provide performance equivalent to or better than a very low hazard rating in accordance with ASTM F1642/F1642M associated with the applicable low level of protection for the project.

b. Standard Airblast Test Method

Testing in accordance with ASTM F2927 may be by shock tube or arena test. Perform the test on the entire proposed door assembly, which must include, but not be limited to, the glazing, its framing/support system, operating devices, and all anchorage devices. Install door system anchorage that replicates the method of installation to be used for the project. Utilize the fasteners and anchorage methods used to attach the tested door assembly that are representative of the actual

door installation. Demonstrate by calculation any deviations in actual installation of the connections or the connected elements from those tested to provide the damage level as indicated below.

The minimum airblast loading parameters for the test must be as indicated on drawings.

The acceptance criteria for the proposed door systems, as determined by the damage level/door response damage criteria of ASTM F2247, will provide a performance equivalent to or better than a category II door damage level rating. Door glazing performance must be equivalent to or better than H4-Low hazard rating in accordance with ASTM F1642/F1642M.

#### 1.2.2 Wind Borne Debris

Provide impact resistant door assemblies meeting the Windborne-Debris-Impact Resistant Performance requirements of ASTM E1996 and ASTM E1886 as follows:

- (1) Pass missile-impact tests when tested according to ASTM E1886 and meeting performance requirements according to ASTM E1996 for missiles A and D in Table 2.

#### 1.2.3 Air Infiltration

When tested in accordance with ASTM E283, air infiltration per door leaf cannot exceed 0.6 cubic feet per minute per square foot of fixed area at a test pressure of 6.24 pounds per square foot.

#### 1.2.4 Water Penetration

When tested in accordance with ASTM E331, there can be no water penetration at a pressure of 2.86 pounds per square foot of fixed area.

#### 1.2.5 Thermal Transmittance, Solar Heat Gain, Visible Light Transmittance

Provide products bearing NFRC Project Label Certificates for Fenestration verifying compliance with requirements for each assembly indicated. An NFRC Bid Report, or approved equal, for field assembled exterior doors may be submitted in lieu of Project Label Certificates for Fenestration if such reports are created in accordance with NFRC CAMP procedures and are provided by the manufacturer. Such alternate reports may be submitted with shop drawings, however, NFRC validated Project Label Certificates for Fenestration are required as a Closeout Submittal. Contact NFRC for information on NFRC 100 and NFRC 200 Compliance and Monitoring Program (CAMP) rating requirements:

<http://www.nfrc.org/industry/certification/compliance-and-monitoring-program-camp/>

##### 1.2.5.1 U-Factor

Provide exterior glazed assemblies, including aluminum entrances doors with greater than 50 percent glazed area, certified by the NFRC as having a whole window U-factor of .57 or less as determined in accordance with ASHRAE 90.1 - IP and as verified in accordance with NFRC 100.

##### 1.2.5.2 Solar Heat Gain Coefficient (SHGC)

Provide exterior glazed assemblies, including aluminum entrances doors

with greater than 50 percent glazed area, certified by the National Fenestration Rating Council with a whole window SHGC of .25 or less as determined in accordance with ASHRAE 90.1 - IP and as verified in accordance with NFRC 200.

#### 1.2.5.3 Visible Light Transmittance (VLT)

Provide exterior glazed assemblies, including aluminum entrances doors with greater than 50 percent glazed area, certified by the NFRC with a whole window VLT of .73 or greater as determined in accordance with ASHRAE 90.1 - IP and as verified in accordance with NFRC 200.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

For Each Type of Door and Frame Assembly; G

#### SD-03 Product Data

For Each Type of Door and Frame Assembly; G

Recycled Content of Aluminum Material; S

#### SD-04 Samples

Finish Samples; G

#### SD-05 Design Data

Structural Calculations for Deflection and Antiterrorism; G

#### SD-06 Test Reports

Air Infiltration; G

Water Penetration; G

Standard Airblast; G

#### SD-07 Certificates

NFRC Project Label Certificates for Fenestration; G

#### SD-08 Manufacturer's Instructions

Installation of Each Type of Door and Frame Assembly; G

#### SD-10 Operation and Maintenance Data

Adjustments, Cleaning, and Maintenance; G

SD-11 Closeout Submittals

NFRC Project Label Certificates for Fenestration; G

1.4 DELIVERY, STORAGE, AND HANDLING

Inspect materials delivered to the site for damage. Unload and store with minimum handling. Provide storage space in dry location with adequate ventilation, free from dust or water, and easily accessible for inspection and handling. Stack materials on non-absorptive strips or wood platforms. Do not cover doors and frames with tarps, polyethylene film, or similar coverings. Protect finished surfaces during shipping and handling using manufacturer's standard method. Do not apply coatings or lacquers to surfaces to which caulking and glazing compounds must adhere.

1.5 QUALITY CONTROL

1.5.1 Shop Drawing

Indicate elevations and sections for each type of door and frame assembly. Show sizes and details of each assembly, frame construction, subframe attachment, thickness and gages of metal, details of door and frame construction, proposed method(s) of anchorage, glazing details, provisions for an location of hardware, mullion details, method and materials for flashing and weatherstripping, miscellaneous trim, installation details, and other related items necessary for a complete representation of all components. A qualified blast engineer must perform testing or calculations for door system design resistance to specified blast loads.

1.5.2 Finish Samples

Submit two color charts and two finish sample chips from manufacturer's standard color and finish options for each type of finish indicated.

1.5.3 Test Reports

Test door assembly including glazing for evaluation of hazards generated from airblast loading in accordance with ASTM F2927 by an independent testing agency regularly engaged in blast testing. This test method and the resulting data are valid for the door size tested and smaller doors of identical construction.

Design Door assembly (including glazing) using a dynamic analysis to prove the performance equivalent to or better than a category II door damage level in accordance with ASTM F2927 for the peak positive pressure as shown on drawings; and peak positive phase impulse as shown on drawings. Use a triangular blast load using the applicable pressure and impulse identified above.

For minimum Antiterrorism doors in lieu of a Design Analysis, submit results of standard blast testing, included in a test report, providing information in accordance with ASTM F2247, as prepared by the independent testing agency performing the test. The test results must demonstrate the ability of each door proposed for use to withstand the blast loading parameters and achieve the damage level rating specified in paragraph TESTING.

Testing in accordance with ASTM F2927 may be by shock tube or arena test.

Perform the test on the entire proposed door assembly, which must include, but not be limited to, the glazing, its framing/support system, operating devices, and all anchorage devices. Install door system anchorage that replicates the method of installation to be used for the project. Utilize the fasteners and anchorage methods used to attach the tested door assembly that are representative of the actual door installation. Demonstrate by calculation any deviations in actual installation of the connections or the connected elements from those tested to provide the damage level as indicated below.

The minimum airblast loading parameters for the test must be as follows: peak positive pressure as shown on drawings; and peak positive phase impulse as shown on drawings.

The acceptance criteria for the proposed door systems, as determined by the damage level/door response damage criterial of ASTM F2247, will provide a performance equivalent to or better than a category II door damage level rating. Door glazing performance must be equivalent to or better than H4 - Low hazard rating in accordance with ASTM F1643.

#### 1.5.4 Operation and Maintenance Data

Submit detailed instructions for installation, adjustments, cleaning, and maintenance of each type of assembly indicated.

### 1.6 QUALITY ASSURANCE

#### 1.6.1 Engineer Qualifications for Blast Design

All blast design calculations must be performed by or under the direct supervision of a registered engineer with a minimum of 5 years' experience performing blast design. The engineering firm performing the blast design must be able to demonstrate experience on similar size projects using similar design methods to meet the requirements outlined in this specification.

## PART 2 PRODUCTS

### 2.1 DOORS AND FRAMES

Provide swing-type aluminum doors and frames of size, design, and location indicated. Provide doors complete with frames, framing members, subframes, adjoining side lites, trim, and accessories.

### 2.2 MATERIALS

#### 2.2.1 Anchors

Stainless steel or steel with hot-dipped galvanized finish.

#### 2.2.2 Weatherstripping

Continuous wool pile, silicone treated, or type recommended by door manufacturer.

#### 2.2.3 Aluminum Alloy for Doors and Frames

ASTM B221M, ASTM B221, Alloy 6063-T5 for extrusions. ASTM B209M, ASTM B209, alloy and temper best suited for aluminum sheets and strips. Provide

aluminum materials that include a minimum of 30 percent recycled content. Provide data indicating percentage of recycled content of aluminum material.

#### 2.2.4 Fasteners

Hard aluminum or stainless steel.

#### 2.2.5 Structural Steel

ASTM A36/A36M.

#### 2.2.6 Aluminum Paint

Aluminum door manufacturer's standard aluminum paint.

### 2.3 FABRICATION

#### 2.3.1 Aluminum Frames

Extruded aluminum shapes with contours approximately as indicated. Provide removable glass stops and glazing beads for frames accommodating fixed glass. Use countersunk stainless steel Phillips screws for exposed fastenings, and space not more than 12 inches on center. Mill joints in frame members to a hairline fit, reinforce, and secure mechanically.

#### 2.3.2 Aluminum Doors

Of type, size, and design indicated and minimum 1-3/4 inch thick. minimum wall thickness, 0.125 inch, except beads and trim, 0.050 inch. Door sizes shown are nominal; include standard clearances as follows: 0.093 inch at hinge and lock stiles, 0.125 inch between meeting stiles, 0.125 inch at top rails, 0.187 inch between bottom and threshold, and 0.687 inch between bottom and floor. Provide double-acting doors rounded edges at hinge stile, lock stile, and meeting stile edges.

##### 2.3.2.1 Full Glazed Stile and Rail Doors

Provide doors with narrow stiles and rails as indicated. Fabricate from extruded aluminum hollow seamless tubes or from a combination of open-shaped members interlocked or welded together. Fasten top and bottom rail together by means of welding or by 3/8 or 1/2 inch diameter cadmium-plated tensioned steel tie rods. Provide an adjustable mechanism of jack screws or other methods in the top rail to allow for minor clearance adjustments after installation.

#### 2.3.3 Welding and Fastening

Where possible, locate welds on unexposed surfaces. Dress welds on exposed surfaces smoothly. Select welding rods, filler wire, and flux to produce a uniform texture and color in finished work. Remove flux and spatter from surfaces immediately after welding. Exposed screws or bolts will be permitted only in inconspicuous locations, and must have countersunk heads. Weld concealed reinforcements for hardware in place.

#### 2.3.4 Weatherstripping

Provide on stiles and rails of exterior doors. Fit into slots which are integral with doors or frames. Weatherstripping must be replaceable without special tools, and adjustable at meeting rails of pairs of doors.

During installation, verify doors swing freely and close positively. Refer to paragraph AIR INFILTRATION for air leakage requirements and testing.

#### 2.3.5 Anchors

On the backs of subframes, provide anchors of the sizes and shapes indicated for securing subframes to adjacent construction. Anchor transom bars at ends and mullions at head and sill. Where indicated, reinforce vertical mullions with structural steel members of sufficient length to extend up to the overhead structural slab or framing and secure thereto. 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.

#### 2.3.6 Provisions for Hardware

Coordinate with Section 08 71 00 DOOR HARDWARE. Deliver hardware templates and hardware (except field-applied hardware) to the door manufacturer for use in fabrication of aluminum doors and frames. Cut, reinforce, drill, and tap doors and frames at the factory to receive template hardware. Provide doors to receive surface-applied hardware, except push plates, kick plates, and mop plates, with reinforcing only; drill and tap in the field. Provide hardware reinforcements of stainless steel or steel with hot-dipped galvanized finish, and secure with stainless steel screws. Provide reinforcement in core of flush doors as required to receive locks, door closers, and other hardware.

#### 2.3.7 Provisions for Glazing

Provide extruded aluminum snap-in glazing beads on interior side of doors. Design glazing beads to receive thickness indicated for each glazed assembly. Coordinate requirements with Section 08 81 00.00 48 GLAZING.

#### 2.3.8 Finishes

Provide exposed aluminum surfaces with factory finish of anodic coating or organic coating.

##### 2.3.8.1 Anodic Coating

Clean exposed aluminum surfaces and provide an anodized finish conforming to AA DAF45. Provide electrolytically deposited color-anodized, designation AA-M10-C22-A34, Architectural Class II 0.4 mil to 0.7 mil finish. Provide material(s) in color(s) as indicated on the drawings.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Plumb, square, level, and align frames and framing members to receive doors and adjoining side lites. Anchor frames to adjacent construction as indicated and in accordance with manufacturer's printed instructions and the approved shop drawings. Install anchorage that complies with applicable structural requirements. Anchor bottom of each frame to rough floor construction with 3/32 inch thick minimum stainless steel angle clips secured to back of each jamb and to floor construction; use stainless steel bolts and expansion rivets for fastening clip anchors.

Hang doors to produce clearances specified in paragraph ALUMINUM DOORS.  
After erection and glazing, adjust doors and hardware to operate properly.

### 3.2 PROTECTION FROM DISSIMILAR MATERIALS

#### 3.2.1 Dissimilar Metals

Where aluminum surfaces come in contact with metals other than stainless steel, zinc, or small areas of white bronze, protect from direct contact to dissimilar metals.

##### 3.2.1.1 Protection

Provide one of the following systems to protect surfaces in contact with dissimilar metals:

- a. Paint the dissimilar metal with one coat of heavy-bodied bituminous paint.
- b. Apply elastomeric sealant between aluminum and dissimilar metals in accordance with Section 07 92 00.00 48 JOINT SEALANTS.
- c. Paint dissimilar metals with one coat of primer and one coat of aluminum paint.
- d. Use a non-absorptive tape or gasket in permanently dry locations.

#### 3.2.2 Drainage from Dissimilar Metals

In locations where drainage from dissimilar metals has direct contact with aluminum, provide protective paint to prevent aluminum discoloration.

#### 3.2.3 Masonry and Concrete

Provide aluminum surfaces in contact with mortar, concrete, or other masonry materials with one coat of heavy-bodied bituminous paint.

#### 3.2.4 Wood or Other Absorptive Materials

Provide aluminum surfaces in contact with absorptive materials subject to frequent moisture, and aluminum surfaces in contact with treated wood, with two coats of aluminum paint or one coat of heavy-bodied bituminous paint. In lieu of painting aluminum, paint the wood or other absorptive surface with two coats of aluminum paint and seal joints with elastomeric sealant.

### 3.3 SEALING AROUND ASSEMBLIES

Seal all penetrations of the air barrier by sealing around door openings as necessary to achieve compliance with air leakage requirements indicated in the air barrier sections of the specifications. Flash all doors with corrosion resistant flashing to prevent water intrusion.

### 3.4 CLEANING

Upon completion of installation, clean door and frame surfaces in accordance with door manufacturer's written recommended procedure. Do not use abrasive, caustic, or acid cleaning agents.

### 3.5 PROTECTION

Protect doors and frames from damage and from contamination by other materials such as cement mortar. Prior to completion and acceptance of the work, restore damaged doors and frames to original condition, or replace with new ones.

-- End of Section --

SECTION 08 14 00

WOOD DOORS  
08/16

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN FOREST FOUNDATION (AFF)

ATFS STANDARDS (2015) American Tree Farm System Standards of Sustainability 2015-2020

ASTM INTERNATIONAL (ASTM)

ASTM E2226 (2015a) Standard Practice for Application of Hose Stream

CALIFORNIA AIR RESOURCES BOARD (CARB)

CARB 93120 (2007) Airborne Toxic Control Measure (ATCM) to Reduce Formaldehyde Emissions from Composite Wood Products

CSA GROUP (CSA)

CSA Z809-08 (R2013) Sustainable Forest Management

FOREST STEWARDSHIP COUNCIL (FSC)

FSC STD 01 001 (2015) Principles and Criteria for Forest Stewardship

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 252 (2017) Standard Methods of Fire Tests of Door Assemblies

NFPA 80 (2016; TIA 16-1) Standard for Fire Doors and Other Opening Protectives

PROGRAMME FOR ENDORSEMENT OF FOREST CERTIFICATION (PEFC)

PEFC ST 2002:2013 (2015) PEFC International Standard Chain of Custody of Forest Based Products Requirements

SUSTAINABLE FOREST INITIATIVE (SFI)

SFI 2015-2019 (2015) Standards, Rules for Label Use, Procedures and Guidance

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

40 CFR 770 Formaldehyde Standards for Composite Wood Products

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

ANSI/WDMA I.S.6A (2013) Interior Architectural Stile and Rail Doors

WOODWORK INSTITUTE (WI)

NAAWS 3.1 (2017; 2018 Errata Edition) North American Architectural Woodwork Standards

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Doors; G

Submit drawings or catalog data showing each type of door unit ; include descriptive data of head and jamb weatherstripping with installation instructions. Indicate within drawings and data the door types and construction, sizes, thickness, methods of assembly, and glazing,.

SD-03 Product Data

Doors; G

Recycled Content for Door Cores; S

Accessories

Water-resistant Sealer

Sample Warranty

Fire Resistance Rating; G

SD-04 Samples

#### Doors

Prior to the delivery of wood doors, submit a sample section of each type of door which shows the stile, rail, veneer, finish, and core construction.

#### Door Finish Colors; G

Submit a minimum of three color selection samples, minimum 3 by 5 inches in size representing wood stain for selection by the Contracting Officer.

#### SD-06 Test Reports

##### Cycle-Slam

##### Hinge Loading Resistance

Submit cycle-slam test report for doors tested in accordance with ANSI/WDMA I.S.1A, and hinge loading resistance test report for doors tested in accordance with ANSI/WDMA I.S.6A.

#### SD-07 Certificates

##### Certificates of Grade

##### Certified Sustainably Harvested Flush Wood Doors; S

##### Indoor Air Quality for Particleboard and Agrifiber Door Cores: S

#### SD-11 Closeout Submittals

##### Warranty

### 1.3 CERTIFICATIONS

#### 1.3.1 Certified Wood Grades

Provide certificates of grade from the grading agency on fire doors.

#### 1.3.2 Certified Sustainably Harvested Wood

Provide wood certified as sustainably harvested by FSC STD 01 001, ATFS STANDARDS, CSA Z809-08, SFI 2015-2019, or other third party program certified by PEFC ST 2002:2013. Provide a letter of Certification of Sustainably Harvested Wood signed by the wood supplier. Identify certifying organization and their third party program name and indicate compliance with chain-of-custody program requirements. Submit sustainable wood certification data; identify each certified product on a line item basis. Submit copies of invoices bearing certification numbers.

#### 1.3.3 Indoor Air Quality Certification

##### 1.3.3.1 Composite Wood, Wood Structural Panel and Agrifiber Products

For purposes of this specification, composite wood and agrifiber products include particleboard, medium density fiberboard (MDF), wheatboard, strawboard, panel substrates, and door cores. Provide products certified to meet requirements of both 40 CFR 770 and CARB 93120. Provide current

product certification documentation from certification body.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

Deliver doors to the site in an undamaged condition and protect against damage and dampness. Stack doors flat under cover. Support on blocking, a minimum of 4 inch thick, located at each end and at the midpoint of the door. Store doors in a well-ventilated building so that they will not be exposed to excessive moisture, heat, dryness, direct sunlight, or extreme changes of temperature and humidity. Do not store in a building under construction until concrete, masonry work, and plaster are dry. Replace defective or damaged doors with new ones.

#### 1.5 WARRANTY

Warrant doors free of defects as set forth in the door manufacturer's standard door warranty.

### PART 2 PRODUCTS

#### 2.1 DOORS

Provide doors of the types, sizes, and designs indicated on drawings free of urea-formaldehyde resins.

##### 2.1.1 Flush Doors

Conform to ANSI/WDMA I.S.1A for flush doors. Provide hollow core doors with lock blocks and 1 inch minimum thickness hinge stile. 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. Provide certified sustainably harvested flush wood doors.

##### 2.1.1.1 Interior Flush Doors

Provide staved lumber core, Type II flush doors conforming to ANSI/WDMA I.S.1A with faces of good grade natural birch. Hardwood veneers must be rotary cut random matched. Door cores must have a minimum recycled content of 45 percent. Provide data identifying percentage of recycled content for door cores. Products must contain no added urea-formaldehyde resins. Provide certification of indoor air quality for particleboard and agrifiber door cores.

##### 2.1.2 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. Provide moldings on the exterior doors with sloped surfaces. Lip 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 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 including exterior doors with a water-repellent preservative treatment and so marketed at the manufacturer's plant.

#### 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 prefinished factory prefitted doors for the specified hardware, door frame and door-swing indicated. Machine and size doors at the factory by the door manufacturer in accordance with the standards under which the doors are produced and manufactured. The work includes sizing, beveling edges, mortising, and drilling for hardware and providing necessary beaded openings for glass and louvers. Provide the door manufacturer with the necessary hardware samples, and frame and hardware schedules to coordinate the work.

#### 2.3.6 Finishes

##### 2.3.6.1 Factory Finish

Provide doors finished at the factory by the door manufacturer as follows: NAAWS 3.1 Section 1500, specification for System No. 4 Conversion varnish alkyd urea or System No. 5 Vinyl catalyzed. The coating is NAAWS 3.1 premium, medium rubbed sheen, open grain effect. Use stain when required to produce the finish specified for color. Seal edges, cutouts, trim, and wood accessories, and apply two coats of finish compatible with the door face finish. Touch-up finishes that are scratched or marred, or where exposed fastener holes are filled, in accordance with the door manufacturer's instructions. Match color and sheen of factory finish

using materials compatible for field application.

#### 2.3.6.2 Color

Provide door finish colors in accordance with drawings.

#### 2.3.7 Water-Resistant Sealer

Provide manufacturer's standard water-resistant sealer compatible with the specified finishes.

### 2.4 SOURCE QUALITY CONTROL

Meet or exceed the following minimum performance criteria of stiles of "B" and "C" label fire doors utilizing standard mortise leaf hinges:

- a. Cycle-slam: Standard Duty Doors: 250,000 cycles with no loose hinge screws or other visible signs of failure when tested in accordance with the requirements of ANSI/WDMA I.S.1A .
- b. Hinge loading resistance: Averages of ten test samples not less than Standard Duty doors: 400 pounds force when tested for direct screw withdrawal in accordance with ANSI/WDMA I.S.6A using a No. 12, 1-1/4 inch long, steel, fully threaded wood screw. Drill 5/32 inch pilot hole, use 1-1/2 inch opening around screw for bearing surface, and engage screw full, except for last 1/8 inch. Do not use a steel plate to reinforce screw area.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

Before installation, seal top and bottom edges of doors with the approved water-resistant sealer. Seal cuts made on the job immediately after cutting using approved water-resistant sealer. Fit, trim, and hang doors with a 1/16 inch minimum, 1/8 inch maximum clearance at sides and top, and a 3/16 inch minimum, 1/4 inch maximum clearance over thresholds. Provide 3/8 inch minimum, 7/16 inch maximum clearance at bottom where no threshold occurs. Bevel edges of doors at the rate of 1/8 inch in 2 inch. Door warp must not exceed 1/4 inch when measured in accordance with ANSI/WDMA I.S.1A.

#### 3.1.1 Fire Doors

Install fire doors in accordance with NFPA 80. Do not paint over labels.

-- End of Section --

SECTION 08 33 23

OVERHEAD COILING DOORS  
08/15

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 SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE 7 (2017) Minimum Design Loads for Buildings and Other Structures

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE FUN IP (2017) Fundamentals Handbook, I-P Edition

ASME INTERNATIONAL (ASME)

ASME B29.400 (2001; (R 2008) (R 2013) (R 2018))  
Combination, "H" Type Mill Chains, and Sprockets

ASTM INTERNATIONAL (ASTM)

ASTM A153/A153M (2016) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A27/A27M (2017) Standard Specification for Steel Castings, Carbon, for General Application

ASTM A307 (2014; E 2017) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength

ASTM A36/A36M (2014) Standard Specification for Carbon Structural Steel

ASTM A48/A48M (2003; R 2012) Standard Specification for Gray Iron Castings

ASTM A53/A53M (2018) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A653/A653M (2017) 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 A780/A780M	(2009; R 2015) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A924/A924M	(2017a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM D2000	(2012; R 2017) Standard Classification System for Rubber Products in Automotive Applications
ASTM E330/E330M	(2014) Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E84	(2018a) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM F568M	(2007) Standard Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 2	(2000; R 2005; Errata 2008) Industrial Control and Systems Controllers, Contactors, and Overload Relays Rated 600 V
NEMA ICS 6	(1993; R 2016) Industrial Control and Systems: Enclosures
NEMA MG 1	(2016; SUPP 2016) Motors and Generators
NEMA ST 1	(1988; R 1994; R 1997) Specialty Transformers (Except General Purpose Type)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2017; ERTA 1-2 2017; TIA 17-1; TIA 17-2; TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6; TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10; TIA 17-11; TIA 17-12; TIA 17-13; TIA 17-14; TIA 17-15; TIA 17-16; TIA 17-17 ) National Electrical Code
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When

used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Overhead Coiling Doors; G  
Counterbalancing Mechanism; G  
Electric Door Operators; G  
Bottom Bars; G  
Guides; G  
Mounting Brackets; G  
Overhead Drum; G  
Hood; G  
Installation Drawings; G

SD-03 Product Data

Overhead Coiling Doors; G  
Hardware; G  
Counterbalancing Mechanism; G  
Electric Door Operators; G

SD-05 Design Data

Overhead Coiling Doors; G  
Hardware; G  
Counterbalancing Mechanism; G  
Electric Door Operators; G

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals; G  
Materials; G  
Devices; G  
Procedures; G  
Manufacture's Brochures; G  
Parts Lists; G

SD-11 Closeout Submittals

Warranty; G

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors to the jobsite wrapped in a protective covering with the brands and names clearly marked thereon. Store doors in an adequately ventilated dry location that is free from dirt and dust, water, or other contaminants. Store in a manner that permits easy access for inspection and handling.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Doors to be coiling type, with interlocking slats, complete with anchoring and door hardware, guides, hood, and operating mechanisms, and designed for use on openings as indicated. Use grease-sealed or self-lubricating bearings for rotating members.

2.1.1 Design Requirements

2.1.1.1 Overhead Coiling Door Detail Shop Drawings

Provide installation drawings for overhead coiling door assemblies which show: elevations of each door type, shape and thickness of materials, finishes, details of joints and connections, details of guides and fittings, rough opening dimensions, location and description of hardware, anchorage locations, and counterbalancing mechanism and door operator details. Show locations of replaceable fusible links on wiring diagrams for power, signal and controls. Include a schedule showing the location of each door with the drawings.

2.1.2 Performance Requirements

2.1.2.1 Wind Loading

Design and fabricate door assembly to withstand the wind loading pressure of at least 28 pounds per square foot with a maximum deflection of 1/120 of the opening width. Provide test data showing compliance with ASTM E330/E330M. Sound engineering principles may be used to interpolate or extrapolate test results to door sizes not specifically tested. Ensure complete assembly meets or exceeds the requirements of ASCE 7.

2.1.2.2 Operational Cycle Life

Design all portions of the door, hardware and operating mechanism that are subject to movement, wear, or stress fatigue to operate through a minimum number of 10 cycles per day. One complete cycle of door operation is defined as when the door is in the closed position, moves to the fully open position, and returns to the closed position.

## 2.2 COMPONENTS

### 2.2.1 Overhead Coiling Doors

#### 2.2.1.1 Curtain Materials and Construction

Provide curtain slats fabricated from Grade A steel sheets conforming to ASTM A653/A653M, with the additional requirement of a minimum yield point of 33,000 psi. Provide sheets, galvanized in accordance with ASTM A653/A653M and ASTM A924/A924M.

Fabricate doors from interlocking cold-rolled slats, with section profiles as specified, designed to withstand the specified wind loading. Ensure the provided slats are continuous without splices for the width of the door.

Provide slats filled with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84. Enclose insulation completely within slat faces on interior surface of slats.

#### 2.2.1.2 Insulated Curtains

Form Curtains from manufacturer's standard shapes of interlocking slats. Supply slat system with a minimum R-value of 4 when calculated in accordance with ASHRAE FUN IP. Slats to consist of a urethane core not less than 11/16-inch thick, completely enclosed within metal facings. Ensure the exterior face of slats are the same gauge as specified for curtains. Select an interior face not lighter than 0.0219-inches. The insulated slat assembly requires a flame spread rating of not more than 25 and a smoke development factor of not more than 50 when tested in accordance with ASTM E84.

#### 2.2.1.3 Curtain Bottom Bar

Install curtain bottom bars as pairs of angles from the manufacturer's standard steel, stainless and aluminum extrusions not less than 2.0 by 2.0-inches by 0.188-inch. Ensure steel extrusions conform to ASTM A36/A36M. Stainless steel extrusions conforming to ASTM A666, Type 304. Aluminum extrusions conforming to ASTM B221. Galvanize angles and fasteners in accordance with ASTM A653/A653M and ASTM A924/A924M. Coat welds and abrasions with paint conforming to ASTM A780/A780M.

#### 2.2.1.4 Vision Panels

Provide complete manufacturer's standard vision panels assembly consisting of clear acrylic glazing panels or fire-rated glass as required for the type door. Set panels in a neoprene channel with a galvanized-steel frame not less than 0.0359-inch uncoated thickness.

#### 2.2.1.5 Locks

Provide end and/or wind locks of Grade B cast steel conforming to ASTM A27/A27M, galvanized in accordance with ASTM A653/A653M, ASTM A153/A153M and ASTM A924/A924M. Secure locks at every other curtain slat.

#### 2.2.1.6 Weather Stripping

Ensure weather-stripping at the door-head and jamb is 1/8-inch thick sheet of natural or neoprene rubber with air baffles. Secure weather stripping to the insides of hoods with galvanized-steel fasteners through continuous galvanized-steel pressure bars at least 5/8-inch wide and 1/8-inch thick.

Ensure threshold weather-stripping is 1/8-inch thick sheet natural or neoprene rubber secured to the bottom bars.

Provide weather-stripping of natural or neoprene rubber conforming to ASTM D2000.

#### 2.2.1.7 Locking Devices

Provide a locking device assembly which includes cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

Provide chain lock keeper suitable for a standard padlock.

#### 2.2.1.8 Safety Interlock

Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

#### 2.2.1.9 Overhead Drum

Fabricate drums from nominal 0.028-inch thick, hot-dip galvanized steel sheet with G90 (Z275) zinc coating, complying with ASTM A653/A653M.

#### 2.2.1.10 Slats

No. 5F, 20 gauge, Grade 40 steel, ASTM A653/A653M galvanized steel zinc coating.

#### 2.2.2 Hardware

Ensure all hardware conforms to ASTM A153/A153M, ASTM A307, ASTM F568M, and ASTM A27/A27M.

##### 2.2.2.1 Guides

Fabricate curtain jamb guides from the manufacturer's standard angles or channels of same material and finish as curtain slats unless otherwise indicated. Provide guides with sufficient depth and strength to retain curtain, and to withstand loading. Ensure curtain operates smoothly. Slot bolt holes for track adjustment.

##### 2.2.2.2 Equipment Supports

Fabricate door-operating equipment supports from the manufacturer's standard steel shapes and plates conforming to ASTM A36/A36M, galvanized in accordance with ASTM A653/A653M and ASTM A924/A924M. Size the shapes and plates in accordance with the industry standards for the size, weight, and type of door installation.

#### 2.2.2.3 Hood

Provide a hood with a minimum 24-gauge galvanized sheet metal, flanged at top for attachment to header and flanged at bottom to provide longitudinal stiffness. The hood encloses the curtain coil and counterbalance mechanism.

#### 2.2.3 Counterbalancing Mechanism

Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted, around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed or self-lubricating bearings for rotating members.

##### 2.2.3.1 Brackets

Provide the manufacturer's standard mounting brackets with one located at each end of the counterbalance barrel conforming to ASTM A48/A48M. Provide brackets of either cast iron or cold-rolled steel.

Brackets will be of 1/4-inch minimum thick steel plates, with permanently sealed ball bearings. Designed to enclose ends of coil and provide support of counterbalance pipe at each end.

##### 2.2.3.2 Counterbalance Barrels

Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, conforming to ASTM A53/A53M. Ensure the barrel is of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats. Limit barrel deflection to not more than 0.03 inch per foot of span under full load.

Curtain to be coiled on a pipe of sufficient size to carry door load with deflection not to exceed 0.033 inches per foot of door span and to be correctly balanced by helical springs, oil tempered torsion type. Use cast iron barrel plugs to anchor springs to tension shaft and pipe.

###### a. Barrel

Provide steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot of width.

###### b. Spring Balance

Provide an oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door. Ensure that effort to operate manually operated units does not exceed 25 lbs. Provide wheel for applying and adjusting spring torque.

##### 2.2.3.3 Spring Balance

Install one or more oil-tempered, heat-treated steel helical torsion springs within the barrel, capable of producing sufficient torque to assure easy operation of the door curtain. Provide and size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with

cast-steel barrel plugs.

#### 2.2.3.4 Torsion Rod for Counter Balance

Fabricate rod from the manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

#### 2.2.3.5 Counterbalance Shaft Assembly

##### a. Barrel

Provide steel pipe capable of supporting the curtain load with maximum deflection of 0.03 inches per foot of width.

##### b. Spring Balance

Provide an oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door. Ensure that maximum effort to operate does not exceed 25 pounds. Provide wheel for applying and adjusting spring torque.

#### 2.2.4 Electric Door Operators

Provide electrical wiring and door operating controls conforming to the applicable requirements of NFPA 70.

Electric door-operator assemblies needs to be the sizes and capacities recommended and provided by the door manufacturer for specified doors. Furnish complete assemblies with electric motors and factory-prewired motor controls, starter, gear reduction units, solenoid-operated brakes, clutch, remote-control stations, manual or automatic control devices, and accessories as required for proper operation of the doors.

Design the operators so that motors may be removed without disturbing the limit-switch adjustment and affecting the emergency auxiliary operators.

Provide a manual operator of crank-gear or chain-gear mechanisms with a release clutch to permit manual operation of doors in case of power failure. Arrange the emergency manual operator so that it may be put into and out of operation from floor level, and its use does not affect the adjustment of the limit switches. Provide an electrical or mechanical device that automatically disconnects the motor from the operating mechanism when the emergency manual operating mechanism is engaged.

##### 2.2.4.1 Electric Motors

Provide motors which are the high-starting-torque, reversible, constant-duty electrical type with overload protection of sufficient torque and horsepower to move the door in either direction from any position. Ensure they produce a door-travel speed of not less than 8 nor more than 12 inches per second without exceeding the horsepower rating.

Provide motors which conform to NEMA MG 1 designation, temperature rating, service factor, enclosure type, and efficiency to the requirements specified.

##### 2.2.4.2 Motor Bearings

Select bearings with bronze-sleeve or heavy-duty ball or roller

antifriction type with full provisions for the type of thrust imposed by the specific duty load.

Pre-lubricate and factory seal bearings in motors less than 1/2 horsepower.

Equip motors coupled to worm-gear reduction units with either ball or roller bearings.

Equip bearings in motors 1/2 horsepower or larger with lubrication service fittings. Fit lubrication fittings with color-coded plastic or metal dust caps.

In any motor, bearings that are lubricated at the factory for extended duty periods do not need to be lubricated for a given number of operating hours. Display this information on an appropriate tag or label on the motor with instructions for lubrication cycle maintenance.

#### 2.2.4.3 Motor Starters, Controls, and Enclosures

Provide each door motor with: a factory-wired, unfused, disconnect switch; a reversing, across-the-line magnetic starter with thermal overload protection; 120-volt operating coils with a control transformer limit switch; and a safety interlock assembled in a NEMA ICS 6 type enclosure as specified herein. Ensure control equipment conforms to NEMA ICS 2.

Provide adjustable switches, electrically interlocked with the motor controls and set to stop the door automatically at the fully open and fully closed position.

#### 2.2.4.4 Control Enclosures

Provide control enclosures that conform to NEMA ICS 6 for oil-tight and dust-tight NEMA Type 13.

#### 2.2.4.5 Transformer

Provide starters with 230/460 to 115 volt control transformers with one secondary fuse when required to reduce the voltage on control circuits to 120 volts or less. Provide a transformer conforming to NEMA ST 1.

#### 2.2.4.6 Safety-Edge Device

Provide each door with a pneumatic safety device extending the full width of the door and located within a U-section neoprene or rubber astragal, mounted on the bottom rail of the bottom door section. Device needs to immediately stop and reverse the door upon contact with an obstruction in the door opening during downward travel and cause the door to return to full-open position. A safety device is not a substitute for a limit switch.

Connect safety device to the control circuit through a retracting safety cord and reel.

#### 2.2.4.7 Remote-Control Stations

Provide interior remote control stations which are full-guarded, momentary-contact three-button, heavy-duty, surface-mounted NEMA ICS 6 type enclosures as specified. Mark buttons "OPEN," "CLOSE," and "STOP." Ensure the "CLOSE" button requires a constant pressure to maintain the

closing motion of the door. When the door is in motion and the "STOP" button is pressed, ensure the door stops instantly and remains in the stopped position. From the stopped position, the door may then be operated in either direction.

#### 2.2.4.8 Speed-Reduction Units

Provide speed-reduction units consisting of hardened-steel worm and bronze worm gear assemblies running in oil or grease and inside a sealed casing, coupled to the motor through a flexible coupling. Drive shafts need to rotate on ball- or roller-bearing assemblies that are integral with the unit.

Provide minimum ratings of speed reduction units in accordance with AGMA provisions for class of service.

Ground worm gears to provide accurate thread form; machine teeth for all other types of gearing. Surface harden all gears.

Provide antifriction type bearings equipped with oil seals.

#### 2.2.4.9 Chain Drives

Provide roller chains that are a power-transmission series steel roller type conforming to ASME B29.400, with a minimum safety factor of 10 times the design load.

Heat-treat or otherwise harden roller-chain side bars, rollers, pins, and bushings.

Provide high-carbon steel chain sprockets with machine-cut hardened teeth, finished bore and keyseat, and hollow-head setscrews.

#### 2.2.4.10 Brakes

Provide 360-degree shoe brakes or shoe and drum brakes. Ensure the brakes are solenoid-operated and electrically interlocked to the control circuit to set automatically when power is interrupted.

#### 2.2.4.11 Clutches

Ensure clutches are either the 4-inch diameter, multiple face, externally adjustable friction type or adjustable centrifugal type.

#### 2.2.4.12 Weather/Smoke Seal Sensing Edge

Provide automatic stop control by an automatic sensing switch within neoprene astragal extending the full width of door bottom bar.

Provide an electric sensing edge device. Ensure the door immediately stops downward travel when contact occurs before door fully closes. Provide a self-monitoring wireless sensing edge connection to the motor operator; eliminating the need for a physical traveling electric cord connection between bottom bar sensing edge device and motor operator. Supervised system alters normal door operation; preventing damage, injury or death due to an inoperable sensing edge system.

### 2.2.5 Surface Finishing

Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Noticeable variations in the same metal component are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved samples and are assembled or installed to minimize contrast.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Install overhead coiling door assembly, anchors and inserts for guides, brackets, motors, switches, hardware, and other accessories in accordance with approved detail drawings and manufacturer's written instructions. Upon completion of installation, ensure doors are free from all distortion.

Install overhead coiling doors, motors, hoods, and operators at the mounting locations as indicated for each door in the contract documents and as required by the manufacturer.

Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility and as required by the manufacturer.

#### 3.1.1 Field Painted Finish

Ensure field painted steel doors and frames are in accordance with Section 09 90 00 PAINTS AND COATINGS and manufacturer's written instructions. Protect weather stripping from paint. Ensure finishes are free of scratches or other blemishes.

### 3.2 ADJUSTING AND CLEANING

#### 3.2.1 Acceptance Provisions

After installation, adjust hardware and moving parts. Lubricate bearings and sliding parts as recommended by manufacturer to provide smooth operating functions for ease movement, free of warping, twisting, or distortion of the door assembly.

Adjust seals to provide weather-tight fit around entire perimeter.

Engage a factory-authorized service representative to perform startup service and checks according to manufacturer's written instructions.

Test the door opening and closing operation when activated by controls or alarm-connected fire-release system. Adjust controls and safeties. Replace damaged and malfunctioning controls and equipment. Reset door-closing mechanism after successful test.

Test and make final adjustment of new doors at no additional cost to the Government.

#### 3.2.1.1 Maintenance and Adjustment

Not more than 90 calendar days after completion and acceptance of the project, examine, lubricate, test, and re-adjust doors as required for

proper operation.

### 3.3 CLOSEOUT ACTIVITIES

#### 3.3.1 Warranty

Furnish a written guarantee that the helical spring and counterbalance mechanism are free from defects in material and workmanship for not less than two years after completion and acceptance of the project.

Warrant that upon notification by the Government, any defects in material, workmanship, and door operation are immediately correct within the same time period covered by the guarantee, at no cost to the Government.

#### 3.3.2 Operation And Maintenance

Submit 6 copies of the Operation and Maintenance Manuals 30 calendar days prior to testing the Overhead Coiling Door Assemblies. Update and resubmit data for final approval no later than 30 calendar days prior to contract completion.

Submit Operation and Maintenance Manuals for Overhead Coiling Door Assemblies, including the following items:

Materials

Devices

Manual Door Operators

Electric Door Operators

Hood

Counterbalancing Mechanism

Painting

Procedures

Manufacture's Brochures

Parts Lists

Provide operation and maintenance manuals which are consistent with manufacturer's standard brochures, schematics, printed instructions, operating procedures, and safety precautions. Provide test data that is legible and of good quality.

-- End of Section --

SECTION 08 34 59

VAULT DOORS AND DAY GATES  
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.

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS AA-D-600 (Rev D, Am 1; Am 4) Door, Vault, Security

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 29.00 06 SUSTAINABILITY REPORTING for project LEED BD+C 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 information only. When used, a designation following the "G" designation identifies the office that reviews the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Vault Door Unit; G  
Day Gate; G

SD-03 Product Data

Vault Door and Frame

SD-07 Certificates

Vault Door and Frame

SD-08 Manufacturer's Instructions

Installation

SD-11 Closeout Submittals

LEED Documentation

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver door and frame assemblies to the jobsite in a protective covering with the brand and name clearly marked thereon. Inspect materials delivered to the jobsite for damage, and unload them with a minimum of handling. Store in a dry location with adequate ventilation, free from dust, water, and other contaminants, and allowing easy access for inspection and handling. Store door assemblies off the floor on nonabsorptive strips or wood platforms. Prevent damage to doors and frames during handling. Replace damaged items that cannot be restored to like-new condition.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

The vault door unit shall be a steel security-vault type door with frame, day gate, and ramp type threshold, which is a standard product of a manufacturer specializing in this type of fabrication. Submit drawings showing head, jamb, and sill sections, and elevations of the doors and gate.

2.2 VAULT DOOR AND FRAME

Design and construct the door and frame assembly in conformance with FS AA-D-600. Provide a door which is Class 5-A, Type IIR - right opening swing without optical device. Lock on vault door shall conform to GSA FF-L-2937 specification and have a drill resistant case and locking mechanism. Submit manufacturer's catalog data including catalog cuts and brochures showing that the proposed vault door unit conforms with the requirements in FS AA-D-600, and has been tested and approved by the General Services Administration (GSA). Submit certification stating that the vault-door units that do not bear the GSA label are constructed to Class 5-A standards.

2.3 DAY GATE

Provide a day gate which is the manufacturer's standard product designed for use with the vault door furnished, and that provides access control and visual security and weapons issue. The gate shall: be hinged on the same side as the vault door, swing into the vault, and have a locking device operable from outside by key and from inside by knob or handle. Gate shall include an issue port hatch and 12 gage thick steel shelf. The issue port shall be a framed 8 by 12 inch opening with a minimum 22 gage thick steel protective door (hatch cover) which is hinged and lockable from the interior side. Weld the issue port frame to the day gate. The shelf shall be 12 inches deep by width to match the port hatch. Provide the manufacturer's standard finish. The day gate shall not interfere with the operation of vault door inner escape device.

PART 3 EXECUTION

3.1 INSTALLATION

Install the vault door assembly in strict compliance with the printed instructions and drawings provided by the manufacturer. Install the day

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W912QR20R0018-0000  
W912QR-18-F-0500  
P2: 475970

gate in a manner that does not interfere with operation of the release handle on the inside of the vault door. After installation, adjust the door, the locking mechanism, and the inner escape device for proper operation. Submit printed instructions and drawings provided by the manufacturer.

-- End of Section --

SECTION 08 51 14.00 48

ALUMINUM AND ENVIRONMENTAL CONTROL ALUMINUM WINDOWS  
03/06

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 DAF-45 (2003) Designation System for Aluminum Finishes

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA 101/I.S.2 (1997) Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors

AAMA 101/I.S.2/NAFS (2002) Voluntary Performance Specification for Windows, Skylights and Glass Doors

AAMA/WDMA/CSA 101/I.S.2/A440 (2011; Update 1 2014) North American Fenestration Standard/Specification for Windows, Doors, and Skylights

ASTM INTERNATIONAL (ASTM)

ASTM E 283 (1991; R 1999) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

ASTM E 330 (2002) Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

ASTM E 547 (2000) Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference

ASTM F 1642 (2004) 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

NATIONAL FENESTRATION RATING COUNCIL (NFRC)

- NFRC 100 (2001) Procedure for Determining Fenestration Product U-Factors
- NFRC 200 (2001) Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 101 (2003) Life Safety Code

U.S. DEPARTMENT OF DEFENSE (DOD)

- UFC 4-010-01 (2003) DoD Minimum Antiterrorism Standards for Buildings

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. The following shall be submitted in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Aluminum Windows

Drawings indicating elevations of window, rough-opening dimensions for each type and size of window, full-size sections, thicknesses of metal, fastenings, methods of installation and anchorage, connections with other work, type of wall construction, size and spacing of anchors, method of glazing, types and locations of operating hardware, mullion details, weatherstripping details, and window schedules showing locations of each window type.

SD-03 Product Data

Aluminum Windows

Manufacturer's descriptive data and catalog cut sheets. Manufacturer's preprinted installation instructions and cleaning instructions.

Design Analysis

For minimum antiterrorism windows, submit manufacturer's design analysis with calculations showing that the design of each different size and type of aluminum window system and their connections to the structure meet the minimum antiterrorism standards required by UFC 4-010-01 and paragraph "Minimum Antiterrorism Performance Criteria", unless conformance is demonstrated by Standard Airblast Test results. Calculations verifying the structural performance of each window proposed for use, under the given loads, shall be prepared and signed by a

registered professional engineer. The window components and anchorage devices to the structure, as determined by the design analysis, shall be reflected in the shop drawings.

#### SD-04 Samples

##### Aluminum Windows

Submit three color samples of the specified finishes.

#### SD-06 Test Reports

##### Aluminum Windows

Reports for each type of aluminum window attesting that identical windows have been tested and meet all performance requirements established under paragraph WINDOW PERFORMANCE.

##### Standard Airblast Test

For minimum antiterrorism windows, in lieu of a Design Analysis, results of airblast testing, whether by arena test or shocktube, shall be included in a test report, providing information in accordance with ASTM F 1642, as prepared by the independent testing agency performing the test. The test results shall demonstrate the ability of each window proposed for use to withstand the airblast loading parameters and achieve the hazard level rating specified in paragraph Standard Airblast Test Method.

#### SD-07 Certificates

##### Aluminum Windows

Certificates stating that the aluminum windows are AAMA certified conforming to requirements of this section. Labels or markings permanently affixed to the window will be accepted in lieu of certificates. Product ratings determined using NFRC 100 and NFRC 200 shall be authorized for certification and properly labeled by the manufacturer.

### 1.3 WINDOW PERFORMANCE

Aluminum windows shall meet the following performance requirements. Testing requirements shall be performed by an independent testing laboratory or agency.

#### 1.3.1 Structural Performance

Structural test pressures on window units shall be for positive load (inward) and negative load (outward) in accordance with ASTM E 330. After testing, there shall be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanisms or any other damage which could cause window to be inoperable. There shall be no permanent deformation of any main frame, sash or ventilator member in excess of the requirements established by AAMA 101/I.S.2 or AAMA 101/I.S.2/NAFS for the window types and classification specified in this section.

### 1.3.2 Minimum Antiterrorism Performance Criteria

Minimum antiterrorism windows shall meet the performance requirements of the paragraphs below. Glazing for antiterrorism windows shall be laminated glass as specified in Section 00 80 00.00 06 GLAZING. Glazing shall have a minimum frame bite of 3/8-inch for structurally glazed window systems and 1-inch for window systems that are not structurally glazed. Conformance to performance requirements may be validated by either one of the following two methods per ASTM F2248.

#### 1.3.2.1 Computational Design Analysis Method

Window frames, mullions, and hardware shall resist a static load of 1 lb per square inch applied perpendicular to the surface of the glazing and frame. Aluminum frame members may be designed based on a 0.2% offset yield strength. Deformations shall not exceed 1/60 of the unsupported member lengths. Equivalent static design loads for connections of the windows to the surrounding structure, the window hardware, associated internal window connections, and glazing stop connections shall be 10.8 pounds per square inch for glazing panels with a vision area less than or equal to 10.8 square feet, and 4.4 pounds per square inch for glazing panels with a vision area greater than 10.8 square feet but less than or equal to 32 square feet. (Vision area is defined as the area through which light may be seen.) Connections and hardware may be designed based on ultimate strength for steel and 0.2% offset yield strength for aluminum. Ultimate strengths and yield strengths may be increased by a factor of 1.1 over specified values. In addition, all safety factors used in blast-resistant structural design may be removed except for safety factors relating to shear.

#### 1.3.2.2 Standard Airblast Test Method

Each minimum antiterrorism window system type shall be tested for evaluation of hazards generated from airblast loading in accordance with ASTM F 1642 by an independent testing agency regularly engaged in blast testing. For proposed window systems that are of the same type as the tested system but of different size, the test results may be accepted provided the proposed window size is within the range from 25% smaller to 10% larger in area, than the tested window. Proposed windows of a size outside this range shall require testing to evaluate their hazard rating. Testing may be by shocktube or arena test. The test shall be performed on the entire proposed window system, which shall include, but not be limited to, the glazing, it's framing system, operating devices, and all anchorage devices. Anchorage of the window frame or subframe shall replicate the method of installation to be used for the project. The minimum airblast loading parameters for the test shall be as follows: Peak positive pressure of 5.8 psi and positive phase impulse of 41.1 psi-msec . The hazard rating for the proposed window systems, as determined by the rating criteria of ASTM F 1642, shall not exceed the "Very Low Hazard" rating (i.e. the "No Break", "No Hazard", "Minimal Hazard" and "Very Low Hazard" ratings are acceptable. "Low Hazard" and "High Hazard" ratings are unacceptable). Results of window systems previously tested by test protocols other than ASTM F 1642 may be accepted provided the required loading, hazard level rating, and size limitations stated herein are met.

#### 1.3.3 Air Infiltration

Air infiltration shall not exceed the amount established by AAMA 101/I.S.2 or AAMA 101/I.S.2/NAFS for each window type when tested in accordance with

ASTM E 283.

#### 1.3.4 Water Penetration

Water penetration shall not exceed the amount established by AAMA 101/I.S.2 or AAMA 101/I.S.2/NAFS for each window type when tested in accordance with ASTM E 547.

#### 1.3.5 Thermal Performance

Thermal transmittance for thermally broken aluminum windows with insulating glass shall not exceed a U-factor of 0.35 Btu/hr-ft<sup>2</sup>-F determined according to NFRC 100. Window units shall comply with the U.S. Department of Energy, Energy Star Window Program for the Northern Climate Zone.

#### 1.3.6 Condensation Index Rating

The condensation index rating shall be 68 as determined using NFRC approved software THERM.

#### 1.3.7 Life Safety Criteria

Windows shall conform to NFPA 101 Life Safety Code when rescue and/or second means of escape are indicated.

### 1.4 QUALIFICATION

Window manufacturer shall specialize in designing and manufacturing the type of aluminum windows specified in this section, and shall have a minimum of 3 years of documented successful experience. Manufacturer shall have the facilities capable of meeting contract requirements, single-source responsibility and warranty.

### 1.5 DELIVERY AND STORAGE

Aluminum windows shall be delivered to project site and stored in accordance with manufacturer's recommendations. Damaged windows shall be replaced with new windows.

### 1.6 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a 1 year period shall be provided.

## PART 2 PRODUCTS

### 2.1 ALUMINUM WINDOW TYPES

Aluminum windows shall consist of complete units including sash, glass, frame, weatherstripping, intermediate mullions, and hardware. Windows shall be labeled as conforming to AAMA 101/I.S.2 or AAMA 101/I.S.2/NAFS. The label shall state the name of the manufacturer, the approved labeling agency, and the product designation as specified in AAMA 101/I.S.2 or AAMA 101/I.S.2/NAFS. Windows shall also meet the minimum antiterrorism standards required by UFC 4-010-01 and the paragraph "Minimum Antiterrorism Performance Criteria" above. This may require stronger frames than for conventional loadings. It shall be the Contractor's responsibility to verify that the selected frames meet all performance

criteria, both conventional and antiterrorism, listed above. Windows shall be thermal break type double-glazed. Thermal barrier shall be neoprene, rigid vinyl, or polyurethane and shall be resistant to weather. Window members shall be heli-arc welded or angle-reinforced and mechanically joined and sealed. Exposed welded joints shall be dressed and finished. Joints shall be permanent and weathertight. Frames shall be constructed to provide a minimum 1/4 inch thermal break between the exterior and interior frame surfaces. Sash corners shall be internally sealed to prevent air and water leaks. Inner sash shall be key-controlled to swing to the interior to allow maintenance and replacement of the glass. Not less than 2 control keys shall be furnished.

#### 2.1.1 Fixed Windows

Aluminum fixed (F) windows shall conform to AAMA 101/I.S.2 or AAMA 101/I.S.2/NAFS F-C30 type, non-operable glazed frame, complete with provisions for reglazing in the field.

#### 2.2 WEATHERSTRIPPING

Weatherstrips shall be factory-applied and easily replaced in the field. Neoprene or polyvinylchloride weatherstripping are not acceptable where exposed to direct sunlight.

#### 2.3 ACCESSORIES

##### 2.3.1 Fasteners

Fastening devices shall be window manufacturer's standard design made from aluminum, non-magnetic stainless steel, cadmium-plated steel, nickel/chrome-plated steel in compliance with AAMA 101/I.S.2 or AAMA 101/I.S.2/NAFS. Self-tapping sheet metal screws will not be acceptable for material thicker than 1/16 inch.

##### 2.3.2 Hardware

Hardware shall be as specified for each window type and shall be fabricated of aluminum, stainless steel, cadmium-plated steel, zinc-plated steel or nickel/chrome-plated steel in accordance with requirements established by AAMA 101/I.S.2 or AAMA 101/I.S.2/NAFS.

##### 2.3.3 Window Anchors

Anchoring devices for installing windows shall be made of aluminum, cadmium-plated steel, stainless steel, or zinc-plated steel conforming to AAMA 101/I.S.2 or AAMA 101/I.S.2/NAFS. Anchoring devices for antiterrorism windows, including spacing, shall be designed by the manufacturer and included in the Design Analysis and indicated on the Shop Drawings.

#### 2.4 GLASS AND GLAZING

Aluminum windows shall be designed for inside glazing, field glazing, and for glass types scheduled on drawings and specified in Section 00 80 00.00 06 GLAZING. Units shall be complete with glass and glazing provisions to meet AAMA 101/I.S.2 or AAMA 101/I.S.2/NAFS. Glazing material shall be compatible with aluminum, and shall not require painting.

## 2.5 FINISH

### 2.5.1 Anodized Aluminum Finish

Exposed surfaces of aluminum windows shall be finished with anodic coating conforming to AA DAF-45: Architectural Class I, AA-M10-C22-A44, color anodic coating, 0.7 mil or thicker. Finish shall be free of scratches and other blemishes.

### 2.5.2 Color

Color shall be as indicated on the drawings. Color listed is not intended to limit the selection of equal colors from other manufacturers.

## 2.6 MULLIONS

Provide mullions between multiple-window units where indicated. Mullions and mullion covers must be the profile indicated, reinforced as required for the specified wind loading, and securely anchored to the adjoining construction. Mullion extrusion will include serrations or pockets to receive weatherstripping, sealant, or tape at the point of contact with each window flange.

Mullion assembly must include aluminum window clamps or brackets screwed or bolted to the mullion and the mullion cover.

Mullion cover must be screw-fastened to the mullion unless otherwise indicated.

Mullion reinforcing members shall be fabricated of the materials specified in AAMA/WDMA/CSA 101/I.S.2/A440 and meet the specified design loading.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Aluminum windows shall be installed in accordance with approved shop drawings and manufacturer's published instructions. Aluminum surfaces in contact with masonry, concrete, wood and dissimilar metals other than stainless steel, zinc, cadmium or small areas of white bronze, shall be protected from direct contact using protective materials recommended by AAMA 101/I.S.2 or AAMA 101/I.S.2/NAFS. The completed window installation shall be watertight in accordance with Section 07 92 00.00 48 JOINT SEALANTS. Glass and glazing shall be installed in accordance with requirements of this section and Section 00 80 00.00 06 GLAZING.

### 3.2 ADJUSTMENTS AND CLEANING

#### 3.2.1 Hardware Adjustments

Final operating adjustments shall be made after glazing work is complete. Operating sash or ventilators shall operate smoothly and shall be weathertight when in locked position.

#### 3.2.2 Cleaning

Aluminum window finish and glass shall be cleaned on exterior and interior sides in accordance with window manufacturer's recommendations. Alkaline or abrasive agents shall not be used. Precautions shall be taken to avoid

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W912QR20R0018-0000  
W912QR-18-F-0500  
P2: 475970

scratching or marring window finish and glass surfaces.

-- End of Section --

SECTION 08 71 00

DOOR HARDWARE  
02/16

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM E283 (2004; R 2012) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.1 (2016) Butts and Hinges  
ANSI/BHMA A156.13 (2017) Mortise Locks & Latches Series 1000  
ANSI/BHMA A156.16 (2013) Auxiliary Hardware  
ANSI/BHMA A156.2 (2017) Bored and Preassembled Locks and Latches  
ANSI/BHMA A156.21 (2014) Thresholds  
ANSI/BHMA A156.22 (2017) Door Gasketing and Edge Seal Systems  
ANSI/BHMA A156.25 (2013) Electrified Locking Devices  
ANSI/BHMA A156.3 (2014) Exit Devices  
ANSI/BHMA A156.31 (2013) Electric Strikes and Frame Mounted Actuators  
ANSI/BHMA A156.4 (2013) Door Controls - Closers  
ANSI/BHMA A156.5 (2014) Cylinder and Input Devices for Locks  
ANSI/BHMA A156.6 (2015) Architectural Door Trim  
ANSI/BHMA A156.7 (2016) Template Hinge Dimensions

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101 (2018; TIA 18-1; TIA 18-2; TIA 18-3) Life Safety Code  
NFPA 252 (2017) Standard Methods of Fire Tests of Door Assemblies

NFPA 70 (2017; ERTA 1-2 2017; TIA 17-1; TIA 17-2;  
TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6;  
TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10;  
TIA 17-11; TIA 17-12; TIA 17-13; TIA  
17-14; TIA 17-15; TIA 17-16; TIA 17-17 )  
National Electrical Code

NFPA 72 (2016; Errata 1 2018) National Fire Alarm  
and Signaling Code

NFPA 80 (2016; TIA 16-1) 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

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

36 CFR 1191 Americans with Disabilities Act (ADA)  
Accessibility Guidelines for Buildings and  
Facilities; Architectural Barriers Act  
(ABA) Accessibility Guidelines

UNDERWRITERS LABORATORIES (UL)

UL Bld Mat Dir (updated continuously online) Building  
Materials Directory

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation;  
submittals not having a "G" designation are for information only. When  
used, a designation following the "G" designation identifies the office  
that will review the submittal for the Government. Submittals with an "S"  
are for inclusion in the Sustainability eNotebook, in conformance with  
Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in  
accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Hardware Schedule; G

Keying System; G

SD-03 Product Data

Hardware Items; G

SD-08 Manufacturer's Instructions

Installation

SD-10 Operation and Maintenance Data

Hardware Schedule Items, Data Package 1; G

SD-11 Closeout Submittals

Key Bitting

1.3 SHOP DRAWINGS

Submit manufacturer's detail drawings indicating all hardware assembly components and interface with adjacent construction. Indicate power components and wiring coordination for electrified hardware. Base shop drawings on verified field measurements and include verification of existing conditions.

1.4 PRODUCT DATA

Indicate fire-ratings at applicable components. Provide documentation of ABA/ADA accessibility compliance of applicable components, as required by 36 CFR 1191 Appendix D - Technical.

1.5 HARDWARE SCHEDULE

Prepare and submit hardware schedule in the following form:

Hardware Item	Quantity	Size	Reference Publication Type No.	Finish	Mfr Name and Catalog No.	Key Control Symbols	UL Mark (If fire-rated and listed)	BHMA Finish Designation

In addition, submit hardware schedule data package 1 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

1.6 KEY BITTING CHART REQUIREMENTS

1.6.1 Requirements

Submit key bitting charts to the Contracting Officer prior to completion of the work. Include:

- a. Complete listing of all keys (e.g. AA1 and AA2).
- b. Complete listing of all key cuts (AA1-123456, AA2-123458).
- c. Tabulation showing which key fits which door.
- d. Copy of floor plan showing doors and door numbers.
- e. Listing of 20 percent more key cuts than are presently required in each master system.

1.7 QUALITY ASSURANCE

1.7.1 Hardware Manufacturers and Modifications

Provide, as far as feasible, locks, hinges, and closers of one lock, hinge, or closer manufacturer's make. Modify hardware as necessary to provide

features indicated or specified.

#### 1.7.2 Key Shop Drawings Coordination Meeting

Prior to the submission of the key shop drawing, the Contracting Officer, Contractor, Door Hardware Subcontractor, using Activity and Base Locksmith must meet to discuss and coordinate key requirements for the facility.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

Deliver hardware in original individual containers, complete with necessary appurtenances including fasteners and instructions. Mark each individual container with item number as shown on hardware schedule. Deliver permanent keys and removable cores to the Contracting Officer, either directly or by certified mail. Deliver construction master keys with the locks.

### PART 2 PRODUCTS

#### 2.1 TEMPLATE HARDWARE

Hardware applied to metal or to prefinished doors must be manufactured using a template. Provide templates to door and frame manufacturers in accordance with ANSI/BHMA A156.7 for template hinges. Coordinate hardware items to prevent interference with other hardware.

#### 2.2 HARDWARE FOR FIRE DOORS AND EXIT DOORS

Provide all hardware necessary to meet the requirements of NFPA 72 for door alarms, NFPA 80 for fire doors, NFPA 101 for exit doors, NFPA 252 for fire tests of door assemblies, ABA/ADA accessibility requirements, and all other requirements indicated, even if such hardware is not specifically mentioned in paragraph HARDWARE SCHEDULE. Provide Underwriters Laboratories, Inc. labels for such hardware in accordance with UL Bld Mat Dir or equivalent labels in accordance with another testing laboratory approved in writing by the Contracting Officer.

#### 2.3 HARDWARE ITEMS

Clearly and permanently mark with the manufacturer's name or trademark, hinges, pivots, locks, latches, exit devices, bolts and closers where the identifying mark is visible after the item is installed. For closers with covers, the name or trademark may be beneath the cover. Coordinate electrified door hardware components with corresponding components specified in Division 28 ELECTRONIC SECURITY SYSTEMS (ESS).

##### 2.3.1 Hinges

Provide in accordance with ANSI/BHMA A156.1. Provide hinges that are 4-1/2 by 4-1/2 inch unless otherwise indicated. Construct loose pin hinges for interior doors and reverse-bevel exterior doors so that pins are non-removable when door is closed. Other anti-friction bearing hinges may be provided in lieu of ball bearing hinges.

##### 2.3.2 Locks and Latches

###### 2.3.2.1 Bored Locks and Latches

Provide in accordance with ANSI/BHMA A156.2, Series 4000, Grade 1.

#### 2.3.2.2 Residential Bored Locks and Latches

Provide in accordance with ANSI/BHMA A156.2, Series 4000, Grade 2. Install locks for exterior doors with threaded roses or concealed machine screws.

#### 2.3.3 Exit Devices

Provide in accordance with ANSI/BHMA A156.3, Grade 1. Provide adjustable strikes for rim type and vertical rod devices. Provide open back strikes for pairs of doors with mortise and vertical rod devices. Provide touch bars in lieu of conventional crossbars and arms. Provide escutcheons not less than 7 by 2-1/4 inch.

#### 2.3.4 Cylinders and Cores

Provide cylinders and cores for new locks, including locks provided under other sections of this specification. Provide cylinders and cores with seven pin tumblers. Provide cylinders from the products of one manufacturer, and provide cores from the products of one manufacturer. Rim cylinders, 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.

#### 2.3.5 Electrified Hardware

Comply with the requirements of NFPA 70 for wiring of electrified hardware.

##### 2.3.5.1 Electric Strikes and Frame Mounted Actuators

Provide in accordance with ANSI/BHMA A156.31, Grade 1. Provide electric strikes and actuators as required to meet operational requirements. Provide electric strikes that remain secure during power failure. Provide a separate power supply for electric strikes, other locking devices and ancillary parts. Provide battery backup for continued operation during power failure. Provide strikes and actuators with a minimum opening force of 2300 pounds.

Provide facility interface devices that use direct current (dc) power to energize the solenoids. Provide electric strikes and actuators that incorporate end-of-line resistors to facilitate line supervision by the system. If not incorporated into the electric strike or local controller, provide metal oxide resistors (MOVs) to protect the controller from reverse current surges.

##### 2.3.5.1.1 Solenoid

Provide actuating solenoid for strikes and actuators that are rated for continuous duty, cannot dissipate more than 12 Watts and must operate on 12 or 24 Volts dc. Inrush current cannot exceed 1 ampere and the holding current cannot be greater than 500 milliamperes. Actuating solenoid must move from fully secure to fully open positions in less than 500 milliseconds.

##### 2.3.5.1.2 Signal Switches

Provide strikes and actuators with signal switches to indicate to the

system when the bolt is not engaged or the strike mechanism is unlocked. Signal switches must report a forced entry to the system.

#### 2.3.5.1.3 Coordination

Provide electric strikes and actuators of a size, weight and profile compatible with each specified door frame. Field verify installation clearances prior to procurement.

#### 2.3.5.1.4 Mounting Method

Provide electric strikes and actuators suitable for use with single and double doors, with mortise or rim type hardware specified, and for right or left hand mounting as specified. In double door installations, locate the lock in the active leaf and monitor the fixed leaf.

#### 2.3.5.2 Card Readers and Keypad Access Control Hardware

Provide in accordance with ANSI/BHMA A156.5 and ANSI/BHMA A156.25, Grade 1 components. Provide devices that are tamper alarmed, tamper and vandal resistant, solid state, and do not contain electronics which could compromise the access control subsystem should the subsystem be attacked. Provide surface, semi-flush, pedestal, or weatherproof mountable devices as specified for each individual location. Provide proximity type card readers capable of reading proximity type access control cards. Coordinate access control hardware with corresponding devices and systems specified in 28 13 00.00 48 PHYSICAL ACCESS CONTROL SYSTEM.

#### 2.3.6 Keying System

Provide a master keying system. Provide construction interchangeable cores. Provide key cabinet as specified.

#### 2.3.7 Lock Trim

Provide cast, forged, or heavy wrought construction and commercial plain design for lock trim.

##### 2.3.7.1 Levers and Roses

Provide in accordance with ANSI/BHMA A156.2 and ANSI/BHMA A156.13 for levers and roses. For unreinforced levers and roses, provide a 0.050 inch thickness. For reinforced levers and roses, provide an outer shell thickness of 0.035 inch and a combined total thickness of 0.070 inch, except for lever shanks. Provide lever shanks 0.060 inch thick.

##### 2.3.7.2 Lever Handles

Provide lever handles in lieu of knobs. Provide in accordance with ANSI/BHMA A156.3 for mortise locks of lever handles for exit devices. Provide lever handle locks with a breakaway feature (such as a weakened spindle or a shear key) to prevent irreparable damage to the lock when force in excess of that specified in ANSI/BHMA A156.13 is applied to the lever handle. Provide lever handles return to within 1/2 inch of the door face.

##### 2.3.7.3 Texture

Provide knurled or abrasive coated knobs or lever handles for doors which

are accessible to blind persons and which lead to dangerous areas.

#### 2.3.8 Keys

Furnish one file key, one duplicate key, and one working key for each key change and for each master keying system. Furnish one additional working key for each lock of each keyed-alike group. Furnish 2 master keys, 2 construction master keys, and 2 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.

#### 2.3.9 Door Bolts

Provide in accordance with ANSI/BHMA A156.16. Provide dustproof strikes for bottom bolts, except at doors having metal thresholds. Provide automatic latching flush bolts in accordance with ANSI/BHMA A156.3, Type 25.

#### 2.3.10 Closers

Provide in accordance with ANSI/BHMA A156.4, Series C02000, Grade 1, with PT 4C. Provide with brackets, arms, mounting devices, fasteners, and other features necessary for the particular application. Size closers in accordance with manufacturer's printed recommendations, or provide multi-size closers, Sizes 1 through 6, and list sizes in the Hardware Schedule. Provide manufacturer's 10 year warranty.

##### 2.3.10.1 Identification Marking

Engrave each closer with manufacturer's name or trademark, date of manufacture, and manufacturer's size designation in locations that will be visible after installation.

#### 2.3.11 Door Protection Plates

Provide in accordance with ANSI/BHMA A156.6.

##### 2.3.11.1 Sizes of Mop and Kick Plates

1/2 inch less than door width for single doors; 1 inch less than door width for pairs of doors. Provide 10 inch kick plates for flush doors. Provide 10 inch mop plates.

#### 2.3.12 Door Stops and Silencers

Provide in accordance with ANSI/BHMA A156.16. Silencers Type L03011. Provide three silencers for each single door, two for each pair.

#### 2.3.13 Thresholds

Provide in accordance with ANSI/BHMA A156.21. Use J35100, with vinyl or silicone rubber insert in face of stop, for exterior doors opening out, unless specified otherwise.

#### 2.3.14 Weatherstripping Gasketing

Provide in accordance with ANSI/BHMA A156.22. Provide the type and function designation where specified in paragraph HARDWARE SCHEDULE.

Provide a set to include head and jamb seals. Air leakage of weatherstripped doors not to exceed 1.25 cubic feet per minute of air per square foot of door area when tested in accordance with ASTM E283. Provide weatherstripping as indicated and specified

#### 2.3.14.1 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.

#### 2.3.14.2 Interlocking Type

Zinc or bronze not less than 0.018 inch thick.

#### 2.3.14.3 Spring Tension Type

Spring bronze or stainless steel not less than 0.008 inch thick.

#### 2.3.15 Rain Drips

Provide in accordance with ANSI/BHMA A156.22. Provide extruded aluminum rain drips, not less than 0.08 inch thick, clear anodized finish. Provide the manufacturer's full range of color choices to the Contracting Officer for color selection. Provide rain drips with a 4 inch overlap on each side of each exterior door that is not protected by an awning, roof, eave or other horizontal projection. Set drips in sealant and fasten with stainless steel screws.

#### 2.3.15.1 Door Rain Drips

Approximately 1-1/2 inch high by 5/8 inch projection. Align bottom with bottom edge of door.

#### 2.3.16 Special Tools

Provide special tools, such as spanner and socket wrenches and dogging keys, as required to service and adjust hardware items.

#### 2.4 FASTENERS

Provide fasteners of type, quality, size, and quantity appropriate to the specific application. Fastener finish to match hardware. Provide stainless steel or nonferrous metal fasteners in locations exposed to weather. Verify metals in contact with one another are compatible and will avoid galvanic corrosion when exposed to weather.

#### 2.5 FINISHES

As specified in Paragraph 3.6 Hardware Sets.

#### 2.6 KEY CABINET AND CONTROL SYSTEM

Provide in accordance with ANSI/BHMA A156.5. Type required to yield a capacity (number of hooks) 50 percent greater than the number of key changes used for door locks.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Provide hardware in accordance with manufacturers' printed installation instructions. Fasten hardware to wood surfaces with full-threaded wood screws or sheet metal screws. Provide machine screws set in expansion shields for fastening hardware to solid concrete and masonry surfaces. Provide toggle bolts where required for fastening to hollow core construction. Provide through bolts where necessary for satisfactory installation.

##### 3.1.1 Weatherstripping Installation

Provide full contact, weathertight seals that allow operation of doors without binding the weatherstripping.

###### 3.1.1.1 Stop Applied Weatherstripping

Fasten in place with color matched sheet metal screws not more than 9 inch on center after doors and frames have been finish painted.

##### 3.1.2 Threshold Installation

Extend thresholds the full width of the opening and notch end for jamb stops. Set thresholds in a full bed of sealant and anchor to floor with cadmium-plated, countersunk, steel screws in expansion sleeves. For aluminum thresholds placed on top of concrete surfaces, coat the underside surfaces that are in contact with the concrete with fluid applied waterproofing as a separation measure prior to placement.

#### 3.2 FIRE DOORS AND EXIT DOORS

Provide hardware in accordance with NFPA 72 for door alarms, NFPA 80 for fire doors, NFPA 101 for exit doors, and NFPA 252 for fire tests of door assemblies.

#### 3.3 HARDWARE LOCATIONS

Provide in accordance with SDI/DOOR A250.8, unless indicated or specified otherwise.

- a. Kick and Armor Plates: Push side of single-acting doors. Both sides of double-acting doors.
- 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. Provide complete instructions for setup and use of key control system. On tags and envelopes, indicate door and room numbers or master or grand master key.

#### 3.5 FIELD QUALITY CONTROL

After installation, protect hardware from paint, stains, blemishes, and other damage until acceptance of work. Submit notice of testing 15 days

before scheduled, so that testing can be witnessed by the Contracting Officer. Adjust hinges, locks, latches, bolts, holders, closers, and other items to operate properly. Demonstrate that permanent keys operate respective locks, and give keys to the Contracting Officer. Correct, repair, and finish, errors in cutting and fitting and damage to adjoining work.

### 3.6 HARDWARE SETS

Provide hardware for aluminum doors under this section. Deliver Hardware templates and hardware, except field applied hardware, to the aluminum door and frame manufacturer for use in fabricating doors and frames.

-- End of Section --

## Hardware Sets for 015907 (Caven Point USARC)

## HW#1 – DOOR # 100

2EA	PIVOT SET	RIXSON	147	626
2EA	INTERMEDIATE PIVOT	RIXSON	M19	626
1EA	EXIT DEVICE	SARGENT	8713 ETL	626
1EA	EXIT DEVICE	SARGENT	8710	626
2EA	CLOSERS	SARGENT	351-250	EN
1EA	THRESHOLD	NAT. GUARD	8533x72"	MILL
1SET	PERIMETER SEAL	PER ALUMINUM DOOR MANUFACTURER		
2EA	DOOR SWEEP	PER ALUMINUM DOOR MANUFACTURER		

## HW#2- DOOR #

2EA	PIVOT SET	RIXSON	147	626
2EA	INTERMEDIATE PIVOT	RIXSON	M19	626
1EA	EXIT DEVICE	SARGENT	8876 ETL	626
1EA	EXIT DEVICE	SARGENT	8710	626
1EA	MULLION	SARGENT	L980	EN
2EA	CLOSERS	SARGENT	351-250	EN
1EA	THRESHOLD	NAT. GUARD	8533x72"	MILL
1EA	CARD READER	PER SPECIFICATION 28 13 00.00 48		
1EA	POWER SUPPLY	COORDINATE WITH ELECTRIFIED HARDWARE		
1EA	POWER TRANSFER	SECURITRON	EPT-SC	
1SET	PERIMETER SEAL	PER ALUMINUM DOOR MANUFACTURER		
2EA	DOOR SWEEP	PER ALUMINUM DOOR MANUFACTURER		

Door normally closed and locked. Swiping access card allows entry to active leaf. Upon loss of power door remains locked, with mechanical key cylinder override. Always free to egress.

HW#3 – DOOR # 102A, 106A, 107A, 108A, 109A, 145A, 147A, 148A, 149A, 150A, 151A, 152, 204A, 205A, 212A, 213A, 214A, 215A, 218A, 219A, 220A, 221A, 222A, 223A, 224A, 225A, 226A, 227A, 228A, 229A, 231A, 232A, 233A, 234A, 235A, 238A, 240, 242A, 243A

3EA	BUTTS	HAGER	BB1279 4.5x4.5	652
1EA	LOCKSET	BEST ACCESS	9K37B15D	626
1EA	KICKPLATE	ROCKWOOD	K1050	630
1EA	WALL STOP	ROCKWOOD	403	626
3EA	SILENCERS	IVES	SR64	
1EA	COAT HOOK	PETER PEPPER	2081	AL

## HW#4 – DOOR # 113A, 206A, 208A

3EA	BUTTS	HAGER	BB1279 4.5x4.5	652
1EA	LOCKSET	BEST ACCESS	9K37D15D	626
1EA	CLOSER	SARGENT	1431-O	EN
1EA	KICK PLATE	ROCKWOOD	K1050	630
1EA	WALL STOP	ROCKWOOD	403	626
3EA	SILENCERS	IVES	SR64	

## HW#5 – DOOR # 104A, 105A, 127A, 142A, 143A, 202A, 230A, 239A

3EA	BUTTS	HAGER	BB1279 4.5x4.5	652
1EA	LOCKSET	BEST ACCESS	9K37D15D	626
1EA	CLOSER	SARGENT	1431-P9	EN
1EA	MOP PLATE	ROCKWOOD	K1050	630
3EA	SILENCERS	IVES	SR64	

## HW#6 – DOOR # 120A, 125A, 126A, 128A, 128B, 267A, 241A

3EA	BUTTS	HAGER	BB1279 4.5x4.5	652
1EA	LOCKSET	BEST ACCESS	9K37R15D	626
1EA	KICKPLATE	ROCKWOOD	K1050	630
1EA	MOP PLATE	ROCKWOOD	K1050	630
1EA	WALL STOP	ROCKWOOD	403	626
	(NO WALL STOP AT 106A)			
3EA	SILENCERS	IVES	SR64	

## HW#7 – DOOR # 122A, 134A

3EA	BUTTS	HAGER	BB1279 4.5x4.5	652
1EA	LOCKSET	BEST ACCESS	9K37R15D	626
1EA	CLOSER	SARGENT	1431-O	EN
1EA	KICKPLATE	ROCKWOOD	K1050	630
1EA	WALL STOP	ROCKWOOD	403	626
3EA	SILENCERS	IVES	SR64	

## HW#8 – DOOR # 114A, 115A, 115B, 117A, 119A, 139A, 140A, 119B, 209A, 210A

3EA	BUTTS	HAGER	BB1279 4.5x4.5	652
1EA	PUSH PLATE	ROCKWOOD	70CxRC	630
1EA	PULL	ROCKWOOD	107x70CxRC	630
1EA	CLOSER	SARGENT	1431-O	EN
1EA	KICK PLATES	ROCKWOOD	K1050	630
1EA	MOP PLATES	ROCKWOOD	K1050	630
1EA	WALL STOP	ROCKWOOD	403	626
3EA	SILENCERS	IVES	SR64	

## HW#9 – DOOR # 136A, 137A

6EA	BUTTS	HAGER	BB1279 4.5x4.5	652
2EA	FLUSH BOLT	ROCKWOOD	550	630
1EA	LOCKSET	BEST ACCESS	9K37D15D	626
2EA	MOP PLATE	ROCKWOOD	K1050	630
2EA	DOOR STOP	ROCKWOOD	461	626
2EA	SILENCERS	IVES	SR64	

## HW#10 – DOOR # 121B, 130A, 133B, 133D, 134B, 160C

3EA	BUTTS	HAGER	BB1191 4.5x4.5	626
1EA	EXIT DEVICE	SARGENT	8810	626
1EA	CLOSER	SARGENT	1431-P9	EN
1EA	KICKPLATE	ROCKWOOD	K1050	630
1EA	THRESHOLD	NAT. GUARD	8533x36"	MILL
1SET	PERIMETER SEAL	NAT. GUARD	5020	CL
1 EA	DOOR SWEEP	NAT. GUARD	9605x36"	A

## HW#11 – DOOR # 124A, 133A

6EA	BUTTS	HAGER	BB1279 4.5x4.5	652
2EA	EXIT DEVICE	SARGENT	NB-8715 ETL	626
2EA	CLOSER	SARGENT	1431-P9	EN
2EA	KICK PLATE	ROCKWOOD	K1050	630
2EA	MOP PLATE	ROCKWOOD	K1050	630
2EA	WALL STOP	ROCKWOOD	403	626
2EA	SILENCERS	IVES	SR64	

## HW#12 – DOOR # 207A

3EA	BUTTS	HAGER	BB1279 4.5x4.5	652
1EA	LATCHSET	BEST ACCESS	9K30N15D	626
1EA	CLOSER	SARGENT	1431-O	EN
1EA	KICK PLATE	ROCKWOOD	K1050	630
1EA	MOP PLATE	ROCKWOOD	K1050	630
1EA	WALL STOP	ROCKWOOD	403	626
3EA	SILENCERS	IVES	SR64	

## HW#13 – DOOR #

3EA	BUTTS	HAGER	BB1279 4.5x4.5	652
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1EA	LOCKSET	BEST ACCESS	9K37D15D	626
1EA	CLOSER	SARGENT	1431-O	EN
1EA	KICK PLATE	ROCKWOOD	K1050	630
1SET	GASKETING	NAT. GUARD	5020	CL
1EA	DOOR SWEEP	NAT. GUARD	9605x36"	A

## HW#14 – DOOR #

3EA	BUTTS	HAGER	BB1191 4.5x4.5	626
1EA	LOCKSET	BEST ACCESS	9K37D15D	626
1EA	CLOSER	SARGENT	1431-P9	EN
1EA	THRESHOLD	NAT. GUARD	8533x36"	MILL
1SET	PERIMETER SEAL	NAT. GUARD	5020	CL
1EA	DOOR BOTTOM	NAT. GUARD	9605x36"	A

## HW#15 – DOOR # 103A, 141A

6EA	BUTTS	HAGER	BB1191 4.5x4.5	626
1EA	FLUSH BOLT	ROCKWOOD	2845	630
1EA	LOCKSET	BEST ACCESS	9K37D15D	626
2EA	CLOSER	SARGENT	1431-P9	EN
1EA	COORDINATOR	ROCKWOOD	2672	
1EA	THRESHOLD	NAT. GUARD	8533x72"	MILL
1SET	PERIMETER SEAL	NAT. GUARD	5020	CL
1SET	ASTRAGAL	NAT. GUARD	9605	A
2EA	DOOR BOTTOM	NAT. GUARD	9605x36"	A

## HW#16 – DOOR #

3EA	BUTTS	HAGER	BB1279 4.5x4.5	652
1EA	COMBINATION LOCK	KABA MAS	CD X-10	
1EA	CLOSER	SARGENT	1431-P9	EN
1EA	ELEC. LOCK SET WITH RX	BEST ACCESS	93KW7DEU15D RQE	626
1EA	KICK PLATE	ROCKWOOD	K1050	630
1EA	WALL STOP	ROCKWOOD	401	626
3EA	SILENCERS	GLYNN-JOHNSON	GJ66	
1EA	CARD READER	PER SPECIFICATION 28 13 00.00 48		
1EA	POWER SUPPLY	COORDINATE WITH ELECTRIFIED HARDWARE		
1EA	POWER TRANSFER	SECURITRON	EPT	

Door normally closed and locked. After unlocking mechanical combination lock, swiping access card allows entry. Upon loss of power door remains locked, with mechanical key override. Always free to egress.

## HW#17 – DOOR # 211A

3EA	BUTTS	HAGER	BB1279 4.5x4.5	652
1EA	LOCKSET	BEST ACCESS	9K37E14D	626
1EA	KICKPLATE	ROCKWOOD	K1050	630
1EA	WALL STOP	ROCKWOOD	403	626
3EA	SILENCERS	IVES	SR64	

## HW#18 –# 144A, 160A

3EA	BUTTS	HAGER	BB1191 4.5x4.5	626
1EA	EXIT DEVICE	SARGENT	8876 ETL	626
1EA	CLOSERS	SARGENT	1431-P9	EN
1EA	KICK PLATE	ROCKWOOD	K1050	630
1EA	THRESHOLD	NAT. GUARD	8533x36"	MILL
1SET	PERIMETER SEAL	NAT. GUARD	5020	CL
1EA	DOOR BOTTOM	NAT. GUARD	9605x36"	A
1EA	CARD READER	PER SPECIFICATION 28 13 00.00 48		
1EA	POWER SUPPLY	COORDINATE WITH ELECTRIFIED HARDWARE		
1EA	POWER TRANSFER	SECURITRON	EPT	

Door normally closed and locked. Swiping access card allows entry. Upon loss of power door remains locked, with mechanical key override. Always free to egress.

## HW#19 – DOOR #

6EA	BUTTS	HAGER	BB1191 4.5x4.5	626
2EA	EXIT DEVICE	SARGENT	NB-8710 ETL	626
2EA	CLOSER	SARGENT	1431-P9	EN
2EA	KICK PLATE	ROCKWOOD	K1050	630
1EA	THRESHOLD	NAT. GUARD	8533x72"	MILL
1SET	PERIMETER SEAL	NAT. GUARD	5020	CL
2EA	DOOR BOTTOM	NAT. GUARD	9605x36"	A

## HW#20 – DOOR #

6EA	BUTTS	HAGER	BB1279 4.5x4.5	652
2EA	PUSH PLATE	ROCKWOOD	70CxRC	630
2EA	PULL	ROCKWOOD	107x70CxRC	630
2EA	CLOSER	SARGENT	1431-O	EN
2EA	KICK PLATES	ROCKWOOD	K1050	630
2EA	MOP PLATES	ROCKWOOD	K1050	630
2EA	WALL STOP	ROCKWOOD	403	626
2EA	SILENCERS	IVES	SR64	

## HW#21 – DOOR #

3EA	BUTTS	HAGER	BB1191 5x4.5	626
1EA	EXIT DEVICE	SARGENT	8810	626
1EA	CLOSER	SARGENT	1431-P9	EN
1EA	KICKPLATE	ROCKWOOD	K1050	630
1EA	THRESHOLD	NAT. GUARD	8533x44"	MILL
1SET	PERIMETER SEAL	NAT. GUARD	5020	CL
1 EA	DOOR SWEEP	NAT. GUARD	9605x44"	A

## HW#22 – DOOR # 121C, 144B, 160B

HARDWARE SHALL BE PER OVERHEAD DOOR MANUFACTURER AND AS SPECIFIED IN SECTION 08 33 23.

## HW#23 – DOOR # 146A

DOOR HARDWARE SHALL BE PER VAULT DOOR MANUFACTURER AND AS SPECIFIED IN SECTION 08 34 59 AND INCLUDE DOOR STOP ROCKWOOD 445

SECTION 08 81 00.00 48

GLAZING  
09/06

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 (2004) Safety Glazing Materials Used in Buildings

ASTM INTERNATIONAL (ASTM)

ASTM C 1036 (2001) Flat Glass  
ASTM C 1048 (2004) Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass  
ASTM C 1172 (2003) Laminated Architectural Flat Glass  
ASTM C 1184 (2000ae1) Structural Silicone Sealants  
ASTM C 509 (2000) Elastomeric Cellular Preformed Gasket and Sealing Material  
ASTM C 669 (2000) Glazing Compounds for Back Bedding and Face Glazing of Metal Sash  
ASTM C 864 (1999) Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers  
ASTM C 920 (2005) Elastomeric Joint Sealants  
ASTM D 395 (2003) Rubber Property - Compression Set  
ASTM E 1300 (2004e1) Determining Load Resistance of Glass in Buildings  
ASTM E 773 (2001) Accelerated Weathering of Sealed Insulating Glass Units  
ASTM E 774 (1997) Classification of the Durability of Sealed Insulating Glass Units  
ASTM F 1642 (2004) Standard Test Method for Glazing and Glass Systems Subject to Air Blast Loadings

GLASS ASSOCIATION OF NORTH AMERICA (GANA)

GANA Glazing Manual (2004) Glazing Manual

GANA Sealant Manual (1990) Sealant Manual  
GANA Standards Manual (2001) Tempering Division's Engineering Standards Manual

INSULATING GLASS MANUFACTURERS ALLIANCE (IGMA)

SIGMA A1202 (1983) Commercial Insulating Glass Dimensional Tolerances  
SIGMA TB-3001 (1990) Guidelines for Sloped Glazing  
SIGMA TM-3000 (1997) Glazing Guidelines for Sealed Insulating Glass Units

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-378 (Basic; Notice 1) Putty Linseed Oil Type, (for Wood-Sash-Glazing)

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

16 CFR 1201 Safety Standard for Architectural Glazing Materials

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-03 Product Data

Insulating Glass

Glazing Accessories

Manufacturer's descriptive product data, handling and storage recommendations, installation instructions, and cleaning instructions.

SD-04 Samples

Insulating Glass

Glazing Compound

Glazing Tape

Sealant

Two 8 x 10 inch samples of each of the following: tinted glass, patterned glass, and insulating glass units.

SD-07 Certificates

### Insulating Glass

#### Glazing Accessories

Certificates from the manufacturer attesting that the units meet the luminous and solar radiant transmission requirements for heat absorbing glass.

#### 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.

### 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 loading in accordance with ASTM E 1300.

### 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 above 40 degrees F and rising, unless procedures recommended by the glass manufacturer and approved by the Contracting Officer are made to warm the glass and rabbet surfaces. Provide ventilation to prevent condensation of moisture on glazing work during installation. Do not perform glazing work during damp or rainy weather.

### 1.6 WARRANTY

#### 1.6.1 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 5-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.

## PART 2 PRODUCTS

### 2.1 GLASS

ASTM C 1036, 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.

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 - tinted, Quality q3 - glazing select, 27 percent light transmittance, 28 percent shading coefficient, conforming to ASTM C 1036. Color shall be gray.

#### 2.1.3 Laminated Glass

ASTM C 1172, Kind LA fabricated from two nominal 1/8 inch pieces of Type I, Class 1, Quality q3, flat annealed transparent glass conforming to ASTM C 1036. Flat glass shall be laminated together with a minimum of 0.030 inch thick, clear polyvinyl butyral interlayer. The total thickness shall be nominally 1/4 inch. Provide as inner pane of insulated glass units and as noted.

#### 2.1.4 Mirrors

##### 2.1.4.1 Glass Mirrors

Glass for mirrors shall be Type I transparent flat type, Class 1-clear, Glazing Quality q1 1/4 inch thick conforming to ASTM C 1036. Glass color shall be clear. 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 C 1048, Kind FT (fully tempered), Condition A (uncoated), Type I, Class 1 (transparent), Quality q3, 1/4 inch thick, 27 percent light transmittance, 28 percent shading coefficient conforming to ASTM C 1048 and GANA Standards Manual. Color shall be clear. Provide wherever safety

glazing material is indicated or specified.

## 2.2 INSULATING GLASS UNITS

Two panes of glass separated by a dehydrated airspace and hermetically sealed. Dimensional tolerances shall be as specified in SIGMA A1202. The units shall conform to ASTM E 773 and ASTM E 774, Class A. 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

Provide 1/2 inch airspace. The inner light shall be ASTM C 1172, clear annealed flat glass Type I, Class I, Quality q3. The outer light shall be ASTM C 1036, Type I, Class 2 (tinted heat absorbing), Quality q4, 1/4 inch thick.

### 2.2.2 Low Emissivity Insulating Glass

Interior and exterior glass panes for Low-E insulating units shall be Type I annealed flat glass, Class 2-tinted with anti-reflective low-emissivity coating on No. 2 surface (inside surface of exterior pane), Quality q3 - glazing select, conforming to ASTM C 1036. Glass performance shall be R-Value/Winter Nighttime .28, shading coefficient .23. Color shall be as shown on the drawings.

## 2.3 SETTING AND SEALING MATERIALS

Provide as specified in the GANA Glazing Manual, SIGMA TM-3000, SIGMA 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 Putty and Glazing Compound

Glazing compound shall conform to ASTM C 669 for face-glazing metal sash. Putty shall be linseed oil type conforming to CID A-A-378 for face-glazing primed wood sash. Putty and glazing compounds shall not be used with insulating glass or laminated glass.

### 2.3.2 Glazing Compound

ASTM C 669. Use for face glazing metal sash. Do not use with insulating glass units or laminated glass.

### 2.3.3 Sealants

Provide elastomeric and structural sealants.

#### 2.3.3.1 Elastomeric Sealant

ASTM C 920, Type S or M, Grade NS, Class 12.5, Use G. Use for channel or stop glazing metal sash. Sealant shall be chemically compatible with setting blocks, edge blocks, and sealing tapes, and with sealants used in manufacture of insulating glass units. Color of sealant shall be as

selected.

#### 2.3.3.2 Structural Sealant

ASTM C 1184.

#### 2.3.4 Preformed Channels

Neoprene, vinyl, or rubber, as recommended by the glass manufacturer for the particular condition.

#### 2.3.5 Sealing Tapes

Preformed, semisolid, polymeric-based material of proper size and compressibility for the particular condition. 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.

#### 2.3.6 Setting Blocks and Edge Blocks

Neoprene setting blocks shall be dense extruded type conforming to ASTM D 395, Method B, Shore A durometer between 70 and 90. Edge blocking shall be Shore A durometer of 50 (+ or - 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.

#### 2.3.7 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 indicated on drawings.

##### 2.3.7.1 Fixed Glazing Gaskets

Fixed glazing gaskets shall be closed-cell (sponge) smooth extruded compression gaskets of cured elastomeric virgin neoprene compounds conforming to ASTM C 509, Type 2, Option 1.

##### 2.3.7.2 Wedge Glazing Gaskets

Wedge glazing gaskets shall be high-quality extrusions of cured elastomeric virgin neoprene compounds, ozone resistant, conforming to ASTM C 864, Option 1, Shore A durometer between 65 and 75.

##### 2.3.7.3 Aluminum Framing Glazing Gaskets

Glazing gaskets for aluminum framing shall be permanent, elastic, non-shrinking, non-migrating, watertight and weathertight.

#### 2.3.8 Accessories

Provide as required for a complete installation, including glazing points,

clips, shims, angles, beads, and spacer strips. Provide noncorroding metal accessories. Provide primer-sealers and cleaners as recommended by the glass and sealant manufacturers.

### 2.3.9 Glazing Bite

Provide sufficient glazing sealant and frame coverage at the window frame glazing connection to meet the criteria as outlined in ASTM F 1642 to effectively transfer the air blast loading from the glazing unit to the window frame.

## 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, SIGMA TB-3001, SIGMA TM-3000, and manufacturer's recommendations. Determine the sizes to provide the required edge clearances by measuring the actual opening to receive the glass. Grind smooth in the shop glass edges that will be exposed in finish work. Leave labels in place until the installation is approved, except remove applied labels on heat-absorbing glass and on insulating glass units as soon as glass is installed. Securely fix movable items or keep in a closed and locked position until glazing compound has thoroughly set.

### 3.2 GLASS SETTING

Shop glaze or field glaze items to be glazed using glass of the quality and thickness specified or indicated. Glazing, unless otherwise specified or approved, shall conform to applicable recommendations in the GANA Glazing Manual, GANA Sealant Manual, SIGMA TB-3001, SIGMA 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.

#### 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 SIGMA TB-3001 and SIGMA 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. Glass units which are broken, chipped, cracked, abraded, or otherwise damaged during construction activities shall be removed and replaced with new units.

-- End of Section --

SECTION 08 91 00

METAL WALL 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-L | (2015) Laboratory Methods of Testing Louvers for Rating  |
| AMCA 511   | (2010) Certified Ratings Program for Air Control Devices |

ASTM INTERNATIONAL (ASTM)

- |                   |   |
|-------------------|---|
| ASTM A1008/A1008M | (2016) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable |
| ASTM A653/A653M   | (2017) 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 information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Wall louvers

SD-03 Product Data

Metal Wall Louvers

SD-04 Samples

Wall 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 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 Stainless Steel

Type 302 or 304, with 2B finish.

2.1.5 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 30 pounds per square foot. Wall louvers must bear the AMCA certified ratings program seal for air performance and water penetration in accordance with AMCA 500-L and AMCA 511. The rating must show a water penetration of 0.20 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 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 FASTENERS AND ACCESSORIES

Provide stainless steel screws and fasteners for aluminum louvers and zinc-coated or stainless steel screws and fasteners for steel louvers. Provide other accessories as required for complete and proper installation.

### 2.4 FINISHES

#### 2.4.1 Steel

Provide factory-applied coating. Clean and phosphate treat exposed surfaces and apply rust-inhibitive primer and baked enamel finish coat, one mil minimum total dry film thickness, color as indicated on drawings.

## PART 3 EXECUTION

### 3.1 INSTALLATION

#### 3.1.1 Wall Louvers

Install using stops or moldings, flanges, strap anchors, or jamb fasteners as appropriate for the wall construction and in accordance with manufacturer's recommendations.

#### 3.1.2 Screens and Frames

Attach frames to louvers with screws or bolts.

### 3.2 PROTECTION FROM CONTACT OF DISSIMILAR MATERIALS

#### 3.2.1 Copper or Copper-Bearing Alloys

Paint copper or copper-bearing alloys in contact with dissimilar metal with heavy-bodied bituminous paint or separate with inert membrane.

3.2.2 Metal

Paint metal in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.

3.2.3 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.

ASTM INTERNATIONAL (ASTM)

ASTM A463/A463M	(2010; R 2015) Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process
ASTM A653/A653M	(2017) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM C645	(2014; E 2015) Nonstructural Steel Framing Members
ASTM C754	(2015) Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
ASTM C841	(2003; R 2013) Installation of Interior Lathing and Furring
ASTM C847	(2014a) Standard Specification for Metal Lath

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM EMLA 920	(2009) Guide Specifications for Metal Lathing and Furring
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UNDERWRITERS LABORATORIES (UL)

UL Fire Resistance	(2014) Fire Resistance Directory
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 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 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 MATERIALS

Provide steel materials for metal support systems with galvanized coating ASTM A653/A653M, G-60; aluminum coating ASTM A463/A463M, T1-25; or a 55-percent aluminum-zinc coating. Provide support systems and attachments per UFC 3-310-04, "Seismic Design for Buildings" in seismic zones.

2.1.1 Materials for Attachment of Lath

2.1.1.1 Suspended and Furred Ceiling Systems and Wall Furring

ASTM C841, and ASTM C847.

2.1.1.2 Non-loadbearing Wall Framing

NAAMM EMLA 920.

2.1.2 Materials for Attachment of Gypsum Wallboard

2.1.2.1 Suspended and Furred Ceiling Systems

ASTM C645.

2.1.2.2 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.

2.1.2.3 Furring Structural Steel Columns

ASTM C645. Steel (furring) clips and support angles listed in UL Fire Resistance may be provided in lieu of steel studs for erection of gypsum wallboard around structural steel columns.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Systems for Attachment of Lath

3.1.1.1 Suspended and Furred Ceiling Systems and Wall Furring

ASTM C841, except as indicated otherwise.

3.1.1.2 Non-loadbearing Wall Framing

NAAMM EMLA 920, except provide framing members 16 inches o.c. unless indicated otherwise.

3.1.2 Systems for Attachment of Gypsum Wallboard

3.1.2.1 Suspended and Furred Ceiling Systems

ASTM C754, except provide framing members 16 inches o.c. unless indicated otherwise.

3.1.2.2 Non-loadbearing Wall Framing and Furring

ASTM C754, except as indicated otherwise.

3.1.2.3 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 on the drawings.

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

08/16

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A108.11 (1992; Reaffirmed 2005) Specifications for Interior Installation of Cementitious Backer Units

ASTM INTERNATIONAL (ASTM)

ASTM C1002 (2018) Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs

ASTM C1047 (2014a) Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base

ASTM C1178/C1178M (2013) Standard Specification for Glass Mat Water-Resistant Gypsum Backing Panel

ASTM C1396/C1396M (2017) Standard Specification for Gypsum Board

ASTM C1629/C1629M (2015) Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels

ASTM C475/C475M (2017) Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board

ASTM C514 (2004; R 2014) Standard Specification for Nails for the Application of Gypsum Board

ASTM C840 (2017) Standard Specification for Application and Finishing of Gypsum Board

ASTM C954 (2018) Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness

ASTM D1037 (2012) Evaluating Properties of Wood-Base  
Fiber and Particle Panel Materials

ASTM D2394 (2017) Standard Test Methods for Simulated  
Service Testing of Wood and Wood-Base  
Finish Flooring

ASTM D5420 (2016) Standard Test Method for Impact  
Resistance of Flat, Rigid Plastic Specimen  
by Means of a Strike Impacted by a Falling  
Weight (Gardner Impact)

ASTM E695 (2003; R 2015; E 2015) Measuring Relative  
Resistance of Wall, Floor, and Roof  
Construction to Impact Loading

ASTM E84 (2018a) Standard Test Method for Surface  
Burning Characteristics of Building  
Materials

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350 (2010; Version 1.1) Standard Method for  
the Testing and Evaluation of Volatile  
Organic Chemical Emissions from Indoor  
Sources using Environmental Chambers

FM GLOBAL (FM)

FM APP GUIDE (updated on-line) Approval Guide  
<http://www.approvalguide.com/>

GREEN SEAL (GS)

GS-36 (2013) Adhesives for Commercial Use

GYPSUM ASSOCIATION (GA)

GA 214 (2010) Recommended Levels of Gypsum Board  
Finish

GA 216 (2010) Application and Finishing of Gypsum  
Panel Products

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168 (2017) Adhesive and Sealant Applications

UNDERWRITERS LABORATORIES (UL)

UL 2818 (2013) GREENGUARD Certification Program  
For Chemical Emissions For Building  
Materials, Finishes And Furnishings

UL Fire Resistance (2014) Fire Resistance Directory

## 1.2 SUBMITTALS

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### SD-03 Product Data

Cementitious Backer Units

Glass Mat Water-Resistant Gypsum Tile Backing Board

Water-Resistant Gypsum Backing Board

Abuse Resistant Gypsum Board

Accessories

Submit for each type of gypsum board and for cementitious backer units.

Gypsum Board

Recycled Content for Gypsum Board; S

Recycled Content for Paper Facing and Gypsum Cores; S

VOC Content of Joint Compound; S

### 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.

Indoor Air Quality for Gypsum Board; S

### SD-08 Manufacturer's Instructions

Safety Data Sheets

### SD-10 Operation and Maintenance Data

Manufacturer Maintenance Instructions

## 1.3 CERTIFICATIONS

### 1.3.1 Indoor Air Quality Certifications

Submit required indoor air quality certifications in one submittal package.

#### 1.3.1.1 Ceiling and Wall Systems

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party program that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

#### 1.3.1.2 Adhesives and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party program that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

### 1.4 DELIVERY, STORAGE, AND HANDLING

#### 1.4.1 Delivery

Deliver materials in the original packages, containers, or bundles with each bearing the brand name, applicable standard designation, and name of manufacturer, or supplier.

#### 1.4.2 Storage

Keep materials dry by storing inside a sheltered building. Where necessary to store gypsum board and cementitious backer units outside, store off the ground, properly supported on a level platform, and protected from direct exposure to rain, snow, sunlight, and other extreme weather conditions. Provide adequate ventilation to prevent condensation. Store per manufacturer's recommendations for allowable temperature and humidity range. Do not store gypsum wallboard with materials which have high emissions of volatile organic compounds (VOCs) or other contaminants. Do not store panels near materials that may offgas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives. Do not use materials that have visible moisture or biological growth.

#### 1.4.3 Handling

Neatly stack gypsum board and cementitious backer units flat to prevent sagging or damage to the edges, ends, and surfaces.

### 1.5 QUALIFICATIONS

Furnish type of gypsum board work specialized by the installer with a minimum of 3 years of documented successful experience.

### 1.6 SCHEDULING

The gypsum wallboard must be taped, finished and primed before the installation of the highly-emitting materials. The gypsum wallboard must be installed after the installation and ventilation period of the highly-emitting materials.

Commence application only after the area scheduled for gypsum board work is completely weathertight. The heating, ventilating, and air-conditioning systems must be complete and in operation prior to application of the gypsum board. If the mechanical system cannot be activated before gypsum board is begun, the gypsum board work may proceed in accordance with an approved plan to maintain the environmental conditions specified below. Apply gypsum board prior to the installation of finish flooring and acoustic ceiling.

#### 1.7 ENVIRONMENTAL REQUIREMENTS

Do not expose the gypsum board to excessive sunlight prior to gypsum board application. Maintain a continuous uniform temperature of not less than 50 degrees F and not more than 80 degrees F for at least one week prior to the application of gypsum board work, while the gypsum board application is being done, and for at least one week after the gypsum board is set. Shield air supply and distribution devices to prevent any uneven flow of air across the plastered surfaces. Provide ventilation to exhaust moist air to the outside during gypsum board application, set, and until gypsum board jointing is dry. In glazed areas, keep windows open top and bottom or side to side 3 to 4 inches. Reduce openings in cold weather to prevent freezing of joint compound when applied. For enclosed areas lacking natural ventilation, provide temporary mechanical means for ventilation. In unglazed areas subjected to hot, dry winds or temperature differentials from day to night of 20 degrees F or more, screen openings with cheesecloth or similar materials. Avoid rapid drying. During periods of low indoor humidity, provide minimum air circulation following gypsum boarding and until gypsum board jointing complete and is dry.

#### 1.8 FIRE RESISTIVE CONSTRUCTION

Comply with specified fire-rated assemblies for design numbers indicated per UL Fire Resistance or FM APP GUIDE.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

Conform to specifications, standards and requirements specified. Provide gypsum board types, gypsum backing board types, cementitious backing units, and joint treating materials manufactured from asbestos free materials only. Submit Safety Data Sheets and manufacturer maintenance instructions for gypsum materials including adhesives.

##### 2.1.1 Gypsum Board

ASTM C1396/C1396M. Gypsum board must contain a minimum of 5 percent post-consumer recycled content, or a minimum of 20 percent post-industrial recycled content. Provide data identifying percentage of recycled content for gypsum board. Paper facings must contain a minimum of 100 percent recycled paper content. Gypsum cores must contain a minimum of 95 percent post-industrial recycled gypsum content. Provide data identifying percentage of recycled content for paper facing and gypsum cores. Provide gypsum wall board and panels meeting the emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type). Provide certification or validation of indoor air quality for gypsum board.

2.1.1.1 Regular

48 inch wide, 5/8 inch thick, tapered edges.

2.1.1.2 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, tapered and featured edges.

2.1.2 Regular Water-Resistant Gypsum Backing Board

ASTM C1396/C1396M

2.1.2.1 Regular

48 inch wide, 5/8 inch thick, tapered edges.

2.1.2.2 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, tapered edges.

2.1.3 Glass Mat Water-Resistant Gypsum Tile Backing Board

ASTM C1178/C1178M

2.1.3.1 Regular

48 inch wide, 5/8 inch thick, square edges.

2.1.3.2 Type X (Special Fire-Resistant)

48 inch wide, 5/8 inch thick, square edges.

2.1.4 Abuse Resistant Gypsum Board

48 inch wide, 5/8 inch thick, tapered edges.  
Reinforced gypsum panel with imbedded fiber mesh or lexan backing tested 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. Abuse 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 Soft Body Impact Test

ASTM E695 or ASTM D2394 for impact penetration and deformation. ASTM E695 using a 60 lb leather bag filled with steel pellets, 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 Hard Body Impact Test

Comply with hard body impact test in accordance with ASTM C1629/C1629M Classification Level 2.

#### 2.1.4.3 Surface Abrasion Test

Comply with test surface abrasion test in accordance with ASTM C1629/C1629M.

#### 2.1.4.4 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. Product must be low emitting VOC types with VOC limits not exceeding 50 g/L. Provide data identifying VOC content of joint compound. Use all purpose joint and texturing compound containing inert fillers and natural binders, including lime compound. Pre-mixed compounds must be free of antifreeze, vinyl adhesives, preservatives, biocides and other slow releasing compounds.

##### 2.1.6.1 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.

#### 2.1.8 Adhesives

Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of GS-36. Provide certification or validation of indoor air quality for non-aerosol adhesives applied on the interior of the building (inside of the weatherproofing system). Provide certification or validation of indoor air quality for aerosol adhesives used on the interior of the building (inside of the weatherproofing system).

##### 2.1.8.1 Adhesive for Fastening Gypsum Board to Metal Framing

Type recommended by gypsum board manufacturer.

#### 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 must be free of dirt, grease, and other materials that may adversely affect bond of joint treatment. Provide prefinished or job decorated materials.

##### 2.1.10 Water

Provide clean, fresh, and potable water.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

##### 3.1.1 Framing and Furring

Verify that framing and furring are securely attached and of sizes and spacing to provide a suitable substrate to receive gypsum board and cementitious backer units. Verify that all blocking, headers and supports are in place to support plumbing fixtures and to receive soap dishes, grab bars, towel racks, and similar items. Do not proceed with work until framing and furring are acceptable for application of gypsum board and cementitious backer units.

##### 3.1.2 Gypsum Board and Framing

Verify that surfaces of gypsum board and framing to be bonded with an adhesive are free of dust, dirt, grease, and any other foreign matter. Do not proceed with work until surfaces are acceptable for application of gypsum board with adhesive.

### 3.1.3 Masonry Walls

Verify that surfaces of masonry walls to receive gypsum board applied with adhesive are dry, free of dust, oil, form release agents, protrusions and voids, and any other foreign matter. Do not proceed with work until surfaces are acceptable for application of gypsum board with adhesive.

### 3.1.4 Building Construction Materials

Do not install building construction materials that show visual evidence of biological growth.

## 3.2 APPLICATION OF GYPSUM BOARD

Apply gypsum board to framing and furring members in accordance with ASTM C840 or GA 216 and the requirements specified. Apply gypsum board with separate panels in moderate contact; do not force in place. Stagger end joints of adjoining panels. Neatly fit abutting end and edge joints. Use gypsum board of maximum practical length; select panel sizes to minimize waste. Cut out gypsum board to make neat, close, and tight joints around openings. In vertical application of gypsum board, provide panels in lengths required to reach full height of vertical surfaces in one continuous piece. Lay out panels to minimize waste; reuse cutoffs whenever feasible. Surfaces of gypsum board and substrate members may not be bonded together with an adhesive. 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 5/8 inch ceiling board over framing at 16 inch on center. Provide type of gypsum board for use in each system specified herein as indicated.

### 3.2.1 Adhesive Application to Interior Masonry Walls

Apply in accordance with ASTM C840, System VI or GA 216.

### 3.2.2 Application of Gypsum Board to Steel Framing and Furring

Apply in accordance with ASTM C840, System VIII or GA 216.

### 3.2.3 Arches and Bending Radii

Apply gypsum board in accordance with ASTM C840, System IX or GA 216.

### 3.2.4 Gypsum Board for Wall Tile or Tile Base Applied with Adhesive

In dry areas (areas other than tubs, shower enclosures, saunas, steam rooms, gang shower rooms), apply glass mat water-resistant gypsum tile backing board or water-resistant gypsum backing board in accordance with ASTM C840, System X or GA 216.

### 3.2.5 Exterior Application

Apply exterior gypsum board (such as at soffits) in accordance with ASTM C840, System XI or GA 216.

### 3.2.6 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 applications of gypsum board to steel framing.

### 3.2.7 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.

### 3.2.8 Application of Abuse 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 (tubs, shower enclosures, saunas, steam rooms, gang shower rooms), apply cementitious backer units in accordance with ANSI A108.11. Place a 15 lb asphalt impregnated, continuous felt paper membrane behind cementitious backer units, between backer units and studs or base layer of gypsum board. Place membrane with a minimum 6 inch overlap of sheets laid shingle style.

### 3.3.2 Joint Treatment

ANSI A108.11.

## 3.4 FINISHING OF GYPSUM BOARD

Tape and finish gypsum board in accordance with ASTM C840, GA 214 and GA 216. Finish plenum areas above ceilings to Level 1 in accordance with GA 214. Finish water resistant gypsum backing board, ASTM C1396/C1396M, to receive ceramic tile to Level 2 in accordance with GA 214. Finish walls and ceilings to receive a heavy-grade wall covering or heave textured finish before painting to Level 3 in accordance with GA 214. Finish walls and ceilings without critical lighting to receive flat paints, light textures, or wall coverings to Level 4 in accordance with GA 214. Unless otherwise specified, finish all gypsum board walls, partitions and ceilings to Level 5 in accordance with GA 214. Provide joint, fastener depression, and corner treatment. Tool joints as smoothly as possible to minimize sanding and dust. Do not use self-adhering fiber glass mesh tape with conventional drying type joint compounds; use setting or hardening type compounds only. Provide treatment for water-resistant gypsum board as recommended by the gypsum board manufacturer. Protect workers, building occupants, and HVAC systems from gypsum dust.

### 3.4.1 Uniform Surface

Wherever gypsum board is to receive eggshell, semigloss or gloss paint finish, or where severe, up or down lighting conditions occur, finish gypsum wall surface in accordance to GA 214 Level 5. In accordance with GA 214 Level 5, apply a thin skim coat of joint compound to the entire gypsum board surface, after the two-coat joint and fastener treatment is complete and dry.

### 3.5 SEALING

Seal openings around pipes, fixtures, and other items projecting through gypsum board and cementitious backer units as specified in Section 07 92 00.00 48 JOINT SEALANTS. Apply material with exposed surface flush with gypsum board or cementitious backer units.

### 3.6 FIRE-RESISTANT ASSEMBLIES

Wherever fire-rated construction is indicated, provide materials and application methods, including types and spacing of fasteners, wall and ceiling framing in accordance with the specifications contained in UL Fire Resistance for the Design Number(s) indicated. Joints of fire-rated gypsum board enclosures must be closed and sealed in accordance with UL test requirements or GA requirements. Seal penetrations through rated partitions and ceilings tight in accordance with tested systems.

### 3.7 PATCHING

Patch surface defects in gypsum board to a smooth, uniform appearance, ready to receive finishes.

-- End of Section --

SECTION 09 30 10

CERAMIC, QUARRY, AND GLASS TILING  
08/17

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- |             |   |
|-------------|---|
| ANSI A136.1 | (2008 Reaffirmed 2013) American National Standard Specifications for Organic Adhesives for Installation of Ceramic Tile |
| ANSI A137.1 | (2012) American National Standards Specifications for Ceramic Tile  |
| ANSI A137.2 | (2012) American National Standards Specifications for Glass Tile  |

ASTM INTERNATIONAL (ASTM)

- |                 |  |
|-----------------|--|
| ASTM C1026      | (2013; R 2018) Standard Test Method for Measuring the Resistance of Ceramic and Glass Tile to Freeze-Thaw Cycling  |
| ASTM C1027      | (2009; R 2017) Standard Test Method for Determining Visible Abrasion Resistance of Glazed Ceramic Tile   |
| ASTM C144       | (2017) Standard Specification for Aggregate for Masonry Mortar   |
| ASTM C150/C150M | (2018) Standard Specification for Portland Cement  |
| ASTM C206       | (2014) Standard Specification for Finishing Hydrated Lime  |
| ASTM C207       | (2006; R 2011) Standard Specification for Hydrated Lime for Masonry Purposes   |
| ASTM C33/C33M   | (2018) Standard Specification for Concrete Aggregates  |
| ASTM C373       | (2018) Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products |

ASTM C648 (2004; R 2009) Breaking Strength of Ceramic Tile

ASTM C847 (2014a) Standard Specification for Metal Lath

ASTM D2103 (2015) Standard Specification for Polyethylene Film and Sheeting

ASTM D226/D226M (2017) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing

ASTM D4068 (2017) Standard Specification for Chlorinated Polyethylene (CPE) Sheeting for Concealed Water-Containment Membrane

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350 (2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

GREEN SEAL (GS)

GS-36 (2013) Adhesives for Commercial Use

MARBLE INSTITUTE OF AMERICA (MIA)

MIA Design Manual (2016) Dimension Stone Design Manual

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168 (2017) Adhesive and Sealant Applications

TILE COUNCIL OF NORTH AMERICA (TCNA)

TCNA Hdbk (2017) Handbook for Ceramic, Glass, and Stone Tile Installation

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

36 CFR 1191 Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

UNDERWRITERS LABORATORIES (UL)

UL 2818 (2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

### SD-02 Shop Drawings

Detail Drawings; G

### SD-03 Product Data

Porcelain Tile; G

Recycled Content for Porcelain Tile; S

Quarry Tile; G

Recycled Content for Quarry Tile; S

Glass Tile; G

Recycled Content for Glass Tile; S

Glazed Wall Tile; G

Recycled Content for Glazed Wall Tile; S

Setting-Bed; G

Mortar, Grout, and Adhesive; G

### SD-04 Samples

Tile; G

Accessories; G

Transition Strips; G

Grout; G

### SD-07 Certificates

Indoor Air Quality for Adhesives; S

Indoor Air Quality for Sealants; S

### SD-08 Manufacturer's Instructions

Maintenance Instructions

### SD-10 Operation and Maintenance Data

Installation; G

### 1.3 CERTIFICATIONS

#### 1.3.1 Indoor Air Quality Certifications

##### 1.3.1.1 Adhesives and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party programs that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited in this Section.

### 1.4 QUALITY ASSURANCE

Provide installers having a minimum of two years experience with a company specializing in performing the type of work described. Each type and color of tile to be provided from a single source. Each type and color of mortar, adhesive, and grout to be provided from the same source.

### 1.5 DELIVERY, STORAGE, AND HANDLING

Ship tiles in sealed packages and clearly marked with the grade, type of tile, producer identification, and country of origin. Deliver materials to the project site in manufacturer's original unopened containers with seals unbroken and labels and hallmarks intact. Protect materials from weather, and store them under cover in accordance with manufacturer's printed instructions.

### 1.6 ENVIRONMENTAL REQUIREMENTS

Do not perform ceramic tile work unless the substrate and ambient temperature is at least 50 degrees F and rising. Maintain temperature above 50 degrees F while the work is being performed and for at least 7 days after completion of the work. When temporary heaters are used, ventilate the area to the outside to avoid carbon dioxide damage to new tilework.

### 1.7 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a 1-year period.

### 1.8 EXTRA MATERIALS

Supply an extra 10 percent of each type tile used in clean and marked cartons.

## PART 2 PRODUCTS

### 2.1 TILE

Provide tiles that comply with ANSI A137.1 and are standard grade tiles. Provide a minimum breaking strength of 125 lbs. for wall tile and 250 lbs. for floor tile in accordance with ASTM C648. Provide exterior building tile for cold climate projects that is approved by the manufacturer for exterior use when tested in accordance with ASTM C1026. 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. Provide glazed floor tile with a Class IV-Commercial or V-Heavy Commercial classification as rated by the manufacturer when tested in accordance with ASTM C1027 for visible abrasion resistance as related to foot traffic. For materials like tile, accessories, and transition strips submit samples of sufficient size to show color range, pattern, type and joints. Submit manufacturer's catalog data.

#### 2.1.1 Porcelain Tile

Provide unglazed or glazed, rectified porcelain tile, bullnose base and trim pieces with color extending uniformly through the body of the tile. Provide tile with a V4 aesthetic classification. Blend tiles in factory and in a packages to have same color range and continuous blend for installation. Provide nominal tile size(s) of as shown on the drawings. Provide a 0.50 percent maximum water absorption in accordance with ASTM C373.

Provide Porcelain Tiling Materials that contain a minimum of 10 percent recycled content. Provide data identifying percentage of recycled content for porcelain tile.

#### 2.1.2 Quarry Tile

Furnish an unglazed quarry tile, base and trim pieces. Provide tiles with smooth and abrasive surface. Provide nominal tile size(s) of 6 by 6 inch and 1/2 inch thick. Provide a 0.30 percent maximum water absorption in accordance with ASTM C373.

Provide Quarry Tiling Materials that contain a minimum of 10 percent recycled content. Provide data identifying percentage of recycled content for quarry tile.

#### 2.1.3 Glass Tile

Furnish glass mosaic tile that complies with ANSI A137.2. Provide nominal tile size(s) of 1 x 4 inches and 4 x 4 by inches.

Provide Glass Tiling Materials that contain a minimum of 10 percent recycled content. Provide data identifying percentage of recycled content for glass tile.

#### 2.1.4 Glazed Wall Tile

Furnish glazed wall tile that has cushioned edges and trim with lead-free bright matte finish. Provide nominal tile size(s) of 4-1/4 by 6 inch.

Provide Glazed Wall Tile Materials that contain a minimum of 3 percent recycled content. Provide data identifying percentage of recycled content for glazed wall tile.

#### 2.2 SETTING-BED

Submit manufacturer's catalog data. Compose the setting-bed of the following materials:

#### 2.2.1 Aggregate for Concrete Fill

Conform to ASTM C33/C33M for aggregate fill. Do not exceed one-half the thickness of concrete fill for maximum size of coarse aggregate.

#### 2.2.2 Portland Cement

Conform to ASTM C150/C150M for cement, Type I, white for wall mortar and gray for other uses.

#### 2.2.3 Sand

Conform to ASTM C144 for sand.

#### 2.2.4 Hydrated Lime

Conform to ASTM C206 for hydrated lime, Type S or ASTM C207, Type S.

#### 2.2.5 Metal Lath

Conform to ASTM C847 for flat expanded type metal lath, and weighing a minimum 2.5 pound/square yard.

#### 2.3 WATER

Provide potable water.

#### 2.4 MORTAR, GROUT, AND ADHESIVE

Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide aerosol adhesives used on the interior of the building meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of GS-36. Provide certification or validation of indoor air quality for adhesives.

##### 2.4.1 Dry-Set Portland Cement Mortar

TCNA Hdbk.

##### 2.4.2 Latex-Portland Cement Mortar

TCNA Hdbk.

##### 2.4.3 Ceramic Tile Grout

TCNA Hdbk; petroleum-free and plastic-free commercial portland cement grout.

##### 2.4.4 Organic Adhesive

TCNA Hdbk, Type I. Water-resistant. Comply with ANSI A136.1.

##### 2.4.5 Epoxy Resin Grout

TCNA Hdbk.

#### 2.4.6 Furan Resin Grout

TCNA Hdbk and consist of an intimate mixture of furfuryl-alcohol resin with carbon filler and catalyst.

#### 2.4.7 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. Refer to Section 07 92 00.00 48 JOINT SEALANTS.

Provide sealants used on the interior of the building (defined as inside of the weatherproofing system) meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide certification or validation of indoor air quality for sealants.

### 2.5 SUBSTRATES

#### 2.5.1 Cementitious Backer Board

Provide cementitious backer units, for use as tile substrate over wood sub-floors, in accordance with TCNA Hdbk. Furnish 1/2 inch thick cementitious backer units.

### 2.6 TRANSITION STRIPS

Provide clear anodized aluminum transitions between tile and carpet or resilient flooring. Provide types as recommended by flooring manufacturer for both edges and transitions of flooring materials specified marble transitions appropriate for conditions. Resilient (Rubber) transition strips are not acceptable. Categorize marble Group A as classified by MIA Design Manual. Provide a fine sand-rubbed finish marble, color as specified in the drawings. Provide transition strips that comply with 36 CFR 1191 requirements.

### 2.7 MEMBRANE MATERIALS

Conform to ASTM D226/D226M, Type 1 for 15 pound waterproofing membrane, asphalt-saturated building felt. Conform to ASTM D2103 ASTM D4068 4 mil for polyethylene film.

### 2.8 COLOR, TEXTURE, AND PATTERN

Provide color, pattern and texture in accordance with as indicated. 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
Dry-Set Mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.
Organic Adhesives	1/8 inch in 8 ft.	1/16 inch in 3 ft.
Latex Portland Cement Mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.
Epoxy	1/8 inch in 8 ft.	1/8 inch in 10 ft.

### 3.2 GENERAL INSTALLATION REQUIREMENTS

Do not start tile work until roughing in for mechanical and electrical work has been completed and tested, and built-in items requiring membrane waterproofing have been installed and tested. Close space, in which tile is being set, to traffic and other work. Keep closed until tile is firmly set. Do not start floor tile installation in spaces requiring wall tile until after wall tile has been installed. Apply tile in colors and patterns indicated in the area shown on the drawings. Install tile with the respective surfaces in true even planes to the elevations and grades shown. Provide special shapes as required for sills, jambs, recesses, offsets, external corners, and other conditions to provide a complete and neatly finished installation. Solidly back tile bases and coves with mortar. Do not walk or work on newly tiled floors without using kneeling boards or equivalent protection of the tiled surface. Keep traffic off horizontal portland cement mortar installations for at least 72 hours. Keep all traffic off epoxy installed floors for at least 40 hours after grouting, and heavy traffic off for at least 7 days, unless otherwise specifically authorized by manufacturer. Dimension and draw detail drawings at a minimum scale of 1/4 inch = 1 foot. Include drawings of pattern at inside corners, outside corners, termination points and location of all equipment items such as thermostats, switch plates, mirrors and toilet accessories mounted on surface. Submit drawings showing ceramic tile pattern elevations and floor plans. Submit manufacturer's preprinted installation instructions.

Do not install building construction materials that show visual evidence of biological growth.

### 3.3 INSTALLATION OF WALL TILE

Install wall tile in accordance with the TCNA Hdbk, method W244C-16 and with grout joints as recommended by the manufacturer for the type of tile. Install thinner wall tile flush with thicker wall tile applied on same wall and provide installation materials as recommended by the tile and setting materials manufacturer's to achieve flush installation.

#### 3.3.1 Workable or Cured Mortar Bed

Install tile over workable mortar bed or a cured mortar bed at the option of the Contractor. Install a 4 mil polyethylene membrane, metal lath, and scratch coat. Conform to TCNA Hdbk for workable mortar bed, materials, and installation of tile. Conform to TCNA Hdbk for cured mortar bed and materials.

### 3.3.2 Dry-Set Mortar and 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.

### 3.3.3 Organic Adhesive

Conform to TCNA Hdbk for the organic adhesive installation of ceramic tile.

### 3.3.4 Furan Mortar and Grout

Conform to TCNA Hdbk for furan mortar and grout installation.

### 3.3.5 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 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.

## 3.5 EXPANSION JOINTS

Form and seal joints as specified in Section 07 92 00.00 48 JOINT SEALANTS.

### 3.5.1 Walls

Provide expansion joints at control joints in backing material. Wherever  
backing material changes, install an expansion joint to separate the  
different materials.

## 3.6 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  
08/17

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM A1008/A1008M	(2016) Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
ASTM A167	(2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A489	(2018; E 2018) Standard Specification for Carbon Steel Eyebolts
ASTM A641/A641M	(2009a; R 2014) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM A653/A653M	(2017) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B633	(2015) Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
ASTM C635/C635M	(2017) Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings
ASTM C636/C636M	(2013) Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels
ASTM C834	(2017) Standard Specification for Latex Sealants
ASTM E1264	(2014) Acoustical Ceiling Products
ASTM E1477	(1998a; R 2017; E 2018) Standard Test Method for Luminous Reflectance Factor of

Acoustical Materials by Use of  
Integrating-Sphere Reflectometers

ASTM E580/E580M (2017) Standard Practice for Installation  
of Ceiling Suspension Systems for  
Acoustical Tile and Lay-in Panels in Areas  
Subject to Earthquake Ground Motions

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350 (2010; Version 1.1) Standard Method for  
the Testing and Evaluation of Volatile  
Organic Chemical Emissions from Indoor  
Sources using Environmental Chambers

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168 (2017) Adhesive and Sealant Applications

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-310-04 (2013; with Change 1) Seismic Design of  
Buildings

UNDERWRITERS LABORATORIES (UL)

UL 2818 (2013) GREENGUARD Certification Program  
For Chemical Emissions For Building  
Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Approved Detail Drawings; G

SD-04 Samples

Acoustical Units; G

SD-06 Test Reports

Ceiling Attenuation Class and Test; G

### 1.3 CERTIFICATIONS

#### 1.3.1 Indoor Air Quality Certifications

##### 1.3.1.1 Ceiling Tiles

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification by other third-party programs. Provide current product certification documentation from certification body.

### 1.4 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 10 percent of the tiles installed.

### 1.9 OTHER SUBMITTAL REQUIREMENTS

Submit the following:

- a. 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.
- b. Reports by an independent testing laboratory attesting that

acoustical ceiling systems meet specified 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.

## PART 2 PRODUCTS

### 2.1 SYSTEM 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 Contractor has the option to substitute inch-pound (I-P) Recessed Light Fixtures (RLF) for metric RLF. If the Contractor opts to furnish I-P RLF, other ceiling elements like acoustical ceiling tiles, air diffusers, air registers and grills, must also be I-P products. Coordinate the whole ceiling system with other details, like the location of access panels and ceiling penetrations, etc., shown on the drawings. The Contractor is responsible for all associated labor and materials and for the final assembly and performance of the specified work and products if I-P products are used. The location and extent of acoustical treatment must be as shown on the approved detail drawings. Submit drawings showing suspension system, method of anchoring and fastening, details, and reflected ceiling plan.

#### 2.1.1 Ceiling Attenuation Class and Test

Provide a ceiling system with an attenuation class (CAC) of 35 for in accordance with ASTM E1264. 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.

#### 2.1.2 Ceiling Sound Absorption

Determine the Noise Reduction Coefficient (NRC) in accordance with ASTM C423 Test Method.

#### 2.1.3 Light Reflectance

Determine light reflectance factor in accordance with ASTM E1477 Test Method.

### 2.2 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:

#### 2.2.1 Metal Pans

##### 2.2.1.1 Type

VI, ASTM A167 stainless steel. Provide certification of indoor air quality for Type VI Ceiling Tiles.

2.2.1.2 Flame Spread

Class: A, 25 or less

2.2.1.3 Pattern

Fine

2.2.1.4 Minimum NRC

0.75

2.2.1.5 Minimum Light Reflectance Coefficient

0.75 or greater

2.2.1.6 Nominal Size

24 by 24 inch

2.2.1.7 Edge Detail

Manufacturer's standard.

2.2.1.8 Joint Detail

Beveled Tegular

2.2.1.9 Finish

Factory-applied standard finish

2.2.1.10 Pads

Completely enclosed, of material and thickness required for acoustical and fire test ratings.

2.2.2 Flame Spread

Class A, 25 or less

2.3 SUSPENSION SYSTEM

Provide standard suspension system conforming to ASTM C635/C635M for intermediate-duty systems. Provide surfaces exposed to view of aluminum with a factory-applied white 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 guidance in UFC 3-310-04 and ASTM E580/E580M.

Provide Suspension System containing a minimum of 15 percent recycled content. Provide data identifying percentage of recycled content for suspension systems.

## 2.4 HANGERS

Provide hangers and attachment capable of supporting a minimum 300 pound ultimate vertical load without failure of supporting material or attachment.

### 2.4.1 Wires

Conform wires to ASTM A641/A641M, Class 1, 0.08 inch (12 gauge) in diameter.

### 2.4.2 Straps

Provide straps of 1 by 3/16 inch galvanized steel conforming to ASTM A653/A653M, with a light commercial zinc coating or ASTM A1008/A1008M with an electrodeposited zinc coating conforming to ASTM B633, Type RS.

### 2.4.3 Rods

Provide 3/16 inch diameter threaded steel rods, zinc or cadmium coated.

### 2.4.4 Eyebolts

Provide eyebolts of weldless, forged-carbon-steel, with a straight-shank in accordance with ASTM A489. Eyebolt size must be a minimum 1/4 inch, zinc coated.

## 2.5 ACCESS PANELS

Provide access panels that match adjacent acoustical units, designed and equipped with suitable framing and fastenings for removal and replacement without damage. Size panel to be not less than 12 by 12 inch or more than 12 by 24 inch.

- a. Attach an identification plate of 0.032 inch thick aluminum, 3/4 inch in diameter, stamped with the letters "AP" and finished the same as the unit, near one corner on the face of each access panel.
- b. Identify ceiling access panel by a number utilizing white identification plates or plastic buttons with contrasting numerals. Provide plates or buttons of minimum 1 inch diameter and securely attached to one corner of each access unit. Provide a typewritten card framed under glass listing the code identification numbers and corresponding system descriptions listed above. Mount the framed card where directed and furnish a duplicate card to the Contracting Officer. Code identification system is as follows:
  - 1 Fire detection/alarm system
  - 2 Air conditioning controls
  - 3 Plumbing system
  - 4 Heating and steam systems
  - 5 Air conditioning duct system
  - 6 Sprinkler system

## 7 Intercommunication system

### 2.6 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.

### 2.7 COLORS AND PATTERNS

Use colors and patterns for acoustical units and suspension system components as specified on drawings.

### 2.8 ACOUSTICAL SEALANT

Conform acoustical sealant to ASTM C834, nonstaining. Provide sealants used on the interior of the building (defined as inside of the weatherproofing system) that meet either emissions requirements of CDPH SECTION 01350 (use the office or classroom requirements, regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide certification of indoor air quality for Sealants.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

Examine surfaces to receive directly attached acoustical units for unevenness, irregularities, and dampness that would affect quality and execution of the work. Rid areas, where acoustical units will be cemented, of oils, form residue, or other materials that reduce bonding capabilities of the adhesive. Complete and dry interior finish work such as plastering, concrete, and terrazzo work before installation. Complete and approve mechanical, electrical, and other work above the ceiling line prior to the start of acoustical ceiling installation. Provide acoustical work complete with necessary fastenings, clips, and other accessories required for a complete installation. Do not expose mechanical fastenings in the finished work. Lay out hangers for each individual room or space. Provide hangers to support framing around beams, ducts, columns, grilles, and other penetrations through ceilings. Keep main runners and carrying channels clear of abutting walls and partitions. Provide at least two main runners for each ceiling span. Wherever required to bypass an object with the hanger wires, install a subsuspension system so that all hanger wires will be plumb.

#### 3.1.1 Suspension System

Install suspension system in accordance with ASTM C636/C636M and as specified herein. Do not suspend hanger wires or other loads from underside of steel decking.

##### 3.1.1.1 Plumb Hangers

Install hangers plumb and not pressing against insulation covering ducts and pipes. Where lighting fixtures are supported from the suspended ceiling system, provide hangers at a minimum of four hangers per fixture and located not more than 6 inch from each corner of each fixture.

### 3.1.2 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.

-- End of Section --

SECTION 09 62 38

STATIC-CONTROL FLOORING  
08/17

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM E648	(2017a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
ASTM F150	(2006; R 2013) Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring
ASTM F1700	(2018a) Standard Specification for Solid Vinyl Floor Tile
ASTM F1869	(2016) Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
ASTM F2170	(2018) Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

ELECTROSTATIC DISCHARGE ASSOCIATION (ESD)

ESD S6.1	(2014) Standard for the Protection of Electrostatic Discharge Susceptible Items - Grounding
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RESILIENT FLOOR COVERING INSTITUTE (RFCI)

FLOORSCORE	FLOORSCORE IAQ Certification
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SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage
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UNDERWRITERS LABORATORIES (UL)

UL 2818	(2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings
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1.2 SCHEDULING

Schedule static-control flooring work after any other work which would

damage the finished surface of the flooring.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

#### SD-03 Product Data

Static-Control Resilient Flooring; G

Recycled content for Static-Dissipative Vinyl Tile; S

Warranty

#### SD-04 Samples

Static-Control Resilient Flooring; G

Moldings; G

#### SD-06 Test Reports

Fire Resistance

Moisture, Alkalinity and Bond

Testing

#### SD-07 Certificates

Indoor Air Quality for Static-Dissipative Vinyl Tile; S

Qualifications of Applicator

#### SD-08 Manufacturer's Instructions

Static-Control Resilient Flooring; G

#### SD-10 Operation and Maintenance Data

Static-Control Resilient Flooring; G

### 1.3.1 Samples

#### 1.3.1.1 Static-Control Resilient Flooring

Submit three samples of each indicated color and type of flooring, base, moldings, and accessories sized a minimum 2-1/2 by 4 inch.

#### 1.3.1.2 Moldings

Submit three pieces of each type at least 12 inches long.

#### 1.3.1.3 Operations and Maintenance Data

- a. Submit Data Package 1 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.
- b. Submit three copies of manufacturer's maintenance instructions for each type of flooring material describing recommended type of cleaning equipment and materials, spotting and cleaning methods, and cleaning cycles.

#### 1.4 CERTIFICATIONS

##### 1.4.1 Indoor Air Quality Certifications

###### 1.4.1.1 Floor Covering Materials

Provide Static-Dissipative Vinyl Tile and wall base products certified to meet indoor air quality requirements by FLOORSCORE, UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party programs that products meet the requirements of this Section. Provide current product certification documentation from certification body.

###### 1.4.1.2 Adhesives

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party programs that products meet the requirements of this Section. Provide current product certification documentation from certification body.

#### 1.5 EXTRA MATERIALS

Provide extra material from same dye lot for future maintenance. Provide a minimum of 10 percent of total square yards of each flooring and base type, pattern, and color.

#### 1.6 QUALITY ASSURANCE

The flooring manufacturer will approve the Qualifications of Applicator and certify that he/she has a minimum of 3 years of experience in the application of the materials to be used.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the building site in original unopened containers bearing the manufacturer's name, style name, pattern color name and number, size, production run, project identification, handling instructions and related information. Observe ventilation and safety procedures specified in the Safety Data Sheets (SDS). Do not store flooring near materials that may off-gas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives.

##### 1.7.1 Static-Control Resilient Flooring

Store materials in a clean, dry, secure, and well-ventilated area with ambient air temperature range as recommended by the manufacturer but not less than 68 degrees F or more than 85 degrees F. Stack materials according to manufacturer's recommendations. Protect materials from the

direct flow of heat from hot-air registers, radiators and other heating fixtures and appliances.

#### 1.8 ENVIRONMENTAL CONDITIONS

Provide temporary ventilation during work of this section.

##### 1.8.1 Static-Control Resilient Flooring

Maintain areas in which resilient flooring is to be installed at a temperature range as recommended by the manufacturer but not less than 68 degrees F or more than 85 degrees F for 3 days before application, during application and 2 days after application, unless otherwise directed by the flooring manufacturer for the flooring being installed. Maintain a minimum temperature range as recommended by the manufacturer but not less than 55 degrees F thereafter for the duration of the contract. Provide adequate ventilation to remove moisture from area and to comply with regulations limiting concentrations of hazardous vapors.

#### 1.9 WARRANTY

##### 1.9.1 Static-Control Resilient Flooring

Provide manufacturer's standard performance guarantees or warranties including a five year wear warranty and ten year conductivity warranty.

### PART 2 PRODUCTS

#### 2.1 STATIC-CONTROL RESILIENT FLOORING

##### 2.1.1 Static-Dissipative Resilient Flooring

###### 2.1.1.1 Static-Dissipative Vinyl Tile

Static-dissipative vinyl tile must be a homogeneous vinyl product and conform to ASTM F1700. Provide electrical resistance from surface to surface and surface to ground between 1,000,000 ohms ( $1.0 \times 10$  to the 6th) and 1,000,000,000 ohms ( $1.0 \times 10$  to the 9th) when tested in accordance with ASTM F150. Tile must be 12 inches square and 1/8 inch thick. As required, provide welding rods as recommended by the manufacturer.

Provide Static-Dissipative Vinyl Tile containing a minimum of 10 percent recycled content. Provide data identifying percentage of recycled content for Static-Dissipative Vinyl Tile.

Provide certification of indoor air quality for Static-Dissipative Vinyl Tile.

#### 2.2 MOLDINGS

Provide heavy duty tapered moldings of colored anodized aluminum in a color to match wall base, or clear anodized aluminum and types as recommended by flooring manufacturer for both edges and transitions of flooring materials specified. Provide vertical lip on molding 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. Resilient (rubber) transition strips are not acceptable.

### 2.3 ELECTRICAL GROUND CONNECTION

Provide an electrical ground connection that meets the requirements of ESD S6.1. Connection between the static-control floor system and the external grounding system must be provided. Contact with the static-control floor system must be with conductive grounding strip and must have the greater of the following: a minimum contact area of 9 square inch or the dimensions recommended by the manufacturer. Provide the grounding conductor recommended by the manufacturer of the flooring. Connect and install the grounding conductor as recommend by the flooring manufacturer.

### 2.4 MANUFACTURER'S COLOR, PATTERN AND TEXTURE

Provide color, pattern and texture as indicated on 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.

### 2.5 FIRE RESISTANCE TESTING REQUIREMENTS

Provide a minimum average critical radiant flux of 0.22 watts per square centimeter for flooring in corridors and exits when tested in accordance with ASTM E648.

## PART 3 EXECUTION

### 3.1 SURFACE PREPARATION

Before any work under this section is begun, defects such as rough or scaling concrete, low spots, high spots, and uneven surfaces must be corrected, and damaged portions of concrete slabs must be repaired in accordance with flooring manufacturer's recommended instructions. Floor must be in a level plane with a maximum variation of 1/8 inch every 10 feet, except where indicated as sloped. Repair cracks and irregularities and prepare the subfloor in accordance with flooring manufacturer's recommended instructions. Curing and sealing compounds should not be used on concrete surfaces to receive flooring unless they have been tested and approved by the flooring manufacturer. In addition, remove paint, varnish, oils, release agents, sealers, waxes, and adhesives, as required by the flooring product in accordance with manufacturer's printed installation instructions. If a curing compound is required, it must be coordinated for compatibility with the flooring adhesive.

### 3.2 MOISTURE, ALKALINITY AND BOND TESTS

Determine the suitability of the concrete subfloor for receiving the flooring with regard to moisture content and pH level by moisture and alkalinity tests. Conduct moisture testing in accordance with ASTM F1869 or ASTM F2170, unless otherwise recommended by the flooring manufacturer. Conduct alkalinity testing as recommended by the flooring manufacturer. Determine the compatibility of the flooring adhesives to the concrete floors by a bond test in accordance with the flooring manufacturer's recommendations.

### 3.3 GENERAL INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

### 3.4 INSTALLATION OF STATIC-CONTROL RESILIENT TILE FLOORING

Install static-control resilient flooring, ground connections and accessories in accordance with the approved manufacturer's installation instructions. Tile lines and joints must be kept square, symmetrical, tight, and even. Tile at the perimeter of the area to be finished may vary as necessary to maintain full-size tiles in the field, but no perimeter tile may be less than one-half the field tile size, except where irregular shaped rooms make it impossible. Tile must be cut, fitted, and scribed to walls, partitions, and projections after field flooring has been applied. Install grounding strips in accordance with manufacturer's installation instructions. Protect edges of flooring material meeting hard surface flooring with molding and install in accordance with the molding manufacturer's printed instructions.

### 3.5 CLEANING AND PROTECTION

The flooring must be cleaned in accordance with the manufacturer's recommendations. Flooring must be protected by a covering of heavy-duty building paper before foot traffic is permitted. Lap and secure edges of kraft paper protection to provide a continuous cover. Boardwalks must be placed over flooring in areas where subsequent building operations might damage the floor. Remove and replace flooring that becomes loose, broken, or curled prior to acceptance, or flooring that does not conform to resistance requirements of ASTM F150.

### 3.6 TESTING

Test the flooring in accordance with and conform to the requirements of ESD S6.1.

-- End of Section --

SECTION 09 65 00

RESILIENT FLOORING  
08/10

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN FOREST FOUNDATION (AFF)

ATFS STANDARDS (2015) American Tree Farm System Standards of Sustainability 2015-2020

ASTM INTERNATIONAL (ASTM)

ASTM D4078 (2002; R 2015) Water Emulsion Floor Polish

ASTM E648 (2017a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source

ASTM F1344 (2015) Rubber Floor Tile

ASTM F1482 (2015) Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring

ASTM F1861 (2016) Standard Specification for Resilient Wall Base

ASTM F1869 (2016) Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

ASTM F2169 (2015; E 2016) Standard Specification for Resilient Stair Treads

ASTM F2170 (2018) Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

ASTM F710 (2017) Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350 (2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

CSA GROUP (CSA)

CSA Z809-08 (R2013) Sustainable Forest Management

FOREST STEWARDSHIP COUNCIL (FSC)

FSC STD 01 001 (2015) Principles and Criteria for Forest Stewardship

GREEN SEAL (GS)

GS-36 (2013) Adhesives for Commercial Use

PROGRAMME FOR ENDORSEMENT OF FOREST CERTIFICATION (PEFC)

PEFC ST 2002:2013 (2015) PEFC International Standard Chain of Custody of Forest Based Products Requirements

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168 (2017) Adhesive and Sealant Applications

SUSTAINABLE FOREST INITIATIVE (SFI)

SFI 2015-2019 (2015) Standards, Rules for Label Use, Procedures and Guidance

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)

UNDERWRITERS LABORATORIES (UL)

UL 2818 (2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Resilient Flooring and Accessories; G

SD-03 Product Data

Resilient Flooring and Accessories; G

Adhesives; (LEED BD+C)

SD-04 Samples

Resilient Flooring and Accessories; G

SD-06 Test Reports

Moisture, Alkalinity and Bond Tests; G

SD-07 Certificates

Indoor Air Quality for Rubber Tile; S

Indoor Air Quality for Wall Base; S

Indoor Air Quality for Adhesives; S

SD-08 Manufacturer's Instructions

Surface Preparation; G

Installation; G

SD-10 Operation and Maintenance Data

Resilient Flooring and Accessories; G

### 1.3 CERTIFICATES

#### 1.3.1 Indoor Air Quality

Submit required indoor air quality certifications and validations in one submittal package.

##### 1.3.1.1 Floor Covering Materials

Provide Rubber Tile, and wall base products certified to meet indoor air quality requirements by FLOORSCORE, UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification by other third-party programs. Provide current product certification documentation from certification body.

##### 1.3.1.2 Adhesives, Caulking and Sealants

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party programs that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

##### 1.3.2 Certified Sustainably Harvested Wood

Provide wood certified as sustainably harvested by FSC STD 01 001,

ATFS STANDARDS, CSA Z809-08, SFI 2015-2019 Standards and Rules, or other third party program certified by PEFC ST 2002:2013. Provide a letter of Certification of Sustainably Harvested Wood signed by the wood supplier. Identify certifying organization and their third party program name and indicate compliance with chain-of-custody program requirements. Submit sustainable wood certification data; identify each certified product on a line item basis. Submit copies of invoices bearing certification numbers.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the building site in original unopened containers bearing the manufacturer's name, style name, pattern color name and number, production run, project identification, and handling instructions. Store materials in a clean, dry, secure, and well-ventilated area with ambient air temperature maintained above 68 degrees F and below 85 degrees F, stacked according to manufacturer's recommendations. Protect materials from the direct flow of heat from hot-air registers, radiators and other heating fixtures and appliances. Observe ventilation and safety procedures specified in the MSDS. Do not store rubber tile near materials that may offgas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives.

#### 1.5 ENVIRONMENTAL REQUIREMENTS

Maintain areas to receive resilient flooring at a temperature above 68 degrees F and below 85 degrees F for 3 days before application, during application and 2 days after application, unless otherwise directed by the flooring manufacturer for the flooring being installed. Maintain a minimum temperature of 55 degrees F thereafter. Provide adequate ventilation to remove moisture from area and to comply with regulations limiting concentrations of hazardous vapors.

#### 1.6 SCHEDULING

Schedule resilient flooring application after the completion of other work which would damage the finished surface of the flooring.

#### 1.7 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a one year period.

#### 1.8 EXTRA MATERIALS

Provide extra flooring material of each color and pattern at the rate of 10 percent installed. Provide extra wall base material composed of 50 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 RT-1, RT-2, RT-3

Conform to ASTM F1344 Class 1, Type B (through mottled), 35 inches and 17.5 inches by 35 inches 5.8 inches by 35 inches inch square. Provide

smooth stud profile. Provide 1/8 inch overall thickness.

Provide certification of indoor air quality for Rubber Tile.

## 2.2 WALL BASE RB-1

Conform to ASTM F1861, Type TS (vulcanized thermoset rubber), Style A (straight - installed with carpet), and Style B (coved - installed with resilient flooring), and Style C (butt toe cove installed with 1/8 inch thick flooring). Provide 4 inch high and a minimum 1/8 inch thick wall base. Provide job formed corners in matching height, shape, and color.

Provide certification of indoor air quality for Wall Base.

## 2.3 STAIR TREADS, RISERS AND STRINGERS

Conform to ASTM F2169, Type TP (thermoplastic rubber). Conform to ASTM F2169 for surface of treads Class 2 raised flagstone pattern and have Group 1 abrasive non-slip strip 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.

## 2.4 MOULDING

Provide tapered mouldings of colored anodized aluminum to match wall base or clear anodized aluminum and types as recommended by flooring manufacturer for both edges and transitions of flooring materials specified. Provide vertical lip on moulding of maximum 1/4 inch. Provide bevel change in level between 1/4 and 1/2 inch with a slope no greater than 1:2. Resilient (rubber) transition strips are not acceptable.

## 2.5 ADHESIVES

Provide adhesives for flooring, base and accessories as recommended by the manufacturer and comply with local indoor air quality standards. Submit manufacturer's descriptive data, documentation stating physical characteristics, and mildew and germicidal characteristics.

Provide non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) that meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide aerosol adhesives used on the interior of the building that meet either emissions requirements of CDPH SECTION 01350 (use the office or classroom requirements, regardless of space type) or VOC content requirements of GS-36. Provide certification or validation of indoor air quality for adhesives.

## 2.6 SURFACE PREPARATION MATERIALS

Provide surface preparation materials, such as panel type underlayment, lining felt, and floor crack fillers as recommended by the flooring manufacturer for the subfloor conditions. Comply with ASTM F1482 for panel type underlayment products.

## 2.7 POLISH/FINISH

Provide polish finish as recommended by the manufacturer and conform to ASTM D4078 for polish.

## 2.8 CAULKING AND SEALANTS

Provide caulking and sealants in accordance with Section 07 92 00.00 48 JOINT SEALANTS.

## 2.9 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 Sheet No. TP-16 TP-120 . Provide flooring in any one continuous area from same production run with same shade and pattern. Submit scaled drawings indicating patterns (including location of patterns and colors) and dimensions. Submit manufacturer's descriptive data and three samples of each indicated color and type of flooring, base, mouldings, and accessories sized a minimum 2-1/2 by 4 inch. Submit Data Package 1 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

## 2.10 FIRE RESISTANCE TESTING REQUIREMENTS

Provide a minimum average critical radiant flux of 0.22 watts per square centimeter for flooring in corridors and exits when tested in accordance with ASTM E648.

# PART 3 EXECUTION

## 3.1 EXAMINATION

Examine and verify that site conditions are in agreement with the design package. Report all conditions that will prevent a proper installation. Do not take any corrective action without written permission from the Government. Work will proceed only when conditions have been corrected and accepted by the installer. Submit manufacturer's printed installation instructions for all flooring materials and accessories, including preparation of substrate, seaming techniques, and recommended adhesives.

## 3.2 SURFACE PREPARATION

Provide a smooth, true, level plane for surface preparation of the flooring, except where indicated as sloped. Floor to be flat to within 3/16 inch in 10 feet. Prepare subfloor in accordance with flooring manufacturer's recommended instructions. Prepare the surfaces of lightweight concrete slabs (as defined by the flooring manufacturer) as recommended by the flooring manufacturer. Comply with ASTM F710 for concrete subfloor preparation. Floor fills or toppings may be required as recommended by the flooring manufacturer. Install underlayments, when required by the flooring manufacturer, in accordance with manufacturer's recommended printed installation instructions. Comply with ASTM F1482 for panel type underlayments. Before any work under this section is begun, correct all defects such as rough or scaling concrete, chalk and dust, cracks, low spots, high spots, and uneven surfaces. Repair all damaged portions of concrete slabs as recommended by the flooring manufacturer. Remove concrete curing and sealer compounds from the slabs, other than the type that does not adversely affect adhesion. Remove paint, varnish, oils, release agents, sealers, waxes, and adhesives, as required by the flooring product in accordance with manufacturer's printed installation instructions.

### 3.3 MOISTURE, ALKALINITY AND BOND TESTS

Determine the suitability of the concrete subfloor for receiving the resilient flooring with regard to moisture content and pH level by moisture and alkalinity tests. Conduct moisture testing in accordance with ASTM F1869 or ASTM F2170, unless otherwise recommended by the flooring manufacturer. Conduct alkalinity testing as recommended by the flooring manufacturer. Determine the compatibility of the resilient flooring adhesives to the concrete floors by a bond test in accordance with the flooring manufacturer's recommendations. Submit copy of test reports for moisture and alkalinity content of concrete slab, and bond test stating date of test, person conducting the test, and the area tested.

### 3.4 GENERAL INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

### 3.5 PLACING 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.

### 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 TREADS, RISERS, AND STRINGERS

Secure and install stair treads, risers, and stringers 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 and clean the flooring and adjacent surfaces to remove all surplus adhesive. Clean flooring as recommended in accordance with manufacturer's printed maintenance instructions and within the recommended time frame. As required by the manufacturer, apply the recommended number of coats and type of polish and finish in accordance with manufacturer's written instructions.

### 3.10 PROTECTION

From the time of installation until acceptance, protect flooring from damage as recommended by the flooring manufacturer. Remove and replace flooring which becomes damaged, loose, broken, or curled and wall base which is not tight to wall or securely adhered.

-- End of Section --

SECTION 09 65 66

RESILIENT ATHLETIC FLOORING  
08/16

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM D2240	(2015; E 2017) Standard Test Method for Rubber Property - Durometer Hardness
ASTM D395	(2016; E 2017) Standard Test Methods for Rubber Property - Compression Set
ASTM E648	(2017a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
ASTM F1869	(2016) Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
ASTM F2170	(2018) Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
ASTM F2772	(2011) Standard Specification for Athletic Performance Properties of Indoor Sports Floor Systems

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers
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CARPET AND RUG INSTITUTE (CRI)

CRI GL CUSHION	Green Label Cushion Program
CRI GLP QM	(2017) Green Label Plus Quality Manual

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 14001	(2015) Environmental Management Systems - Requirements with Guidance for Use
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ISO 9001 (2008; Corr 1 2009) Quality Management  
Systems- Requirements

RESILIENT FLOOR COVERING INSTITUTE (RFCI)

FLOORSCORE FLOORSCORE IAQ Certification

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1113 (2016) Architectural Coatings

SCAQMD Rule 1168 (2017) Adhesive and Sealant Applications

UNDERWRITERS LABORATORIES (UL)

UL 2818 (2013) GREENGUARD Certification Program  
For Chemical Emissions For Building  
Materials, Finishes And Furnishings

## 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

### SD-02 Shop Drawings

Approved Detail Drawings; G

### SD-03 Product Data

Installation

Indoor Air Quality for Adhesives; S

Indoor Air Quality for Primer; S

### SD-04 Samples

Flooring

### SD-06 Test Reports

Laboratory Test Results

### SD-07 Certificates

Indoor Air Quality for Rubber Composition Tile; S

Indoor Air Quality for Wall Base; S

SD-11 Closeout Submittals

Warranty

1.3 QUALITY ASSURANCE

1.3.1 Shop Drawings

Provide approved detail drawings showing, as a minimum, installation details and locations of borders, patterns, and locations of floor seams.

1.3.2 Manufacturer Qualifications

Manufacturer must have at least ten years active experience in the manufacturing and marketing of indoor resilient athletic flooring, and be a certified manufacturer in accordance with ISO 9001 and ISO 14001. Manufacturer must also have an authorized installer training program.

1.3.3 Installer Qualifications

Installer must have at least five years of experience in the installation of resilient athletic flooring, and have experience on at least five projects of similar size, type and complexity as this Project. Installer must also utilize workers for this Project who are competent in techniques required by manufacturer of resilient athletic flooring installation indicated.

1.3.4 Laboratory Test Results

1.3.4.1 Performance Properties

Provide certification documents indicating testing per ASTM F2772 has been performed and the product being supplied complies with the ASTM category/classification specified for this project. Information from product catalogs or sales literature is not sufficient.

1.3.4.2 Shock Absorption

Shock absorption (force reduction) test results certified by an independent testing laboratory certified to perform such testing.

- a. ASTM test must be from certified North American laboratories.
- b. EN and DIN test must be from certified European laboratories.

1.3.4.3 Fire Performance

Provide fire performance test results.

1.3.5 Fire Test Characteristics

As determined by testing identical products according to ASTM E648, Class 1, by a qualified testing agency acceptable to authorities having jurisdiction.

1.3.6 Athletic Performance Properties

Comply with ASTM F2772 Performance Level C2 for force reduction and ball

rebound.

#### 1.3.7 Adhesive Application

Adhesive applied and poured-in-place flooring must be installed by an experienced floor applicator approved by the manufacturer.

#### 1.3.8 Flooring Material Samples

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.

### 1.4 CERTIFICATIONS

#### 1.4.1 Indoor Air Quality Certifications

Submit required indoor air quality certifications in one submittal package.

##### 1.4.1.1 Floor Covering Materials

Provide rubber composition tile, sheet rubber composition flooring, sheet vinyl composition flooring, and wall base products certified to meet indoor air quality requirements by FLOORSCORE, UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party program that products meet the requirements of this Section. Provide resilient mat underlay products certified to meet indoor air quality requirements by FLOORSCORE, UL 2818 (GreenGuard) Gold, SCS Global Services Indoor Advantage Gold, CRI GL CUSHION or provide certification or validation by other third-party program that products meet the requirements of this Section. Provide indoor-outdoor carpeting products certified to meet indoor air quality requirements by UL 2818 (GreenGuard) Gold, SCS Global Services Indoor Advantage Gold, CRI GLP QM or provide certification or validation by other third-party program that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

### 1.5 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.

- a. Store flooring and installation materials in protected dry spaces, with ambient temperatures maintained within range recommended by manufacturer, but less than 55 degrees F nor more than 85 degrees F.
- b. Store the indoor resilient athletic surfacing rolls in an upright position on a smooth flat surface immediately upon delivery to Project.

## 1.6 WARRANTY

### 1.6.1 Manufacturer's Warranty

Manufacturer's standard form in which manufacturer agrees to repair or replace sports flooring that fails within specified warranty period. Material warranty must be direct from the product manufacturer. Material warranties from separate or third party insurance providers are not valid. Material warranties from private label distributors are not valid.

Failures include, but are not limited to, the following:

- a. Material manufacturing defects.
- b. Surface wear and deterioration to the point of wear-through.
- c. Failure due to substrate moisture exposure not exceeding 80 percent relative humidity when tested according to ASTM F2170 or 5 pounds moisture vapor emission rate when tested according to ASTM F1869.

#### 1.6.1.1 Warranty Period

For materials: Minimum of 2 years from date of Substantial Completion. For surface wear: minimum of 15 years from date of Substantial Completion.

### 1.6.2 Installer's Warranty

Installer's standard form in which installer agrees to repair or replace sports flooring that fails due to poor workmanship or faulty installation within the specified warranty period.

## 1.7 COORDINATION

Coordinate layout and installation of flooring with other gymnasium equipment.

## 1.8 EXTRA MATERIALS

## PART 2 PRODUCTS

### 2.1 FLOORING MATERIALS

#### 2.1.1 Rubber Composition Tile Type

Provide 40 x 40 inches square, of solid first quality rubber, uniformly resilient material rubber tiles, designed to be applied with adhesive. Provide tiles that are approximately 0.36 inch thick, smooth texture, and non-reversible. Flooring must be able to withstand 75 percent compression for 22 hours at 158 degrees F without residual deformation when tested in accordance with ASTM D395. Provide flooring with a durometer hardness Shore-A of 50-60 when tested in accordance with ASTM D2240. Product must meet emissions requirements of CDPH SECTION 01350. Provide certification or validation of indoor air quality for Rubber Composition Tile.

#### 2.2 ADHESIVES

Adhesive must be as recommended by the flooring manufacturer and correspond to the specified flooring product and to the substrate. Adhesive products used on the interior of the building (defined as inside

of the weatherproofing system) must meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1168. Provide validation of indoor air quality for adhesives.

### 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

Provide strips of the same material and design as recommended by flooring manufacturer.

### 2.5 PRIMER

Concrete primer must be as recommended by flooring manufacturer and correspond to the specified flooring product and to the substrate. For interior applications (defined as inside of the weatherproofing system) of primer, provide products meeting either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1113. Provide validation of indoor air quality for primer.

### 2.6 WALL BASE

Base must be rubber, Type coved style. Base must be 4 inches high and minimum 0.080 inch thick.

Product must meet emissions requirements of CDPH SECTION 01350. Provide certification or validation of indoor air quality for wall base.

### 2.7 SEALANTS

provide sealants in accordance with Section 07 92 00.00 48 JOINT SEALANTS.

### 2.8 MANUFACTURERS COLOR

Color must be as shown on drawings.

## PART 3 EXECUTION

### 3.1 PREPARATION

Concrete surfaces must be completely cured and dry. Do not use curing agents, sealers, or hardeners to aid in the curing of the concrete slab. Surfaces must be free of paint spots, and other foreign materials. Surfaces must 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 must be filled with crack filler for concrete surfaces. Expansion joints must be filled and sealed in accordance with the approved installation instructions of the manufacturer. All sealants must be in accordance with ASTM C920. Expansion joints must not be filled with a material that will make them inoperable.

### 3.2 MOISTURE TEST

Confirm that the moisture content of concrete subfloors is in the range recommended by the flooring manufacturer before floor installation.

### 3.3 INSTALLATION

Do not install building construction materials that show visual evidence of biological growth.

#### 3.3.1 General Requirements

Installation must be in accordance with the approved installation instructions. Tile or sheet flooring must 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 must be included.

#### 3.3.2 Molded Rubber Base

Install base in accordance with the approved installation instructions of the manufacturer of the base.

#### 3.3.3 Line Marking and Finishing

After installation is complete, clean the floor surface in accordance with installation instructions. Lay out, mask, and paint line marking according to approved detail drawings and approved installation instructions. Finish in accordance with the manufacturer's recommendations.

### 3.4 PROTECTION

Protect the installed flooring from soiling and damage with heavy reinforced, nonstaining kraft paper, plywood, or hardboard sheets as required. Lap and secure edges of kraft paper protection to provide a continuous cover. Remove protective covering when directed by the Contracting Officer.

-- End of Section --

SECTION 09 67 23.13

STANDARD RESINOUS FLOORING

11/15

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM A990/A990M	(2018) Standard Specification for Castings, Iron-Nickel-Chromium and Nickel Alloys, Specially Controlled for Pressure-Retaining Parts for Corrosive Service
ASTM C881/C881M	(2015) Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
ASTM D1475	(2013) Standard Test Method for Density of Liquid Coatings, Inks, and Related Products
ASTM D1544	(2004; R 2010) Standard Test Method for Color of Transparent Liquids (Gardner Color Scale)
ASTM D1652	(2011; E 2012) Standard Test Method for Epoxy Content of Epoxy Resins
ASTM D2240	(2015; E 2017) Standard Test Method for Rubber Property - Durometer Hardness
ASTM D2471	(1999) Standard Test Method for Gel Time and Peak Exothermic Temperature of Reacting Thermosetting Resins
ASTM D4259	(1988; R 2012) Standard Practice for Abrading Concrete
ASTM D445	(2017a) Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)
ASTM D523	(2014; R 2018) Standard Test Method for Specular Gloss
ASTM D570	(1998; E 2010; R 2010) Standard Test Method for Water Absorption of Plastics
ASTM D638	(2014) Standard Test Method for Tensile Properties of Plastics

ASTM D696 (2016) Standard Test Method for  
Coefficient of Linear Thermal Expansion of  
Plastics Between -30 degrees C and 30  
degrees C With a Vitreous Silica  
Dilatometer

## 1.2 ADMINISTRATIVE REQUIREMENTS

### 1.2.1 Product Data

Within 30 days of contract award, submit manufacturer's catalog data for the following items:

- a. Epoxy-Resin Binder/Matrix
- b. Cured Epoxy Binder
- c. Aggregate
- d. Surface Sealing Coat

### 1.2.2 Design Mix Data

Within 30 days of contract award, submit design mix data for the following items, including a complete list of ingredients and admixtures:

- a. Epoxy-Resin Binder/Matrix
- b. Cured Epoxy Binder
- c. Surface Sealing Coat

Ensure applicable test reports verify the mix has been successfully tested and meets design requirements.

## 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that reviews the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

### SD-02 Shop Drawings

Installation Drawings; G

Fabrication Drawings; G

### SD-03 Product Data

Manufacturer's Catalog Data; G

### SD-04 Samples

Hardboard Mounted Epoxy Flooring; G

Floor Topping; G

SD-05 Design Data

Design Mix Data; G

SD-07 Certificates

Listing of Product Installations; G

Referenced Standards Certificates; G

SD-11 Closeout Submittals

Warranty; G

#### 1.4 DELIVERY, STORAGE, AND HANDLING

Protect materials from weather, soil, and damage during delivery, storage, and construction. Deliver materials in original packages, containers, or bundles bearing brand name and name of material.

Maintain materials used in the installation of floor topping at a temperature between 65 and 85 degrees F.

#### 1.5 QUALITY CONTROL

Prior to commencement of work, submit referenced standards certificates for the following, showing conformance with the referenced standards contained in this section:

- a. Epoxy-Resin Binder/Matrix
- b. Cured Epoxy Binder
- c. Aggregate
- d. Surface Sealing Coat

##### 1.5.1 Qualifications

Submit a listing of product installations for heavy duty epoxy flooring including identification of at least 5 units, similar to those proposed for use, that have been in successful service for a minimum period of 5 years. Identify purchaser, address of installation, service organization, and date of installation.

Ensure floor system applicators are experienced in the application of troweled walnut-shell aggregate thin-set floor topping.

##### 1.5.2 Sampling

Submit hardboard mounted epoxy flooring samples not less than 12-inch square for each required color.

Provide panels showing nominal thickness of finished toppings, color, and texture of finished surfaces. Finished floor toppings and the approved samples are to match in color and texture.

1.6 WARRANTY

Submit a 2 year written warranty for all materials and installation work.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Submit installation drawings for heavy duty epoxy flooring systems clearly designating the areas of application and the installation plan. Include in the installation plan, methods to control sand and dust if sand blasting is required.

Submit fabrication drawings for heavy duty epoxy flooring Systems consisting of fabrication and assembly details to be performed in the factory.

2.2 MATERIALS

2.2.1 Mixes

2.2.1.1 Epoxy-Resin Binder/Matrix

Provide a clear two-component compatible system epoxy resin binder consisting of: (1) a liquid blend of a biphenyl-based epoxy resin and an aliphatic polyglyceride ether, and (2) a liquid blend of two modified amine curing agents, which individually cures the epoxy resin at room temperature to a glossy smooth film. Ensure the two components and the cured epoxy binder have the following physical properties:

<u>PROPERTY</u>	<u>TEST METHOD</u>	<u>REQUIREMENT</u>
	COMPONENT A (EPOXY RESIN)	
Viscosity (kinematic), at 77 degrees F, centipoises	ASTM D445	3000 to 5000
Weight per epoxide, grams	ASTM D1652	205 to 225
Color (Gardner Color Scale), maximum	ASTM D1544	5
Weight per gallon, pounds	ASTM D1475	9.46 - 9.56
	COMPONENT B (CURING AGENT)	
Viscosity (kinematic), at 77 degrees F, centistokes	ASTM D445	75 to 125
Weight per gallon, pounds	ASTM D1475	7.50 to 7.60
Color (Gardner Color Scale), maximum	ASTM D1544	8

2.2.1.2 Cured Epoxy Binder

Provide a cured epoxy binder with the following properties.

PROPERTY	TEST METHOD	REQUIREMENT
Tensile strength, psi* at test temperature: 77 degrees F	ASTM D638	4500 to 6500
Tensile elongation, percent* at test temperature: 77 degrees F	ASTM D638	20 to 40
Water absorption, percent 24 hours at 77 degrees F, maximum	ASTM D570	0.40
Hardness, Shore D	ASTM D2240	74 to 82
Linear shrinkage, inch/inch maximum	ASTM C881/C881M	0.006
Shrinkage, glass bow, inch divergence, maximum	ASTM A990/A990M	0.016
Coefficient of linear thermal expansion, inch/inch/degree C, maximum	ASTM D696 0 degrees C to 40 degrees C	200 X 10-6
Gel time/peak exotherm at 77 degrees F, 100 gm mass in 4-ounce metal container	ASTM D2471	20 to 40 minutes at 300 degrees F, maximum
*1/8 inch thick castings		
**1/8 by 1 by 3 inch castings, aged in forced draft oven		

2.2.1.3 Aggregate

Provide aggregate recommended by the resinous flooring manufacturer and approved by the Contracting Officer. Deliver aggregate to the site in three separate package gradations for blending. Gradations are:

SIEVE SIZE	PERCENT	
	MAXIMUM	MINIMUM
GRADUATION NO. 1		
Retained on No. 6	0.0	-

SIEVE SIZE	PERCENT	
	MAXIMUM	MINIMUM
Passing No. 6, retained on No. 8	5.0	0.0
Passing No. 8, retained on No. 12	100.0	74.0
Passing No. 20	1.0	-
GRADATION NO. 2		
Retained on No. 16	0.0	-
Passing No. 16, retained on No. 18	5.0	0.0
Passing No. 18, retained on No. 40	100.0	85.0
Passing No. 40, retained on No. 60	9.0	0.0
Passing No. 60	1.0	-
GRADATION NO. 3		
Retained on No. 20	0.0	-
Passing No. 20, retained on No. 35	5.0	0.0
Passing No. 35, retained on No. 60	100.0	80.0
Passing No. 60, retained on No. 100	13.0	0.0
Passing No. 100	2.0	-

2.2.1.4 Surface Sealing Coat

Provide nonnumbering aliphatic or aromatic moisture-curing polyurethane surface sealer into which has been incorporated a flatting agent. Add flatting agent not more than 24 hours prior to actual application of the coating. Ensure cured coating with flatting agent yields 60-degree specular gloss of 10 to 20 when tested in accordance with ASTM D523.

PART 3 EXECUTION

3.1 PREPARATION

Prior to applying resinous flooring material, inspect substrate and immediately report any unsatisfactory conditions that exist and repair.

3.1.1 Safety Precautions

Prior to application in confined spaces of toppings and coatings containing flammable or toxic properties, institute safety precautions recommended by the manufacturer of the product.

Erect "NO SMOKING" signs, and prohibit smoking or use of spark- or flame-producing devices within 50 feet of any mixing or placing operation involving flammable materials.

Provide personnel required to handle, mix, or apply toppings containing toxic or flammable properties with such items of personal protective equipment and apparel for eye, skin, and respiratory protection as are recommended by the manufacturer of the product. Ensure all personnel are trained in the appropriate use and wearing of personal protection equipment.

### 3.1.2 Protection of Adjacent Surfaces

In addition to the protection of adjacent surfaces during installation, provide areas used to store and mix materials with a protective covering under the materials. After application of the sealer coats, protect finished flooring during the remainder of the construction period. In areas of expected minimum or moderate traffic, cover floors with 70-pound kraft paper a 30-30-30 waterproof kraft paper, with strips taped together and edges secured to prevent roll-up. Place vegetable fiberboard, plywood, or other suitable material that does not mar the flooring over the paper to protect areas used as passages by workmen and areas subject to floor damage because of subsequent building operations. Upon completion of construction, remove the protection, clean flooring and, where necessary, repair, reseal, or both, at no additional cost to the Government.

### 3.1.3 Concrete Subfloor

#### 3.1.3.1 New Concrete Floors

Do not commence installation of floor topping until concrete has cured a minimum of 28 calendar days. Verify concrete floor is straight, properly sloped, and has wooden float type finish. Ensure concrete is moist cured with burlap or polyethylene. Prior to applying the prime coat, clean concrete surface by an approved method.

#### 3.1.3.2 Existing Concrete Floors

Clean existing concrete floors, with hard troweled or contaminated areas in conformance with ASTM D4259, and ensure concrete is free of all paint, sealers, curing agents, oil, grease, moisture, dirt or any other contaminants. Remove any loose or corroded segments of existing concrete and patch with a grouting compound as recommended by the resinous flooring manufacturer. Fill all cracks with an elastomeric jointing compound compatible with the resinous flooring system used.

### 3.1.4 Mixing Of Materials

Select job mix proportions on the trial batch proportions used to prepare the floor topping samples as submitted and approved.

Use mechanical equipment for mixing of materials in accordance with the manufacturer's instructions.

Use rotating paddle-type masonry mortar mixers for preblending the three sizes and color pigment, if any, of the walnut shell aggregate and addition of the mixed epoxy resin binder. Ensure mixing times are as recommended by the materials supplier(s), provided mixing times result in

homogeneous mixtures. Limit quantity of material mixed at one time to that which can be applied and finished within the working life of the mixtures. Verify temperature of materials at the time of mixing are between 65 and 85 degrees F.

### 3.2 APPLICATION

#### 3.2.1 Areas of Application

Anchor plates set with the top surface at or above the finished epoxy floor level do not require coverage with this flooring material. Extend flooring under equipment, except when the equipment base is indicated to be flush against the structural floor. Cover and/or mask surfaces not to receive the epoxy floor topping, such as equipment or cabinets installed prior to surface-preparation efforts and adjacent to the flooring installation.

#### 3.2.2 Application of Prime Coat and Troweling

Combine the epoxy binder components A and B in the proportions specified by the manufacturer to form a clear compatible system immediately on mixing. Cure combined components to a clear film possessing a glossy, non-greasy surface at relative humidities less than 80 percent, having the following properties after curing 24 hours at 77 degrees F, followed by 24 hours at 125 degrees F:

Ensure prepared subfloor surface is dry and at a temperature of not less than 60 degrees F when application of the floor topping is initiated. Immediately prior to application of the prime/scratch coat on the prepared surface, remove dust or other loose particles by blowing with compressed air or vacuum cleaned. Use only an air compressor equipped with an efficient oil-water trap to prevent oil contamination or wetting of surface.

Apply a thin roller coat of the epoxy binder specified to the prepared subfloor as a prime coat. As an aid to placing, compacting, and finishing the floor topping, form a scratch coat by sprinkling a minimum quantity of the walnut shell aggregate on the prime coat surface immediately following the prime coat application. Prior to application of the prime/scratch coat, fill cracks in the concrete, and make provisions to keep control or expansion joints open.

Place the floor topping prior to final gelling of the prime/scratch coat. Immediately after the materials are mixed as specified, dump the mixture in the placement area and spread to prolong troweling life. Screed or rough trowel placed materials to the specified thickness and then compact by the use of a smooth roller prior to finish troweling to a nominal thickness of 3/16-inch plus or minus 1/16-inch. Ensure all finished surfaces are free of ridges, hollows (bird-baths), trowel marks, and smoothness varies no more than 1/8-inch when tested with an 8-foot straightedge. Make provisions to maintain the work areas in a relatively dust-free environment during curing of the topping.

#### 3.2.3 Sealer Coat

After the floor topping has set firmly (approximately 6 to 16 hours depending on subfloor temperature) in a relatively dust-free environment, apply two thin coats of the sealer coat, by means of brush, roller, squeegee, or notched trowel to provide a pore-free, easy-to-clean

surface. At the time of sealer application, ensure the surface is dust-free. Depending on relative humidity, allow the applied sealer to cure to a tack-free condition in 2 to 4 hours. Do not apply second coat until after the initial coat has cured to a tack-free, hard film. Maintain topping areas in a relatively dust-free environment during curing of the sealer coats.

### 3.3 FIELD QUALITY CONTROL

#### 3.3.1 Repairing

Remove and replace damaged or unacceptable portions of completed work with new work to match adjacent surfaces at no additional cost to the Government.

### 3.4 ADJUSTING AND CLEANING

Clean surfaces of the new work, and adjacent surfaces soiled as a result of the work. Remove all equipment, surplus materials, and rubbish associated with the work from the site.

-- End of Section --

SECTION 09 68 00

CARPETING  
11/17

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC 107	(2013) Colorfastness to Water
AATCC 134	(2016) Electrostatic Propensity of Carpets
AATCC 16	(2004; E 2008; E 2010) Colorfastness to Light
AATCC 165	(2013) Colorfastness to Crocking: Textile Floor Coverings - Crockmeter Method
AATCC 174	(2016) Antimicrobial Activity Assessment of New Carpets

ASTM INTERNATIONAL (ASTM)

ASTM D1335	(2017; E 2018) Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings
ASTM D2859	(2016) Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials
ASTM D3278	(1996; R 2011) Flash Point of Liquids by Small Scale Closed-Cup Apparatus
ASTM D5793	(2018) Standard Test Method for Binding Sites Per Unit Length or Width of Pile Yarn Floor Coverings
ASTM D5848	(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 D7330	(2015) Standard Test Method for Assessment of Surface Appearance Change in Pile Floor Coverings Using Standard Reference Scales
ASTM E648	(2017a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems

Using a Radiant Heat Energy Source

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350 (2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers

CARPET AND RUG INSTITUTE (CRI)

CRI 104 (2015) Carpet Installation Standard for Commercial Carpet

CRI 105 (2015) Carpet Installation Standard for Residential Carpet

CRI GLP QM (2017) Green Label Plus Quality Manual

CRI Test Method 103 (2015) Standard Test Method for the Evaluation of Texture Appearance Retention of Carpet Standards Program

GREEN SEAL (GS)

GS-36 (2013) Adhesives for Commercial Use

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

ISO 2551 (1981) Machine-made Textile Floor Coverings - Determination of Dimensional Changes Due to the Effects of Varied Water and Heat Conditions

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS SCS Global Services (SCS) Indoor Advantage

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1113 (2016) Architectural Coatings

SCAQMD Rule 1168 (2017) Adhesive and Sealant Applications

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

16 CFR 1630 Standard for the Surface Flammability of Carpets and Rugs (FF 1-70)

UNDERWRITERS LABORATORIES (UL)

UL 2818 (2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When

used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation Drawings; G

SD-03 Product Data

Carpet; G

Recycled Content for Carpeting; S

Moldings; G

Indoor Air Quality for Aerosol Adhesives; S

Indoor Air Quality for Non-Aerosol Adhesives; S

SD-04 Samples

Carpet; G

Moldings; G

SD-06 Test Reports

Moisture and Alkalinity Tests; G

SD-07 Certificates

Indoor Air Quality for Carpet; S

SD-08 Manufacturer's Instructions

Surface Preparation

SD-10 Operation and Maintenance Data

Cleaning and Protection

SD-11 Closeout Submittals

Warranty

1.3 CERTIFICATIONS

1.3.1 Indoor Air Quality Certifications

1.3.1.1 Floor Covering Materials

Provide carpet and cushion products certified to meet indoor air quality requirements by UL 2818 (GreenGuard) Gold, SCS Global Services Indoor Advantage Gold, CRI GLP QM or provide certification or validation by other third-party program that products meet the requirements of this Section. Provide current product certification documentation from certification

body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the site in the manufacturer's original wrappings and packages clearly labeled with the manufacturer's name, brand name, size, dye lot number, and related information. Remove materials from packaging and store them in a clean, dry, well ventilated area protected from damage, soiling, and moisture, and maintain at a temperature above 60 degrees F for 2 days prior to installation. Do not store carpet near materials that may off gas or emit harmful fumes, such as kerosene heaters, fresh paint, or adhesives.

#### 1.5 AMBIENT CONDITIONS

Maintain areas in which carpeting is to be installed at a temperature above 60 degrees F and below 90 degrees F for 2 days before installation, during installation, and for 2 days after installation. Provide temporary ventilation during work of this section. Maintain a minimum temperature of 55 degrees F thereafter for the duration of the contract.

#### 1.6 WARRANTY

Provide manufacturer's standard performance guarantees or warranties including minimum ten year wear warranty, two year material and workmanship and ten year tuft bind and delamination.

### PART 2 PRODUCTS

#### 2.1 CARPET

Furnish first quality carpet that is free of visual blemishes, streaks, poorly dyed areas, fuzzing of pile yarn, spots or stains, and other physical and manufacturing defects. Provide carpet materials and treatments as reasonably nonallergenic and free of other recognized health hazards. Provide a static control construction on all grade carpets which gives adequate durability and performance. Submit manufacturer's catalog data and printed documentation stating physical characteristics, durability, resistance to fading, and flame resistance characteristics for each type of carpet material and installation accessory. Submit manufacturer's Product Data for 1) Carpet, 2) Moldings, and 3) Carpet Backing. Also, submit Samples of the following:

- a. Carpet: Two "Production Quality" samples of each carpet proposed for use, showing quality, pattern, and color specified
- b. Moldings: Two samples of each type minimum 12 inches long

##### 2.1.1 Recycled Content

Carpeting must contain a minimum of 40 percent recycled content. Provide data identifying percentage of recycled content for carpeting.

Provide certification of indoor air quality for carpet.

##### 2.1.2 Indoor Air Quality Requirements

Products must meet emissions requirements of CDPH SECTION 01350. Provide

certification or validation of indoor air quality for carpet.

### 2.1.3 Physical Characteristics for Modular Tile Carpet

#### 2.1.3.1 Carpet Construction

Tufted

#### 2.1.3.2 Type

Modular tile 24 by 24 inch square with 0.15 percent growth/shrink rate in accordance with ISO 2551. Entrance 24 x 24 inch square.

#### 2.1.3.3 Pile Type

Level-loop Multilevel loop

#### 2.1.3.4 Pile Fiber

Commercial 100 percent branded (federally registered trademark) nylon continuous filament.

#### 2.1.3.5 Gauge or Pitch

Minimum 1/12 inch in accordance with ASTM D5793

#### 2.1.3.6 Stitches or Rows/Wires

Minimum 10 per square inch

#### 2.1.3.7 Surface Pile Weight

Minimum 30 ounces per square yard. This does not include weight of backings. Determine weight in accordance with ASTM D5848.

#### 2.1.3.8 Pile Thickness

Minimum .139 inch in accordance with ASTM D6859

#### 2.1.3.9 Pile Density

Minimum 7770

#### 2.1.3.10 Dye Method

Solution dyed

#### 2.1.3.11 Backing Materials

Provide primary backing materials like those customarily used and accepted by the trade for each type of carpet.. Provide secondary backing to suit project requirements of those customarily used and accepted by the trade for each type of carpet.

## 2.2 PERFORMANCE REQUIREMENTS

### 2.2.1 Texture Appearance Retention Rating (TARR)

Provide carpet with a greater than or equal to 3.0 (Heavy) TARR traffic

level classification in accordance with ASTM D7330 or CRI Test Method 103.

#### 2.2.2 Static Control

Provide static control to permanently regulate static buildup to less than 3.0 kV when tested at 20 percent relative humidity and 70 degrees F in accordance with AATCC 134.

#### 2.2.3 Flammability and Critical Radiant Flux Requirements

Comply with 16 CFR 1630 or ASTM D2859. Provide carpet in corridors and exits with a minimum average critical radiant flux of 0.22 watts per square centimeter when tested in accordance with ASTM E648.

#### 2.2.4 Tuft Bind

Comply with ASTM D1335 for tuft bind force required to pull a tuft or loop free from carpet backing with a minimum 8 pound average force for modular carpet tile.

#### 2.2.5 Colorfastness to Crocking

Comply dry and wet crocking with AATCC 165 and with a Class 4 minimum rating on the AATCC Color Transference Chart for all colors.

#### 2.2.6 Colorfastness to Light

Comply colorfastness to light with AATCC 16, Test Option E "Water-Cooled Xenon-Arc Lamp, Continuous Light" and with a minimum 4 grey scale rating after 40 hours.

#### 2.2.7 Colorfastness to Water

Comply colorfastness to water with AATCC 107 and with a minimum 4.0 gray scale rating and a minimum 4.0 transfer scale rating.

#### 2.2.8 Delamination Strength

Provide delamination strength for tufted carpet with a secondary back of minimum 2.5 lbs/inch.

#### 2.2.9 Antimicrobial

Nontoxic antimicrobial treatment in accordance with AATCC 174 Part I (qualitative), guaranteed by the carpet manufacturer to last the life of the carpet.

### 2.3 ADHESIVES AND CONCRETE PRIMER

Comply with applicable regulations regarding toxic and hazardous materials. Provide water resistant, mildew resistant, nonflammable, and nonstaining adhesives and concrete primers for carpet installation as required by the carpet manufacturer. Provide release adhesive for modular tile carpet as recommended by the carpet manufacturer. Provide adhesives flashpoint of minimum 140 degrees F in accordance with ASTM D3278. Non-aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) must meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content

requirements of SCAQMD Rule 1168. Aerosol adhesive products used on the interior of the building (defined as inside of the weatherproofing system) must meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of GS-36. Provide validation of indoor air quality for aerosol adhesives. Provide validation of indoor air quality for non-aerosol adhesives. Concrete primer products used on the interior of the building (defined as inside of the weatherproofing system) must meet either emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type) or VOC content requirements of SCAQMD Rule 1113. Provide validation of indoor air quality for concrete primer.

#### 2.4 MOLDINGS

Provide carpet moldings where floor covering material changes or carpet edge does not abut a vertical surface. Provide a heavy-duty aluminum molding designed for the type of carpet being installed. Provide floor flange of a minimum 1 1/2 inches wide. Provide natural color to match an aluminum molding, pinless clamp-down type, designed for the type of carpet being installed. Provide natural color anodized finish. Provide a floor flange of a minimum 1-1/2 inch wide and face a minimum 5/8 inch wide. Resilient (rubber) transition strips are not acceptable.

#### 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 Surface Preparation, seaming techniques, and recommended adhesives and tapes.

#### 3.2 MOISTURE AND ALKALINITY TESTS

Test concrete slab for moisture content and excessive alkalinity in accordance with CRI 104/CRI 105. Submit three copies of reports of Moisture and Alkalinity Tests including content of concrete slab stating date of test, person conducting the test, and the area tested.

#### 3.3 PREPARATION OF CONCRETE SUBFLOOR

Do not commence installation of the carpeting until concrete substrate is at least 90 days old. Prepare the concrete surfaces in accordance with the carpet manufacturer's instructions. Match carpet, when required, and adhesives to prevent off-gassing to a type of curing compounds, leveling agents, and concrete sealer.

### 3.4 INSTALLATION

Perform all work by manufacturer's approved installers. Conduct installation in accordance with the manufacturer's printed instructions and CRI 104/CRI 105. Protect edges of carpet meeting hard surface flooring with molding and install in accordance with the molding manufacturer's printed instructions. Follow ventilation, personal protection, and other safety precautions recommended by the adhesive manufacturer. Continue ventilation during installation and for at least 72 hours following installation. Do not permit traffic or movement of furniture or equipment in carpeted area for 24 hours after installation. Complete other work which would damage the carpet prior to installation of carpet. Submit three copies of Installation Drawings for 1) Carpet, 2) Moldings indicating areas receiving carpet, carpet types, patterns, direction of pile, location of seams, and locations of edge molding.

Do not install building construction materials that show visual evidence of biological growth.

#### 3.4.1 Modular Tile Installation

Install modular tiles with adhesive and snug joints. Use 1/4 turn installation method. Comply with manufacturer installation instructions for required drying time of releasable adhesive so it sets up properly. Provide accessibility to the subfloor where required. Carpet tile on sloped surfaces must be installed with a more permanent installation method in accordance with the manufacturer's instructions and with manufacturer recommended adhesives for this application.

#### 3.4.2 Entrance Carpet Installation

Install tiles with releasable adhesive and snug joints. Use 1/4 turn installation method. Prepare regular, unnoticeable, and treated seams with a seam adhesive. Install breadths parallel, with carpet pile in the same direction. Match patterns accurately. Neatly cut and fit, securely, cutouts at door jambs, columns, and ducts. Locate seams at doorways parallel to and centered directly under doors. Do not make seams perpendicular to doors or at pivot points.

### 3.5 CLEANING AND PROTECTION

Submit three copies of carpet manufacturer's maintenance instructions describing recommended type of cleaning equipment and material, spotting and cleaning methods, and cleaning cycles.

#### 3.5.1 Cleaning

After installation of the carpet, remove debris, scraps, and other foreign matter. Remove soiled spots and adhesive from the face of the carpet with appropriate spot remover. Cut off and remove protruding face yarn. Vacuum carpet clean.

#### 3.5.2 Protection

Protect the installed carpet from soiling and damage with heavy, reinforced, nonstaining kraft paper, plywood, or hardboard sheets. Lap and secure edges of kraft paper protection to provide a continuous cover. Restrict traffic for at least 48 hours. Remove protective covering when directed by the Contracting Officer.

### 3.6 REMNANTS

Manage waste as specified in the Waste Management Plan. Provide remnants remaining from the installation, consisting of scrap pieces more than 2 feet in dimension with more than 6 square feet total to the Government. .

### 3.7 MAINTENANCE

#### 3.7.1 Extra Materials

Provide extra material from same dye lot consisting of for future maintenance. Provide a minimum of 10 percent of total square yards of each carpet type, pattern, and color. Furnish 10 percent extra of total adhesive tabs.

-- End of Section --

SECTION 09 90 00

PAINTS AND COATINGS

05/11

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH 0100 (2015; Suppl 2002-2016) Documentation of the Threshold Limit Values and Biological Exposure Indices

ASTM INTERNATIONAL (ASTM)

ASTM C920 (2018) Standard Specification for Elastomeric Joint Sealants

ASTM D235 (2002; R 2012) Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)

ASTM D2824/D2824M (2018) Standard Specification for Aluminum-Pigmented Asphalt Roof Coatings, Non-Fibered, and Fibered without Asbestos

ASTM D4214 (2007; R 2015) Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films

ASTM D4263 (1983; R 2012) Indicating Moisture in Concrete by the Plastic Sheet Method

ASTM D4444 (2013) Use and Calibration of Hand-Held Moisture Meters

ASTM D523 (2014; R 2018) Standard Test Method for Specular Gloss

ASTM D6386 (2016) Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting

ASTM F1869 (2016) Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

MASTER PAINTERS INSTITUTE (MPI)

MPI 1 (2012) Aluminum Paint

MPI 101 (2012) Primer, Epoxy, Anti-Corrosive, for

Metal

MPI 107 (2012) Primer, Rust-Inhibitive, Water Based  
MPI 108 (2012) Epoxy, High Build, Low Gloss  
MPI 138 (2012) Latex, Interior, High Performance Architectural, (MPI Gloss Level 2)  
MPI 139 (2012) Latex, Interior, High Performance Architectural, (MPI Gloss Level 3)  
MPI 140 (2012) Latex, Interior, High Performance Architectural, (MPI Gloss Level 4)  
MPI 141 (2012) Latex, Interior, High Performance Architectural, Semi-Gloss (MPI Gloss Level 5)  
MPI 144 (2012) Latex, Interior, Institutional Low Odor/VOC, (MPI Gloss Level 2)  
MPI 145 (2012) Latex, Interior, Institutional Low Odor/VOC, ( MPI Gloss Level 3)  
MPI 146 (2012) Latex, Interior, Institutional Low Odor/VOC, (MPI Gloss Level 4)  
MPI 147 (May 2016) Latex, Interior, Institutional Low Odor/VOC, Semi-Gloss (MPI Gloss Level 5)  
MPI 151 (2012) Light Industrial Coating, Interior, Water Based (MPI Gloss Level 3)  
MPI 153 (2012) Light Industrial Coating, Interior, Water Based, Semi-Gloss (MPI Gloss Level 5)  
MPI 154 (2012) Light Industrial Coating, Interior, Water Based, Gloss (MPI Gloss Level 6)  
MPI 161 (2012) Light Industrial Coating, Exterior, Water Based ( MPI Gloss Level 3)  
MPI 163 (2012) Light Industrial Coating, Exterior, Water Based, Semi-Gloss (MPI Gloss Level 5)  
MPI 164 (2012) Light Industrial Coating, Exterior, Water Based, Gloss (MPI Gloss Level 6)  
MPI 23 (2012) Primer, Metal, Surface Tolerant  
MPI 27 (2012) Floor Enamel, Alkyd, Gloss (MPI Gloss Level 6)  
MPI 39 (2012) Primer, Latex, for Interior Wood  
MPI 42 (2012) Textured Coating, Latex, Flat

- MPI 44 (2012) Latex, Interior, (MPI Gloss Level 2)
- MPI 45 (2012) Primer Sealer, Interior Alkyd
- MPI 46 (2012) Undercoat, Enamel, Interior
- MPI 47 (2012) Alkyd, Interior, Semi-Gloss (MPI Gloss Level 5)
- MPI 48 (2012) Alkyd, Interior, Gloss (MPI Gloss Level 6-7)
- MPI 49 (2012) Alkyd, Interior, Flat (MPI Gloss Level 1)
- MPI 50 (2012) Primer Sealer, Latex, Interior
- MPI 51 (2012) Alkyd, Interior, (MPI Gloss Level 3)2
- MPI 52 (2012) Latex, Interior, (MPI Gloss Level 3)
- MPI 54 (2012) Latex, Interior, Semi-Gloss (MPI Gloss Level 5)
- MPI 72 (2012) Polyurethane, Two-Component, Pigmented, Gloss (MPI Gloss Level 6-7)
- MPI 77 (2012) Epoxy, Gloss
- MPI 79 (2012) Primer, Alkyd, Anti-Corrosive for Metal
- MPI 8 (2012) Alkyd, Exterior Flat (MPI Gloss Level I)
- MPI 9 (2012) Alkyd, Exterior Gloss (MPI Gloss Level 6)
- MPI 94 (2012) Alkyd, Exterior, Semi-Gloss (MPI Gloss Level 5)
- MPI 95 (2012) Primer, Quick Dry, for Aluminum

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

- SCS SCS Global Services (SCS) Indoor Advantage

SOCIETY FOR PROTECTIVE COATINGS (SSPC)

- SSPC PA 1 (2016) Shop, Field, and Maintenance Coating of Metals
- SSPC PA Guide 3 (1982; E 1995) A Guide to Safety in Paint Application
- SSPC SP 1 (2015) Solvent Cleaning

SSPC SP 10/NACE No. 2 (2007) Near-White Blast Cleaning  
SSPC SP 12/NACE No.5 (2002) Surface Preparation and Cleaning of  
Metals by Waterjetting Prior to Recoating  
SSPC 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  
SSPC VIS 4/NACE VIS 7 (1998; E 2000; E 2004) Guide and Reference  
Photographs for Steel Surfaces Prepared by  
Waterjetting

U.S. ARMY CORPS OF ENGINEERS (USACE)

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

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

29 CFR 1910.1000 Air Contaminants

UNDERWRITERS LABORATORIES (UL)

UL 2818 (2013) GREENGUARD Certification Program  
For Chemical Emissions For Building  
Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance with Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

The current MPI, "Approved Product List" which lists paint by brand, label, product name and product code as of the date of contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use a subsequent MPI "Approved Product List", however, only one list may be used for the entire contract and each coating system is to be from a single manufacturer. Provide all coats on a particular substrate from a single manufacturer. No variation from the MPI Approved Products List is acceptable.

Samples of specified materials may be taken and tested for compliance with specification requirements.

SD-03 Product Data

Coating; G

Sealant

SD-04 Samples

Color; G

SD-07 Certificates

Applicator's Qualifications

Indoor Air Quality for Paints and Primers

Indoor Air Quality for Consolidated Latex Paints

SD-08 Manufacturer's Instructions

Application Instructions

Mixing

Manufacturer's Safety Data Sheets

SD-10 Operation and Maintenance Data

Coatings; G

### 1.3 CERTIFICATES

#### 1.3.1 Indoor Air Quality

Submit required indoor air quality certifications in one submittal package.

##### 1.3.1.1 Paints and Coatings

Provide paint and coating products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification by other third-party programs. Provide current product certification documentation from certification body.

### 1.4 APPLICATOR'S QUALIFICATIONS

#### 1.4.1 Contractor Qualification

Submit the name, address, telephone number, FAX number, and e-mail address of the contractor that will be performing all surface preparation and coating application. Submit evidence that key personnel have successfully performed surface preparation and application of coatings on a minimum of three similar projects within the past three years. List information by individual and include the following:

- a. Name of individual and proposed position for this work.
- b. Information about each previous assignment including:

Position or responsibility

Employer (if other than the Contractor)

Name of facility owner

Mailing address, telephone number, and telex number (if non-US) of facility owner

Name of individual in facility owner's organization who can be contacted as a reference

Location, size and description of structure

Dates work was carried out

Description of work carried out on structure

## 1.5 QUALITY ASSURANCE

### 1.5.1 Field Samples and Tests

The Contracting Officer may choose up to two coatings that have been delivered to the site to be tested at no cost to the Government. Take samples of each chosen product as specified in the paragraph SAMPLING PROCEDURES. Test each chosen product as specified in the paragraph TESTING PROCEDURE. Remove products from the job site which do not conform, and replace with new products that conform to the referenced specification. Test replacement products that failed initial testing at no cost to the Government.

#### 1.5.1.1 Sampling Procedure

The Contracting Officer will select paint at random from the products that have been delivered to the job site for sample testing. The Contractor will provide one quart samples of the selected paint materials. Take samples in the presence of the Contracting Officer, and label, and identify each sample. Provide labels in accordance with the paragraph PACKAGING, LABELING, AND STORAGE of this specification.

## 1.6 REGULATORY REQUIREMENTS

### 1.6.1 Environmental Protection

In addition to requirements specified elsewhere for environmental protection, provide coating materials that conform to the restrictions of the local Air Pollution Control District and regional jurisdiction. Notify Contracting Officer of any paint specified herein which fails to conform.

#### 1.6.2 Lead Content

Do not use coatings having a lead content over 0.06 percent by weight of nonvolatile content.

#### 1.6.3 Chromate Content

Do not use coatings containing zinc-chromate or strontium-chromate.

#### 1.6.4 Asbestos Content

Provide asbestos-free materials.

#### 1.6.5 Mercury Content

Provide materials free of mercury or mercury compounds.

#### 1.6.6 Silica

Provide abrasive blast media containing no free crystalline silica.

#### 1.6.7 Human Carcinogens

Provide materials that do not contain ACGIH 0100 confirmed human carcinogens (A1) or suspected human carcinogens (A2).

#### 1.7 PACKAGING, LABELING, AND STORAGE

Provide paints in sealed containers that legibly show the contract specification number, designation name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name and address of manufacturer. Furnish pigmented paints in containers not larger than 5 gallons. Store paints and thinners in accordance with the manufacturer's written directions, and as a minimum, stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors, and at temperatures between 40 to 95 degrees F.

#### 1.8 SAFETY AND HEALTH

Apply coating materials using safety methods and equipment in accordance with the following:

Comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis as specified in Section 01 35 26.00 06 GOVERNMENT SAFETY REQUIREMENTS and in Appendix A of EM 385-1-1. Include in the Activity Hazard Analysis the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.

##### 1.8.1 Safety Methods Used During Coating Application

Comply with the requirements of SSPC PA Guide 3.

##### 1.8.2 Toxic Materials

To protect personnel from overexposure to toxic materials, conform to the most stringent guidance of:

- a. The applicable manufacturer's Safety Data Sheets (SDS) or local regulation.
- b. 29 CFR 1910.1000.
- c. ACGIH 0100, threshold limit values.

#### 1.9 ENVIRONMENTAL CONDITIONS

Comply, at minimum, with manufacturer recommendations for space ventilation during and after installation. Isolate area of application

from rest of building when applying high-emission paints or coatings.

#### 1.9.1 Coatings

Do not apply coating when air or substrate conditions are:

- a. Less than 5 degrees F above dew point;
- b. Below 50 degrees F or over 95 degrees F, unless specifically pre-approved by the Contracting Officer and the product manufacturer. Do not, under any circumstances, violate the manufacturer's application recommendations.

#### 1.10 COLOR SELECTION

Provide colors of finish coats as indicated or specified. Allow Contracting Officer to select colors not indicated or specified. Manufacturers' names and color identification are used for the purpose of color identification only. Named products are acceptable for use only if they conform to specified requirements. Products of other manufacturers are acceptable if the colors approximate colors indicated and the product conforms to specified requirements.

Tint each coat progressively darker to enable confirmation of the number of coats.

Provide color, texture, and pattern of wall coating systems as indicated on drawings.

Submit manufacturer's samples of paint colors. Cross reference color samples to color scheme as indicated. Submit color stencil codes.

#### 1.11 LOCATION AND SURFACE TYPE TO BE PAINTED

##### 1.11.1 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.

##### 1.11.1.1 Exterior Painting

Includes new surfaces, existing coated surfaces, and existing uncoated surfaces, of the buildings and appurtenances. Also included are existing coated surfaces made bare by cleaning operations.

##### 1.11.1.2 Interior Painting

Includes new surfaces, existing uncoated surfaces, and existing coated 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.

#### 1.11.2 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.

#### 1.11.3 Mechanical and Electrical Painting

Includes field coating of interior and exterior new and existing surfaces.

- a. Where a space or surface is indicated to be painted, include the following items unless indicated otherwise.
  - (1) Exposed piping, conduit, and ductwork;
  - (2) Supports, hangers, air grilles, and registers;
  - (3) Miscellaneous metalwork and insulation coverings.
- b. Do not paint the following, unless indicated otherwise:
  - (1) New zinc-coated, aluminum, and copper surfaces under insulation
  - (2) New aluminum jacket on piping
  - (3) New interior ferrous piping under insulation.

#### 1.11.3.1 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:

Exposed Piping in Finished and Unfinished 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.

#### 1.11.4 Definitions and Abbreviations

##### 1.11.4.1 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.

##### 1.11.4.2 Batch Quality Conformance Testing

Batch quality conformance testing determines that the product provided is the same as the product qualified to the appropriate product specification. This testing must be accomplished by an MPI testing lab.

##### 1.11.4.3 Coating

A film or thin layer applied to a base material called a substrate. A coating may be a metal, alloy, paint, or solid/liquid suspensions on various substrates (such as metals, plastics, wood, paper, leather, cloth). They may be applied by electrolysis, vapor deposition, vacuum, or mechanical means such as brushing, spraying, calendaring, and roller coating. A coating may be applied for aesthetic or protective purposes or both. The term "coating" as used herein includes emulsions, enamels, stains, varnishes, sealers, epoxies, and other coatings, whether used as primer, intermediate, or finish coat. The terms paint and coating are used interchangeably.

##### 1.11.4.4 DFT or dft

Dry film thickness, the film thickness of the fully cured, dry paint or coating.

##### 1.11.4.5 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.

##### 1.11.4.6 EPP

Environmentally Preferred Products, a standard for determining environmental preferability in support of Executive Order 13101.

##### 1.11.4.7 EXT

MPI short term designation for an exterior coating system.

1.11.4.8 INT

MPI short term designation for an interior coating system.

1.11.4.9 micron / microns

The metric measurement for 0.001 mm or one/one-thousandth of a millimeter.

1.11.4.10 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.

1.11.4.11 mm

The metric measurement for millimeter, 0.001 meter or one/one-thousandth of a meter.

1.11.4.12 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).

1.11.4.13 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.

1.11.4.14 Paint

See Coating definition.

1.11.4.15 REX

MPI short term designation for an exterior coating system used in repainting projects or over existing coating systems.

1.11.4.16 RIN

MPI short term designation for an interior coating system used in repainting projects or over existing coating systems.

PART 2 PRODUCTS

2.1 MATERIALS

Conform to the coating specifications and standards referenced in PART 3. Submit product data sheets for specified coatings and solvents. Provide preprinted cleaning and maintenance instructions for all coating systems.

Submit Manufacturer's Instructions on Mixing: Detailed mixing instructions, minimum and maximum application temperature and humidity, potlife, and curing and drying times between coats.

Provide certification of Indoor Air Quality for paints and primers.

Provide certification of Indoor Air Quality for consolidated latex paints.

PART 3 EXECUTION

3.1 PROTECTION OF AREAS AND SPACES NOT TO BE PAINTED

Prior to surface preparation and coating applications, remove, mask, or otherwise protect hardware, hardware accessories, machined surfaces, radiator covers, plates, lighting fixtures, public and private property, and other such items not to be coated that are in contact with surfaces to be coated. Following completion of painting, reinstall removed items by workmen skilled in the trades. Restore surfaces contaminated by coating materials, to original condition and repair damaged items.

3.2 RESEALING OF EXISTING EXTERIOR JOINTS

3.2.1 Surface Condition

Begin with surfaces that are clean, dry to the touch, and free from frost and moisture; remove grease, oil, wax, lacquer, paint, defective backstop, or other foreign matter that would prevent or impair adhesion. Where adequate grooves have not been provided, clean out to a depth of 1/2 inch and grind to a minimum width of 1/4 inch without damage to adjoining work. Grinding is not required on metal surfaces.

3.2.2 Backstops

In joints more than 1/2 inch deep, install glass fiber roving or neoprene, butyl, polyurethane, or polyethylene foams free of oil or other staining elements as recommended by sealant manufacturer. Provide backstop material compatible with sealant. Do not use oakum and other types of absorptive materials as backstops.

3.2.3 Primer and Bond Breaker

Install the type recommended by the sealant manufacturer.

3.2.4 Ambient Temperature

Between 38 degrees F and 95 degrees F when applying sealant.

### 3.2.5 Exterior Sealant

For joints in vertical surfaces, provide ASTM C920, Type S or M, Grade NS, Class 25, Use NT. For joints in horizontal surfaces, provide ASTM C920, Type S or M, Grade P, Class 25, Use T. Color(s) will be selected by the Contracting Officer. Apply the sealant in accordance with the manufacturer's printed instructions. Force sealant into joints with sufficient pressure to fill the joints solidly. Apply sealant uniformly smooth and free of wrinkles.

### 3.2.6 Cleaning

Immediately remove fresh sealant from adjacent areas using a solvent recommended by the sealant manufacturer. Upon completion of sealant application, remove remaining smears and stains and leave the work in a clean condition. Allow sealant time to cure, in accordance with manufacturer's recommendations, prior to coating.

## 3.3 SURFACE PREPARATION

Remove dirt, splinters, loose particles, grease, oil, disintegrated coatings, and other foreign matter and substances deleterious to coating performance as specified for each substrate before application of paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Schedule cleaning so that dust and other contaminants will not fall on wet, newly painted surfaces. Spot-prime exposed ferrous metals such as nail heads on or in contact with surfaces to be painted with water-thinned paints, with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas.

### 3.3.1 Additional Requirements for Preparation of Surfaces With Existing Coatings

Before application of coatings, perform the following on surfaces covered by soundly-adhered coatings, defined as those which cannot be removed with a putty knife:

- a. Test existing finishes for lead before sanding, scraping, or removing. If lead is present, refer to paragraph Toxic Materials. If additional lead is present other than what is identified in the RFP, the Government will be notified for scope changes.
- b. Wipe previously painted surfaces to receive solvent-based coatings, except stucco and similarly rough surfaces clean with a clean, dry cloth saturated with mineral spirits, ASTM D235. Allow surface to dry. Wipe immediately preceding the application of the first coat of any coating, unless specified otherwise.
- c. Sand existing glossy surfaces to be painted to reduce gloss. Brush, and wipe clean with a damp cloth to remove dust.
- d. The requirements specified are minimum. Comply also with the application instructions of the paint manufacturer.
- e. Thoroughly clean previously painted surfaces specified to be repainted damaged during construction of all grease, dirt, dust or other foreign matter.

- f. Remove blistering, cracking, flaking and peeling or otherwise deteriorated coatings.
- g. Remove chalk so that when tested in accordance with ASTM D4214, the chalk resistance rating is no less than 8.
- h. Roughen slick surfaces. Repair damaged areas such as, but not limited to, nail holes, cracks, chips, and spalls with suitable material to match adjacent undamaged areas.
- i. Feather and sand smooth edges of chipped paint.
- j. Clean rusty metal surfaces as per SSPC requirements. Use solvent, mechanical, or chemical cleaning methods to provide surfaces suitable for painting.
- k. Provide new, proposed coatings that are compatible with existing coatings.

### 3.3.2 Existing Coated Surfaces with Minor Defects

Sand, spackle, and treat minor defects to render them smooth. Minor defects are defined as scratches, nicks, cracks, gouges, spalls, alligating, chalking, and irregularities due to partial peeling of previous coatings. Remove chalking by sanding so that when tested in accordance with ASTM D4214, the chalk rating is not less than 8.

### 3.3.3 Removal of Existing Coatings

Remove existing coatings from the following surfaces:

- a. Surfaces containing large areas of minor defects;
- b. Surfaces containing more than 20 percent peeling area; and
- c. Surfaces designated by the Contracting Officer, such as surfaces where rust shows through existing coatings.

### 3.3.4 Substrate Repair

- a. Repair substrate surface damaged during coating removal;
- b. Sand edges of adjacent soundly-adhered existing coatings so they are tapered as smooth as practical to areas involved with coating removal; and
- c. Clean and prime the substrate as specified.

## 3.4 PREPARATION OF METAL SURFACES

### 3.4.1 Existing and New Ferrous Surfaces

- a. Ferrous Surfaces including Shop-coated Surfaces and Small Areas That Contain Rust, Mill Scale and Other Foreign Substances: Solvent clean or detergent wash in accordance with SSPC SP 1 to remove oil and grease. Where shop coat is missing or damaged, clean according to SSPC SP 2, SSPC SP 3. Water jetting to SSPC SP 12/NACE No.5 WJ-4 may be used to remove loose coating and other loose materials. Use

inhibitor as recommended by coating manufacturer to prevent premature rusting. Protect shop-coated ferrous surfaces from corrosion by treating and touching up corroded areas immediately upon detection.

- b. Surfaces With More Than 20 Percent Rust, Mill Scale, and Other Foreign Substances: Clean entire surface in accordance with SSPC SP 12/NACE No.5 WJ-3.

#### 3.4.2 Final Ferrous Surface Condition:

For tool cleaned surfaces, the requirements are stated in SSPC SP 2 and SSPC SP 3. Use as a visual reference, photographs in SSPC VIS 3 for the appearance of cleaned surfaces.

For waterjet cleaned surfaces, the requirements are stated in SSPC SP 12/NACE No.5. Use as a visual reference, photographs in SSPC VIS 4/NACE VIS 7 for the appearance of cleaned surfaces.

#### 3.4.3 Galvanized Surfaces

- a. New or Existing Galvanized Surfaces With Only Dirt and Zinc Oxidation Products: Clean with solvent, steam, or non-alkaline detergent solution in accordance with SSPC SP 1. Completely remove coating by brush-off abrasive blast if the galvanized metal has been passivated or stabilized. Do not "passivate" or "stabilize" new galvanized steel to be coated. If the absence of hexavalent stain inhibitors is not documented, test as described in ASTM D6386, Appendix X2, and remove by one of the methods described therein.
- b. Galvanized with Slight Coating Deterioration or with Little or No Rusting: Water jetting to SSPC SP 12/NACE No.5 WJ3 to remove loose coating from surfaces with less than 20 percent coating deterioration and no blistering, peeling, or cracking. Use inhibitor as recommended by the coating manufacturer to prevent rusting.
- c. Galvanized With Severe Deteriorated Coating or Severe Rusting: Water jet to SSPC SP 12/NACE No.5 WJ3 degree of cleanliness.

#### 3.4.4 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.

#### 3.4.5 Terne-Coated Metal Surfaces

Solvent clean surfaces with mineral spirits, ASTM D235. Wipe dry with clean, dry cloths.

#### 3.4.6 Existing Surfaces with a Bituminous or Mastic-Type Coating

Remove chalk, mildew, and other loose material by washing with a solution of 1/2 cup trisodium phosphate, 1/4 cup household detergent, one quart 5 percent sodium hypochlorite solution and 3 quarts of warm water.

### 3.5 PREPARATION OF CONCRETE AND CEMENTITIOUS SURFACE

#### 3.5.1 Concrete and Masonry

- a. Curing: Allow concrete, stucco and masonry surfaces to cure at least 30 days before painting, and concrete slab on grade to cure at least 90 days before painting.
- b. Surface Cleaning: Remove the following deleterious substances.
  - (1) Dirt, Chalking, Grease, and Oil: Wash new and existing uncoated surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, and 4 quarts of warm water. Then rinse thoroughly with fresh water. Wash existing coated surfaces with a suitable detergent and rinse thoroughly. For large areas, water blasting may be used.
  - (2) Fungus and Mold: Wash new, existing coated, and existing uncoated surfaces with a solution composed of 1/2 cup trisodium phosphate, 1/4 cup household detergent, 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.
  - (5) Removal of Existing Coatings: For surfaces to receive textured coating MPI 42, remove existing coatings including soundly adhered coatings if recommended by textured coating manufacturer.
- c. Cosmetic Repair of Minor Defects: Repair or fill mortar joints and minor defects, including but not limited to spalls, in accordance with manufacturer's recommendations and prior to coating application.
- d. Allowable Moisture Content: Latex coatings may be applied to damp surfaces, but not to surfaces with droplets of water. Do not apply epoxies to damp vertical surfaces as determined by ASTM D4263 or horizontal surfaces that exceed 3 lbs of moisture per 1000 square feet in 24 hours as determined by ASTM F1869. In all cases follow manufacturers recommendations. Allow surfaces to cure a minimum of 30 days before painting.

#### 3.5.2 Gypsum Board, Plaster, and Stucco

- a. Surface Cleaning: Verify that plaster and stucco surfaces are free from loose matter and that gypsum board is dry. Remove loose dirt and dust by brushing with a soft brush, rubbing with a dry cloth, or vacuum-cleaning prior to application of the first coat material. A damp cloth or sponge may be used if paint will be water-based.
- b. Repair of Minor Defects: Prior to painting, repair joints, cracks, holes, surface irregularities, and other minor defects with patching plaster or spackling compound and sand smooth.

- c. Allowable Moisture Content: Latex coatings may be applied to damp surfaces, but not surfaces with droplets of water. Do not apply epoxies to damp surfaces as determined by ASTM D4263. Verify that new plaster to be coated has a maximum moisture content of 8 percent, when measured in accordance with ASTM D4444, Method A, unless otherwise authorized. In addition to moisture content requirements, allow new plaster to age a minimum of 30 days before preparation for painting.

### 3.5.3 Existing Asbestos Cement Surfaces

Remove oily stains by solvent cleaning with mineral spirits, ASTM D235. Remove loose dirt, dust, and other deleterious substances by brushing with a soft brush or rubbing with a dry cloth prior to application of the first coat material. Do not wire brush or clean using other abrasive methods. Verify surfaces are dry and clean prior to application of the coating.

### 3.6 PREPARATION OF WOOD AND PLYWOOD SURFACES

#### 3.6.1 New, Existing Uncoated, and Existing Coated Plywood and Wood Surfaces, Except Floors:

- a. Clean wood surfaces of foreign matter.

Surface Cleaning: Verify that surfaces are free from dust and other deleterious substances and in a condition approved by the Contracting Officer prior to receiving paint or other finish. Do not use water to clean uncoated wood. Scrape to remove loose coatings. Lightly sand to roughen the entire area of previously enamel-coated wood surfaces.

- b. Removal of Fungus and Mold: Wash existing coated surfaces with a solution composed of 3 ounces (2/3 cup) trisodium phosphate, 1 ounce (1/3 cup) household detergent, 1 quart 5 percent sodium hypochlorite solution and 3 quarts of warm water. Rinse thoroughly with fresh water.
- c. Do not exceed 12 percent moisture content of the wood as measured by a moisture meter in accordance with ASTM D4444, Method A, unless otherwise authorized.
- d. Prime or touch up wood surfaces adjacent to surfaces to receive water-thinned paints before applying water-thinned paints.
- e. Cracks and Nailheads: Set and putty stop nailheads and putty cracks after the prime coat has dried.
- f. Cosmetic Repair of Minor Defects:
  - (1) Knots and Resinous Wood and Fire, Smoke, Water, and Color Marker Stained Existing Coated Surface: Prior to application of coating, cover knots and stains with two or more coats of 3-pound-cut shellac varnish, plasticized with 5 ounces of castor oil per gallon. Scrape away existing coatings from knotty areas, and sand before treating. Prime before applying any putty over shellacked area.
  - (2) Open Joints and Other Openings: Fill with whiting putty, linseed oil putty. Sand smooth after putty has dried.
  - (3) Checking: Where checking of the wood is present, sand the

surface, wipe and apply a coat of pigmented orange shellac. Allow to dry before paint is applied.

- g. Prime Coat For New Exterior Surfaces: Prime coat wood doors, windows, frames, and trim before wood becomes dirty, warped, or weathered.

### 3.6.2 Interior Wood Surfaces, Stain Finish

Sand interior wood surfaces to receive stain. Fill oak and other open-grain wood to receive stain with a coat of wood filler not less than 8 hours before the application of stain; remove excess filler and sand the surface smooth.

## 3.7 APPLICATION

### 3.7.1 Coating Application

Comply with applicable federal, state and local laws enacted to insure compliance with Federal Clean Air Standards. Apply coating materials in accordance with SSPC PA 1. SSPC PA 1 methods are applicable to all substrates, except as modified herein.

At the time of application, paint must show no signs of deterioration. Maintain uniform suspension of pigments during application.

Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. Use trigger operated spray nozzles for water hoses. Use rollers for applying paints and enamels of a type designed for the coating to be applied and the surface to be coated. Wear protective clothing and respirators when applying oil-based paints or using spray equipment with any paints.

Only apply paints, except water-thinned types to surfaces that are completely free of moisture as determined by sight or touch.

Thoroughly work coating materials into joints, crevices, and open spaces. Pay special attention to ensure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces.

Apply each coat of paint so that dry film is of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Completely hide all blemishes.

Touch up damaged coatings before applying subsequent coats. Broom clean and clear dust from interior areas before and during the application of coating material.

Apply paint to new fire extinguishing sprinkler systems including valves, piping, conduit, hangers, supports, miscellaneous metal work, and accessories. Shield sprinkler heads with protective coverings while painting is in progress. Remove sprinkler heads which have been painted and replace with new sprinkler heads. For piping in unfinished spaces, provide primed surfaces with one coat of red alkyd gloss enamel to a minimum dry film thickness of 1.0 mil. Unfinished spaces include attic spaces, spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and space where walls or ceiling are not painted or not constructed of a prefinished material. For piping in

finished areas, provide prime surfaces with two coats of paint to match adjacent surfaces, except provide valves and operating accessories with one coat of red alkyd gloss enamel. Upon completion of painting, remove protective covering from sprinkler heads.

- a. Drying Time: Allow time between coats, as recommended by the coating manufacturer, to permit thorough drying, but not to present topcoat adhesion problems. Provide each coat in specified condition to receive next coat.
- b. Primers, and Intermediate Coats: Do not allow primers or intermediate coats to dry more than 30 days, or longer than recommended by manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if primers or intermediate coats are allowed to dry longer than recommended by manufacturers of subsequent coatings. Cover each preceding coat or surface completely by ensuring visually perceptible difference in shades of successive coats.
- c. Finished Surfaces: Provide finished surfaces free from runs, drops, ridges, waves, laps, brush marks, and variations in colors.
- d. Thermosetting Paints: Topcoats over thermosetting paints (epoxies and urethanes) should be applied within the overcoating window recommended by the manufacturer.

### 3.7.2 Mixing and Thinning of Paints

Reduce paints to proper consistency by adding fresh paint, except when thinning is mandatory to suit surface, temperature, weather conditions, application methods, or for the type of paint being used. Obtain written permission from the Contracting Officer to use thinners. Verify that the written permission includes quantities and types of thinners to use.

When thinning is allowed, thin paints immediately prior to application with not more than 1 pint of suitable thinner per gallon. The use of thinner does not relieve the Contractor from obtaining complete hiding, full film thickness, or required gloss. Thinning cannot cause the paint to exceed limits on volatile organic compounds. Do not mix paints of different manufacturers.

### 3.7.3 Two-Component Systems

Mix two-component systems in accordance with manufacturer's instructions. Follow recommendation by the manufacturer for any thinning of the first coat to ensure proper penetration and sealing for each type of substrate.

### 3.7.4 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

Table

Division 9: Exterior Stucco Paint Table  
Division 10. Exterior Cloth Coverings and Bituminous Coated  
Surfaces Paint Table

Division 3. Interior Concrete Paint Table  
Division 4. Interior Concrete Masonry Units Paint Table  
Division 5. Interior Metal, Ferrous and Non-Ferrous Paint Table  
Division 6. Interior Wood Paint Table  
Division 9: Interior Plaster, Gypsum Board, Textured Surfaces  
Paint Table

- b. Minimum Dry Film Thickness (DFT): Apply paints, primers, varnishes, enamels, undercoats, and other coatings to a minimum dry film thickness of 1.5 mil each coat unless specified otherwise in the Tables. Coating thickness where specified, refers to the minimum dry film thickness.
- c. Coatings for Surfaces Not Specified Otherwise: Coat surfaces which have not been specified, the same as surfaces having similar conditions of exposure.
- d. Existing Surfaces Damaged During Performance of the Work, Including New Patches In Existing Surfaces: Coat surfaces with the following:
  - (1) One coat of primer.
  - (2) One coat of undercoat or intermediate coat.
  - (3) One topcoat to match adjacent surfaces.
- e. Existing Coated Surfaces To Be Painted: Apply coatings conforming to the respective specifications listed in the Tables herein, except that pretreatments, sealers and fillers need not be provided on surfaces where existing coatings are soundly adhered and in good condition. Do not omit undercoats or primers.

3.8 COATING SYSTEMS FOR METAL

Apply coatings of Tables in Division 5 for Exterior and Interior.

- a. Apply specified ferrous metal primer on the same day that surface is cleaned, to surfaces that meet all specified surface preparation requirements at time of application.
- b. Inaccessible Surfaces: Prior to erection, use one coat of specified primer on metal surfaces that will be inaccessible after erection.
- c. Shop-primed Surfaces: Touch up exposed substrates and damaged coatings to protect from rusting prior to applying field primer.
- d. Surface Previously Coated with Epoxy or Urethane: Apply MPI 101, 1.5 mils DFT immediately prior to application of epoxy or urethane coatings.
- e. Pipes and Tubing: The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat. Overcoat these items with the specified ferrous-metal primer prior to application of finish coats.

- f. Exposed Nails, Screws, Fasteners, and Miscellaneous Ferrous Surfaces. On surfaces to be coated with water thinned coatings, spot prime exposed nails and other ferrous metal with latex primer MPI 107.

### 3.9 COATING SYSTEMS FOR CONCRETE AND CEMENTITIOUS SUBSTRATES

Apply coatings of Tables in Division 3, 4 and 9 for Exterior and Interior.

### 3.10 COATING SYSTEMS FOR WOOD AND PLYWOOD

- a. Apply coatings of Tables in Division 6 for Exterior and Interior.
- b. Prior to erection, apply two coats of specified primer to treat and prime wood and plywood surfaces which will be inaccessible after erection.
- c. Apply stains in accordance with manufacturer's printed instructions.

### 3.11 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.

### 3.13 PAINT TABLES

All DFT's are minimum values. Acceptable products are listed in the MPI Green Approved Products List, available at <http://www.specifygreen.com/APL/ProductIdxByMPInum.asp>.

#### 3.13.1 Exterior Paint Tables

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) Existing; MPI REX 5.1D-G5  
Primer: Intermediate: Topcoat:  
MPI 23 MPI 94 MPI 94  
System DFT: 5.25 mils

STEEL / FERROUS SURFACES

New; MPI EXT 5.1Q-G6 (Gloss) / Existing; MPI REX 5.1D-G6  
Primer: Intermediate: Topcoat:  
MPI 23 MPI 9 MPI 9  
System DFT: 5.25 mils

B. New Steel that has been blast-cleaned to SSPC SP 6/NACE No.3:

2. Alkyd

New; MPI EXT 5.1D-G5 (Semigloss) / Existing; MPI REX 5.1D-G5  
Primer: Intermediate: Topcoat:  
MPI 79 MPI 94 MPI 94  
System DFT: 5.25 mils

New; MPI EXT 5.1D-G6 (Gloss) / Existing; MPI REX 5.1D-G6  
Primer: Intermediate: Topcoat:  
MPI 79 MPI 9 MPI 9  
System DFT: 5.25 mils

C. Existing steel that has been spot-blasted to SSPC SP 6/NACE No.3:

1. Surface previously coated with alkyd or latex:

Waterborne Light Industrial Coating  
MPI REX 5.1C-G5 (Semigloss)  
Spot Primer: Intermediate: Topcoat:  
MPI 79 MPI 163 MPI 163  
System DFT: 5 mils

MPI REX 5.1C-G6 (Gloss)  
Spot Primer: Intermediate: Topcoat:  
MPI 79 MPI 164 MPI 164  
System DFT: 5 mils

2. Surface previously coated with epoxy:

Waterborne Light Industrial  
a. MPI REX 5.1L-G5 (Semigloss)  
Spot Primer: Intermediate: Topcoat:  
MPI 101 MPI 163 MPI 163  
System DFT: 5 mils

D. New and existing steel blast cleaned to SSPC SP 10/NACE No. 2:

1. Waterborne Light Industrial

MPI EXT 5.1R-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 101 MPI 108 MPI 163  
System DFT: 8.5 mils

MPI EXT 5.1R-G6 (Gloss)  
Primer: Intermediate: Topcoat:  
MPI 101 MPI 108 MPI 164  
System DFT: 8.5 mils

2. Pigmented Polyurethane

MPI EXT 5.1J-G6 (Gloss)  
Primer: Intermediate: Topcoat:  
MPI 101 MPI 108 MPI 72

STEEL / FERROUS SURFACES  
System DFT: 8.5 mils

E. Metal floors (non-shop-primed surfaces or non-slip deck surfaces) with non-skid additive (NSA), load at manufacturer's recommendations.:

1. Alkyd Floor Enamel  
MPI EXT 5.1S-G6 (Gloss)  
Primer: Intermediate: Topcoat:  
MPI 79 MPI 27 MPI 27 (plus NSA)  
System DFT: 5.25 mils

EXTERIOR SURFACES, OTHER METALS (NON-FERROUS)

I. Aluminum, aluminum alloy and other miscellaneous non-ferrous metal items not otherwise specified except hot metal surfaces, roof surfaces, and new prefinished equipment. Match surrounding finish:

1. Alkyd  
MPI EXT 5.4F-G1 (Flat)  
Primer: Intermediate: Topcoat:  
MPI 95 MPI 8 MPI 8  
System DFT: 5 mils

MPI EXT 5.4F-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 95 MPI 94 MPI 94  
System DFT: 5 mils

MPI EXT 5.4F-G6 (Gloss)  
Primer: Intermediate: Topcoat:  
MPI 95 MPI 9 MPI 9  
System DFT: 5 mils

2. Waterborne Light Industrial Coating  
MPI EXT 5.4G-G3(Eggshell)  
Primer: Intermediate: Topcoat:  
MPI 95 MPI 161 MPI 161  
System DFT: 5 mils

MPI EXT 5.4G-G5(Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 95 MPI 163 MPI 163  
System DFT: 5 mils

MPI EXT 5.4G-G6(Gloss)  
Primer: Intermediate: Topcoat:  
MPI 95 MPI 164 MPI 164  
System DFT: 5 mils

I. Existing roof surfaces previously coated:

1. Aluminum Pigmented Asphalt Roof Coating  
ASTM D2824/D2824M: Sufficient coats to provide not less than 8 mils of finished coating system (without asbestos fibers).

2. Aluminum Paint  
MPI REX 10.2D  
Primer: Intermediate: Topcoat:

EXTERIOR SURFACES, OTHER METALS (NON-FERROUS)

MPI 107 MPI 1 MPI 1  
System DFT: 3.5 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. Alkyd

MPI EXT 5.1D-G1 (Flat)  
Primer: Intermediate: Topcoat:  
MPI 79 MPI 8 MPI 8  
System DFT: 5.25 mils

MPI EXT 5.1D-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 79 MPI 94 MPI 94  
System DFT: 5.25 mils

MPI EXT 5.1D-G6 (Gloss)  
Primer: Intermediate: Topcoat:  
MPI 79 MPI 9 MPI 9  
System DFT: 5.25 mils

2. Waterborne Light Industrial Coating

MPI EXT 5.1C-G3(Eggshell)  
Primer: Intermediate: Topcoat:  
MPI 79 MPI 161 MPI 161  
System DFT: 5 mils

MPI EXT 5.1C-G5(Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 79 MPI 163 MPI 163  
System DFT: 5 mils

MPI EXT 5.1C-G6(Gloss)  
Primer: Intermediate: Topcoat:  
MPI 79 MPI 164 MPI 164  
System DFT: 5 mils

3.13.2 Interior Paint Tables

DIVISION 3: INTERIOR CONCRETE PAINT TABLE

A. New and uncoated existing and Existing, previously painted Concrete, vertical surfaces, not specified otherwise:

1. Latex

New; MPI INT 3.1A-G2 (Flat) / Existing; MPI RIN 3.1A-G2 (Flat)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 44 MPI 44  
System DFT: 4 mils

New; MPI INT 3.1A-G3 (Eggshell) / Existing; MPI RIN 3.1A-G3 (Eggshell)  
Primer: Intermediate: Topcoat:

DIVISION 3: INTERIOR CONCRETE PAINT TABLE

MPI 50 MPI 52 MPI 52  
System DFT: 4 mils

New; MPI INT 3.1A-G5 (Semigloss) / Existing; MPI RIN 3.1A-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 54 MPI 54  
System DFT: 4 mils

2. High Performance Architectural Latex

New; MPI INT 3.1C-G2 (Flat) / Existing; MPI RIN 3.1J-G2 (Flat)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 138 MPI 138  
System DFT: 4 mils

New; MPI INT 3.1C-G3 (Eggshell) / Existing; MPI RIN 3.1J-G3 (Eggshell)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 139 MPI 139  
System DFT: 4 mils

New; MPI INT 3.1C-G4 (satin)/ Existing; MPI RIN 3.1J-G4  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 140 MPI 140  
System DFT: 4 mils

New; MPI INT 3.1C-G5 (Semigloss) / Existing; MPI RIN 3.1J-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 141 MPI 141  
System DFT: 4 mils

3. Institutional Low Odor / Low VOC Latex

New; MPI INT 3.1M-G2 (Flat) / Existing; MPI RIN 3.1L-G2 (Flat)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 144 MPI 144  
System DFT: 4 mils

New; MPI INT 3.1M-G3 (Eggshell) / Existing; MPI RIN 3.1L-G3 (Eggshell)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 145 MPI 145  
System DFT: 4 mils

New; MPI INT 3.1M-G4 (satin)/ Existing; MPI RIN 3.1L-G4  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 146 MPI 146  
System DFT: 4 mils

New; MPI INT 3.1M-G5 (Semigloss) / Existing; MPI RIN 3.1L-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 147 MPI 147  
System DFT: 4 mils

C. New and uncoated existing and Existing, previously painted Concrete in toilets, food-preparation, food-serving, restrooms, shower areas, areas requiring a high degree of sanitation, and other high-humidity areas not otherwise specified except floors:

1. Waterborne Light Industrial Coating

New; MPI INT 3.1L-G3(Eggshell) / Existing; MPI RIN 3.1C-G3(Eggshell)  
Primer: Intermediate: Topcoat:

DIVISION 3: INTERIOR CONCRETE PAINT TABLE

MPI 151 MPI 151 MPI 151  
System DFT: 4.8 mils

New; MPI INT 3.1L-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 153 MPI 153 MPI 153  
System DFT: 4.8 mils

New; MPI INT 3.1L-G6 (Gloss)  
Primer: Intermediate: Topcoat:  
MPI 154 MPI 154 MPI 154  
System DFT: 4.8 mils

2. Alkyd

New; MPI INT 3.1D-G3 (Eggshell)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 51 MPI 51  
System DFT: 4.5 mils

MPI INT 3.1D-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 47 MPI 47  
System DFT: 4.5 mils

MPI INT 3.1D-G6 (Gloss)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 48 MPI 48  
System DFT: 4.5 mils

E. New and uncoated existing and Existing, previously painted concrete floors in following areas unit storage, unit storage receiving, and storage areas:

DIVISION 5: INTERIOR METAL, FERROUS AND NON-FERROUS PAINT TABLE

INTERIOR STEEL / FERROUS SURFACES

A. Metal, Mechanical, Electrical, Fire extinguishing sprinkler systems including valves, conduit, hangers, supports, Surfaces adjacent to painted surfaces (Match surrounding finish), exposed copper piping, and miscellaneous metal items not otherwise specified except floors, hot metal surfaces, and new prefinished equipment:

1. High Performance Architectural Latex

MPI INT 5.1R-G2 (Flat)  
Primer: Intermediate: Topcoat:  
MPI 79 MPI 138 MPI 138  
System DFT: 5 mils

MPI INT 5.1R-G3 (Eggshell)  
Primer: Intermediate: Topcoat:  
MPI 79 MPI 139 MPI 139  
System DFT: 5 mils

MPI INT 5.1R-G5 (Semigloss)  
Primer: Intermediate: Topcoat:

INTERIOR STEEL / FERROUS SURFACES

MPI 79 MPI 141 MPI 141  
System DFT: 5 mils

2. Alkyd

MPI INT 5.1E-G2 (Flat)  
Primer: Intermediate: Topcoat:  
MPI 79 MPI 49 MPI 49  
System DFT: 5.25 mils

MPI INT 5.1E-G3 (Eggshell)  
Primer: Intermediate: Topcoat:  
MPI 79 MPI 51 MPI 51  
System DFT: 5.25 mils

MPI INT 5.1E-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 79 MPI 47 MPI 47  
System DFT: 5.25 mils

MPI INT 5.1E-G6 (Gloss)  
Primer: Intermediate: Topcoat:  
MPI 79 MPI 48 MPI 48  
System DFT: 5.25 mils

B. Metal in toilets, food-preparation, food-serving, restrooms,  
shower areas, areas requiring a high degree of sanitation, and other  
high-humidity areas not otherwise specified except floors, hot metal  
surfaces, and new prefinished equipment:

1. Alkyd

MPI INT 5.1E-G3 (Eggshell)  
Primer: Intermediate: Topcoat:  
MPI 79 MPI 51 MPI 51  
System DFT: 5.25 mils

MPI INT 5.1E-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 79 MPI 47 MPI 47  
System DFT: 5.25 mils

MPI INT 5.1E-G6 (Gloss)  
Primer: Intermediate: Topcoat:  
MPI 79 MPI 48 MPI 48  
System DFT: 5.25 mils

2. Alkyd

MPI INT 5.1T-G3 (Eggshell) For hand tool cleaning  
Primer: Intermediate: Topcoat:  
MPI 23 MPI 51 MPI 51  
System DFT: 5.25 mils

MPI INT 5.1T-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 23 MPI 47 MPI 47  
System DFT: 5.25 mils

MPI INT 5.1T-G6 (Gloss)

INTERIOR STEEL / FERROUS SURFACES

Primer:	Intermediate:	Topcoat:
MPI 23	MPI 48	MPI 48
System DFT:	5.25 mils	

D. Ferrous metal in concealed damp spaces or in exposed areas having unpainted adjacent surfaces as follows:

1. Aluminum Paint

MPI INT 5.1M		
Primer:	Intermediate:	Topcoat:
MPI 79	MPI 1	MPI 1
System DFT:	4.25 mils	

E. 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

INTERIOR STEEL / FERROUS SURFACES

System DFT: 5 mils

DIVISION 6: INTERIOR WOOD PAINT TABLE

A. New and Existing, uncoated Wood and plywood not otherwise specified:

1. High Performance Architectural Latex

MPI INT 6.4S-G3 (Eggshell)

Primer:	Intermediate:	Topcoat:
MPI 39	MPI 139	MPI 139
System DFT:	4.5 mils	

MPI INT 6.4S-G4 (Satin)

Primer:	Intermediate:	Topcoat:
MPI 39	MPI 140	MPI 140
System DFT:	4.5 mils	

MPI INT 6.4S-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 39	MPI 141	MPI 141
System DFT:	4.5 mils	

2. Alkyd

MPI INT 6.4B-G3 (Eggshell)

Primer:	Intermediate:	Topcoat:
MPI 45	MPI 51	MPI 51
System DFT:	4.5 mils	

MPI INT 6.4B-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
MPI 45	MPI 47	MPI 47
System DFT:	4.5 mils	

MPI INT 6.4B-G6 (Gloss)

Primer:	Intermediate:	Topcoat:
MPI 45	MPI 48	MPI 48
System DFT:	4.5 mils	

3. Institutional Low Odor / Low VOC Latex

New; MPI INT 6.3V-G2 (Flat)

Primer:	Intermediate:	Topcoat:
MPI 39	MPI 144	MPI 144
System DFT:	4 mils	

New; MPI INT 6.3V-G3 (Eggshell)

Primer:	Intermediate:	Topcoat:
MPI 39	MPI 145	MPI 145
System DFT:	4 mils	

New; MPI INT 6.3V-G4

Primer:	Intermediate:	Topcoat:
MPI 39	MPI 146	MPI 146
System DFT:	4 mils	

New; MPI INT 6.3V-G5 (Semigloss)

Primer:	Intermediate:	Topcoat:
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DIVISION 6: INTERIOR WOOD PAINT TABLE  
MPI 39 MPI 147 MPI 147  
System DFT: 4 mils

B. Existing, previously painted Wood and plywood not otherwise specified:

1. High Performance Architectural Latex

MPI RIN 6.4B-G3 (Eggshell)  
Primer: Intermediate: Topcoat:  
MPI 46 MPI 139 MPI 139  
System DFT: 4.5 mils

MPI RIN 6.4B-G4 (Satin)  
Primer: Intermediate: Topcoat:  
MPI 46 MPI 140 MPI 140  
System DFT: 4.5 mils

MPI RIN 6.4B-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 46 MPI 141 MPI 141  
System DFT: 4.5 mils

2. Alkyd

MPI RIN 6.4C-G3 (Eggshell)  
Primer: Intermediate: Topcoat:  
MPI 46 MPI 51 MPI 51  
System DFT: 4.5 mils

MPI RIN 6.4C-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 46 MPI 47 MPI 47  
System DFT: 4.5 mils

MPI RIN 6.4C-G6 (Gloss)  
Primer: Intermediate: Topcoat:  
MPI 46 MPI 48 MPI 48  
System DFT: 4.5 mils

3. Institutional Low Odor / Low VOC Latex

Existing; MPI RIN 6.4D-G2 (Flat)  
Primer: Intermediate: Topcoat:  
MPI 39 MPI 144 MPI 144  
System DFT: 4 mils

Existing; MPI RIN 6.4D-G3 (Eggshell)  
Primer: Intermediate: Topcoat:  
MPI 39 MPI 145 MPI 145  
System DFT: 4 mils

Existing; MPI RIN 6.4D-G4  
Primer: Intermediate: Topcoat:  
MPI 39 MPI 146 MPI 146  
System DFT: 4 mils

Existing; MPI RIN 6.4D-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 39 MPI 147 MPI 147  
System DFT: 4 mils

DIVISION 6: INTERIOR WOOD PAINT TABLE  
F.

1. Waterborne Light Industrial  
MPI INT 6.3P-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 45 MPI 153 MPI 153  
System DFT: 4.5 mils  
  
MPI INT 6.3P-G6 (Gloss)  
Primer: Intermediate: Topcoat:  
MPI 45 MPI 154 MPI 154  
System DFT: 4.5 mils
2. Alkyd  
MPI INT 6.3B-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 45 MPI 47 MPI 47  
System DFT: 4.5 mils  
  
MPI INT 6.3B-G6 (Gloss)  
Primer: Intermediate: Topcoat:  
MPI 45 MPI 48 MPI 48  
System DFT: 4.5 mils

G. Existing, previously painted wood surfaces in toilets,  
food-preparation, food-serving, restrooms, laundry areas, shower  
areas, areas requiring a high degree of sanitation, and  
other high humidity areas not otherwise specified:

1. Waterborne Light Industrial Coating  
MPI RIN 6.3P-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 46 MPI 153 MPI 153  
System DFT: 4.5 mils  
  
MPI RIN 6.3P-G6 (Gloss)  
Primer: Intermediate: Topcoat:  
MPI 46 MPI 154 MPI 154  
System DFT: 4.5 mils
3. Alkyd  
MPI RIN 6.3B-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 46 MPI 47 MPI 47  
System DFT: 4.5 mils  
  
MPI RIN 6.3B-G6 (Gloss)  
Primer: Intermediate: Topcoat:  
MPI 46 MPI 48 MPI 48  
System DFT: 4.5 mils

DIVISION 9: INTERIOR PLASTER, GYPSUM BOARD, TEXTURED SURFACES PAINT  
TABLE

A. New and Existing, previously painted Plaster and Wallboard not otherwise  
specified:

DIVISION 9: INTERIOR PLASTER, GYPSUM BOARD, TEXTURED SURFACES PAINT TABLE

1. Latex

New; MPI INT 9.2A-G2 (Flat) / Existing; RIN 9.2A-G2 (Flat)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 44 MPI 44  
System DFT: 4 mils

New; MPI INT 9.2A-G3 (Eggshell) / Existing; RIN 9.2A-G3 (Eggshell)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 52 MPI 52  
System DFT: 4 mils

New; MPI INT 9.2A-G5 (Semigloss) / Existing; RIN 9.2A-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 54 MPI 54  
System DFT: 4 mils

2. High Performance Architectural Latex - High Traffic Areas

New; MPI INT 9.2B-G2 (Flat) / Existing; MPI RIN 9.2B-G2 (Flat)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 138 MPI 138  
System DFT: 4 mils

New; MPI INT 9.2B-G3 (Eggshell) / Existing; MPI RIN 9.2B-G3 (Eggshell)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 139 MPI 139  
System DFT: 4 mils

New; MPI INT 9.2B-G5 (Semigloss) / Existing; MPI RIN 9.2B-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 141 MPI 141  
System DFT: 4 mils

3. Institutional Low Odor / Low VOC Latex

New; MPI INT 9.2M-G2 (Flat) / Existing; MPI RIN 9.2M-G2 (Flat)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 144 MPI 144  
System DFT: 4 mils

New; MPI INT 9.2M-G3 (Eggshell) / Existing; MPI RIN 9.2M-G3 (Eggshell)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 145 MPI 145  
System DFT: 4 mils

New; MPI INT 9.2M-G4 (Satin) / Existing; MPI RIN 9.2M-G4 (Satin)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 146 MPI 146  
System DFT: 4 mils

New; MPI INT 9.2M-G5 (Semigloss) / Existing; MPI RIN 9.2M-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 147 MPI 147  
System DFT: 4 mils

B. New and Existing, previously painted Plaster and Wallboard in toilets, food-preparation, food-serving, restrooms, laundry areas, shower areas, areas requiring a high degree of sanitation, and other high humidity areas not otherwise specified.:

DIVISION 9: INTERIOR PLASTER, GYPSUM BOARD, TEXTURED SURFACES PAINT TABLE

1. Waterborne Light Industrial Coating

New; MPI INT 9.2L-G5 (Semigloss) / Existing; MPI RIN 9.2L-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 153 MPI 153  
System DFT: 4 mils

2. Alkyd

New; MPI INT 9.2C-G5 (Semigloss) / Existing; MPI RIN 9.2C-G5 (Semigloss)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 47 MPI 47  
System DFT: 4 mils

3. Epoxy

New; MPI INT 9.2E-G6 (Gloss) / Existing; MPI RIN 9.2D-G6 (Gloss)  
Primer: Intermediate: Topcoat:  
MPI 50 MPI 77 MPI 77  
System DFT: 4 mils

-- End of Section --

SECTION 10 11 00

VISUAL DISPLAY UNITS  
08/17

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM B221	(2014) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM F148	(2013) Binder Durability of Cork Composition Gasket Materials
ASTM F152	(1995; R 2009) Tension Testing of Nonmetallic Gasket Materials

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH (CDPH)

CDPH SECTION 01350	(2010; Version 1.1) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers
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SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	SCS Global Services (SCS) Indoor Advantage
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UNDERWRITERS LABORATORIES (UL)

UL 2818	(2013) GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings
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1.2 DEFINITIONS OR ADMINISTRATIVE REQUIREMENTS

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 must 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 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When

used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-03 Product Data

Visual Display Board; G

Projection Screen; G

SD-04 Samples

Aluminum; G

Porcelain Enamel; G

Materials; G

SD-07 Certificates

Indoor air quality for markerboards; S

Indoor air quality for tackboards; S

Indoor air quality for projection screen; S

1.4 CERTIFICATIONS

1.4.1 Indoor Air Quality

1.4.1.1 Indoor Air Quality for Visual Display Products

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party program that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

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 must 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 must 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 must 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 must 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 must be free from streaks, spots, cracks or other imperfections that would impair its usefulness or appearance. The material must be seasoned, and a clean cut made not less than 1/2 inch from the edge must 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 must be colored throughout and must be washable. The burlap backing must be deeply imbedded and keyed to the work sheet being partially concealed in it and meeting the requirements of ASTM F148.

##### 2.1.2.2 Natural Cork

Material must be a single layer of pure grain natural cork without backing or facing. The color must be light tan. The cork sheet must have a tensile strength of not less than 40 psi when tested in accordance with ASTM F152.

#### 2.1.3 Aluminum

Aluminum frame extrusions must be alloy 6063-T5 or 6063-T6, conform to ASTM B221, and be a minimum 0.06 inches thick. Exposed aluminum must have an anodized, satin finish. Straight, single lengths must be used wherever possible. Joints must be kept to a minimum. Corners must be mitered and must have a hairline closure. Submit sections of frame, map rail, and chalktray, and two map hooks.

#### 2.1.4 Hardwood

Exposed hardwood for frames, cabinets, and cases must be oak, walnut or mahogany. Provide hardwood with a durable factory-applied stain and lacquer finish of a type standard with the manufacturer.

## 2.2 MARKERBOARD

Markerboard must have a porcelain enamel writing surface and a chalktray. Markerboard must be a factory assembled unit complete in one piece, without joints whenever possible. When markerboard dimensions require delivery in separate sections, components must be prefit at the factory, disassembled for delivery and jointed at the site. Frame must be aluminum. Chalktray must be the same material as the frame and extend the full length of the liquid markerboard. The markerboard must have a map rail. The map rail with a tackable insert must extend the full length of the liquid chalkboard, and must have map hooks with clips for holding sheets of paper. Two map hooks must be provided for each 4 foot of map rail. Dry erase markings must be removable with a felt eraser or dry cloth without ghosting. Each unit must come complete with an eraser and four different color compatible dry erase markers. The size must be as shown in the drawings. Provide markerboards that meet the emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type).

Provide certification or validation of indoor air quality for markerboards.

## 2.3 TACKBOARDS

Provide tackboards that meet the emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type). Provide certification or validation of indoor air quality for tackboards.

### 2.3.1 Cork

Tackboard must consist of a minimum 1/8 inch thick colored cork with burlap backing laminated to a minimum 3/8 inch thick insulation board or fiber board 1/4 inch thick colored cork with burlap backing laminated to a minimum 1/4 inch thick hardboard.

## 2.4 PROJECTION SCREEN

Ceiling mounted motorized projection screen must have 120V motor that is lubricated for life, quick reversal type, has overload protector, integral gears, and preset accessible limit switches. Recessed mount projection screens must have an operable closure door and access panel. Screen must be flame retardant, mildew resistant, and glass beaded white matte with white masking borders tab tensioned. Tab tensioned screens must have a vinyl surface that is stretchable. Bottom of screen fabric must be weighted with metal rod. Roller must be a rigid metal at least 3 inches in diameter mounted on sound absorbing supports. Motor will be motor-in-roller design. Screen must have a 3 position control switch to stop or reverse screen at any point. The switch must be installed in a flush electrical box with cover plate, location(s) as shown on the electrical drawings. All conduit and wiring from the control switch to the projection screen must be furnished and installed by the Contractor. Ceiling recessed case must be extruded aluminum. Wall Ceiling mounted case must be aluminum. Screen must be UL listed. The size must be as shown in the drawings. Provide projection screens that meet the emissions requirements of CDPH SECTION 01350 (limit requirements for either office or classroom spaces regardless of space type).

Provide certification or validation of indoor air quality for projection screens.

## 2.5 COLOR

Finish colors for required items must be as indicated on drawings.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Do not install items that show visual evidence of biological growth. Perform installation and assembly in accordance with manufacturer's printed instructions. Use concealed fasteners. Visual display boards must 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 must not be initiated until completion of room painting and finishing operations. Visual display boards must be installed in locations and at mounting heights indicated. Visual display boards must be installed level and plumb, and if applicable doors must be aligned and hardware must be adjusted. Damaged units must be repaired or replaced as directed by the Contracting Officer.

### 3.2 CLEANING

Writing surfaces must be cleaned in accordance with manufacturer's instructions.

-- End of Section --

SECTION 10 14 00.10

EXTERIOR SIGNAGE  
08/17

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WELDING SOCIETY (AWS)

- |                |  |
|----------------|--|
| AWS C1.1M/C1.1 | (2012) Recommended Practices for Resistance Welding                  |
| AWS D1.1/D1.1M | (2015; Errata 1 2015; Errata 2 2016) Structural Welding Code - Steel |

ASTM INTERNATIONAL (ASTM)

- |                 |   |
|-----------------|---|
| ASTM A123/A123M | (2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products   |
| ASTM A653/A653M | (2017) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process |
| ASTM A924/A924M | (2017a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process                         |
| ASTM B108/B108M | (2015) 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   | (2014; E 2015) Standard Specification for Aluminum-Alloy Sand Castings  |

1.2 GENERAL REQUIREMENTS

All exterior signage must be provided by a single manufacturer. Exterior signage must be of the design, detail, sizes, types, and message content shown on the drawings, must conform to the requirements specified, and must be provided at the locations indicated. Submit exterior signage schedule in electronic media with spread sheet format. Spread sheet must include sign location, sign type, and message. Signs must be complete

with lettering, framing as detailed, and related components for a complete installation. Each sample must consist of a complete sign panel with letters and symbols. Samples may be installed in the work, provided each sample is identified and location recorded. Submit three color samples for each material requiring color and 12 inch square sample of sign face color sample.

#### 1.2.1 Wind Load Requirements

Exterior signage must be designed to withstand 90 mph windload. 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 must have a width-to-height ratio between 3:5 and 1:1 and a stroke-width-to-height ratio between 1:5 and 1:10. Characters and numbers on indicated signs must be sized according to the viewing distance from which they are to be read. The minimum height is measured using an upper case letter "X". Lower case characters are permitted.

#### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

##### SD-02 Shop Drawings

Approved Detail Drawings; G

##### SD-03 Product Data

Installation

Exterior Signage; G

Wind Load Requirements

##### SD-04 Samples

Exterior Signage; G

##### SD-10 Operation and Maintenance Data

Protection and Cleaning; G

#### 1.4 QUALIFICATIONS

Signs, plaques, and dimensional letters must be the standard product of a manufacturer regularly engaged in the manufacture of the products. Items of equipment must essentially duplicate equipment that has been in satisfactory use at least 2 years prior to bid opening.

## 1.5 DELIVERY AND STORAGE

Materials must be wrapped for shipment and storage, delivered to the jobsite in manufacturer's original packaging, and stored in a clean, dry area in accordance with manufacturer's instructions.

## 1.6 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one year period must be provided.

## PART 2 PRODUCTS

### 2.1 GRAPHICS FOR EXTERIOR SIGNAGE SYSTEMS

#### 2.1.1 Graphics

Signage graphics must conform to the following:

Message must be applied to panel using the silkscreen process. Silkscreened images must be executed with photo screens prepared from original art. Handcut screens will not be accepted. Original art must be defined as artwork that is a first generation pattern of the original specified art. Edges and corners must be clean. Rounded corners, cut or ragged edges, edge buildup, bleeding or surfaces pinholes will not be accepted.

#### 2.1.2 Messages

See drawings and schedule for message content. Typeface: Helvetica medium. Type size as indicated on drawing.

### 2.2 DIMENSIONAL BUILDING LETTERS

#### 2.2.1 Fabrication

Letters must be fabricated from cast aluminum. Letters must be cleaned by chemical etching or cleaned ultrasonically in a special degreasing bath. Letters must be packaged for protection until installation.

#### 2.2.2 Typeface

Typeface must be helvetica medium as indicated on drawings.

#### 2.2.3 Size

Letter size must be as indicated on the drawings.

#### 2.2.4 Finish

Baked enamel or two-component acrylic polyurethane finish must be provided.

#### 2.2.5 Mounting

Steel U-bracket, cap screws, and expansion bolts of number and size as recommended by manufacturer, must be used for concealed anchorage. Letters which project from the building line must have stud spacer sleeves. Letters, studs, and sleeves must be of the same material. Supply templates for mounting.

## 2.3 ALUMINUM ALLOY PRODUCTS

Aluminum alloy products must conform to ASTM B209 for sheet or plate, ASTM B221 for extrusions and ASTM B26/B26M or ASTM B108/B108M for castings. Aluminum extrusions must be provided at least 1/8 inch thick and aluminum plate or sheet at least 16 gauge thick. Welding for aluminum products must conform to AWS C1.1M/C1.1.

## 2.4 ANCHORS AND FASTENERS

Exposed anchor and fastener materials must be compatible with metal to which applied and must match in color and finish and must be non-rusting, non-corroding, and non-staining. Exposed fasteners must be tamper-proof.

## 2.5 SHOP FABRICATION AND MANUFACTURE

### 2.5.1 Factory Workmanship

Work must be assembled in the shop, as far as practical, ready for installation at the site. Work that cannot be shop assembled must be given a trial fit in the shop to ensure proper field assembly. Holes for bolts and screws must be drilled or punched. Drilling and punching must produce clean, true lines and surfaces. Welding to or on structural steel must be in accordance with AWS D1.1/D1.1M. Welding must be continuous along the entire area of contact. Exposed welds must be ground smooth. Exposed surfaces of work must have a smooth finish and exposed riveting must be flush. Fastenings must be concealed where practical. Items specified to be galvanized must be by hot-dip process after fabrication if practical. Galvanization must be in accordance with ASTM A123/A123M and ASTM A653/A653M, as applicable. Other metallic coatings of steel sheet must be in accordance with ASTM A924/A924M. Joints exposed to the weather must be formed to exclude water. Drainage and weep holes must be included as required to prevent condensation buildup.

### 2.5.2 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 must be protected with a coat of asphalt varnish or a coat of zinc-molybdate primer to prevent galvanic or corrosive action.

### 2.5.3 Shop Painting

Surfaces of miscellaneous metal work, except nonferrous metal, corrosion resisting steel, and zinc-coated work, must 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 must not be painted. Upon completion of work, damaged surfaces must be recoated.

## 2.6 COLOR, FINISH, AND CONTRAST

Color must be as indicated on the drawings. Color listed is not intended to limit the selection of equal colors from other manufacturers. For buildings required to be handicapped-accessible, the characters and background of signs must be eggshell, matte, or other non-glare finish. Characters and symbols must contrast with their background - either light

characters on a dark background or dark characters on a light background.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Signs, plaques, or dimensional letters must be installed in accordance with approved manufacturer's instructions at locations shown on the approved detail drawings; submit drawings showing elevations of each type of sign; dimensions, details, and methods of mounting or anchoring; shape and thickness of materials; and details of construction. A schedule showing the location, each sign type, and message must be included. Circuits installed underground must conform to the requirements of Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION. Steel conduits installed underground and illuminated signage mounted directly on buildings must be in conformance with the requirements of Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Signs must be installed plumb and true at mounting heights indicated, and by method shown or specified. Signs mounted on other surfaces must not be installed until finishes on such surfaces have been completed. Submit manufacturer's installation instructions and cleaning instructions.

##### 3.1.1 Anchorage

Anchorage and fastener materials must be in accordance with approved manufacturer's instructions for the indicated substrate. Anchorage not otherwise specified or indicated must include slotted inserts, expansion shields, and powder-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; lag bolts and screws for wood.

##### 3.1.2 Protection and Cleaning

The work must be protected against damage during construction. Hardware and electrical equipment must be adjusted for proper operation. Glass, frames, and other sign surfaces must be cleaned in accordance with manufacturer's instructions. After signs are completed and inspected, cover all project identification, directional, and other signs which may mislead the public. Covering must be maintained until instructed to be removed by the Contracting Officer or until the facility is to be opened for business. Submit six copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guides. The instructions must include simplified diagrams for the equipment as installed. Signs must be cleaned, as required, at time of cover removal.

#### 3.2 FIELD PAINTED FINISH

Miscellaneous metals and frames must be field painted in accordance with Section 09 90 00 PAINTS AND COATINGS. Anodized metals, masonry, and glass must be protected from paint. Finish must be free of scratches or other blemishes.

-- End of Section --

SECTION 10 14 00.20

INTERIOR SIGNAGE  
08/17

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z97.1 (2015) Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test

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

36 CFR 1191 Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 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

### 1.3 EXTRA MATERIALS

Provide 10 extra frames and extra stock of the following: blank plates of each color and size for sign types BB2. Changeable message strips for sign type BB2. Provide 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.

### 1.4 QUALITY ASSURANCE

#### 1.4.1 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.

#### 1.4.2 Detail Drawings

Submit detail drawings showing elevations of each type of sign, dimensions, details and methods of mounting or anchoring, mounting height, shape and thickness of materials, and details of construction. Include a schedule showing the location, each sign type, and message.

### 1.5 DELIVERY, STORAGE, AND HANDLING

Materials must be packaged to prevent damage and deterioration during shipment, handling, storage and installation. Product must be delivered to the jobsite in manufacturer's original packaging and stored in a clean, dry area in accordance with manufacturer's instructions.

### 1.6 WARRANTY

Warrant the interior signage for a period of 2 years against defective workmanship and material. Warranties must 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 must 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 must consist of acrylic plastic 0.080 inch thickness minimum conforming to ANSI Z97.1 and must conform to the following: Units must be

frameless. Corners of sign must be squared.

#### 2.2.2 Changeable Message Strip Signs

Changeable message strip signs must 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 must be prepared 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 must be by mechanical fasteners. Surface mounted signs must be mounted with 1/16 inch thick closed cell vinyl foam with adhesive backing. Adhesive must be transparent, long aging, high tech formulation on two sides of the vinyl foam fabricated from materials that are not corrosive to sign material and mounting surface.

#### 2.2.4 Graphics

Signage graphics for modular signs must conform to the following:

##### 2.2.4.1 Surface Applied Photopolymer

Integral graphics and Braille achieved by photomechanical stratification processes. Photopolymer used for ADA compliant graphics must be of the type that has a minimum durometer reading of 90. Tactile graphics must be raised 1/32 inch from the first surface of plaque by photomechanical stratification process.

##### 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 must conform to 36 CFR 1191.

#### 2.3 BUILDING DIRECTORIES

Building directories must be lobby directories or floor directories, and must be provided with a changeable directory listing consisting of the areas, offices and personnel located within the facility. Dimensions, details, and materials of sign and message content must be as shown on the drawings.

##### 2.3.1 Header Panel

Header panel must be acrylic with raised acrylic letters.

##### 2.3.2 Fabrication

Extruded aluminum frames and trim must be assembled with corners welded and mitered to a hairline fit, with no exposed fasteners.

## 2.4 DIMENSIONAL BUILDING LETTERS

### 2.4.1 Fabrication

Letters must be cast cutout or fabricated channel. Letters must be aluminum. Package letters for protection until installation.

### 2.4.2 Size

Letter size and must be thickness as indicated on drawings.

### 2.4.3 Finish

Provide finish as indicated on drawings.

### 2.4.4 Mounting

Threaded studs Steel U-bracket, cap screws, and expansion bolts of number and size recommended by manufacturer, must be supplied for concealed anchorage. Letters which project from the mounting surface must have stud spacer sleeves. Letters, studs, and sleeves must be of the same material. Templates for mounting must be supplied.

## 2.5 FABRICATION AND MANUFACTURE

### 2.5.1 Factory Workmanship

Holes for bolts and screws must be drilled or punched. Drilling and punching must produce clean, true lines and surfaces. Exposed surfaces of work must have a smooth finish and exposed riveting must be flush. Fastenings must be concealed where practicable.

### 2.5.2 Dissimilar Materials

Where dissimilar metals are in contact, the surfaces will be protected to prevent galvanic or corrosive action.

## 2.6 COLOR, FINISH, AND CONTRAST

Color must be as indicated on drawings. Finish of all signs must be eggshell, matte, or other non-glare finish as required in handicapped-accessible buildings.

## 2.7 TYPEFACE

ADA-ABA compliant font for Room Signs Helvetica Medium.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Signs must 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 must 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 must be permanently bound and must have a hard cover. The following

identification must 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 must conform to 36 CFR 1191. Required blocking must be installed. Signs on doors or other surfaces must not be installed until finishes on such surfaces have been installed. Signs installed on glass surfaces must be installed with matching blank back-up plates in accordance with manufacturer's instructions.

Do not install items that show visual evidence of biological growth.

### 3.1.1 Anchorage

Anchorage must be in accordance with approved manufacturer's instructions. In high humidity interior spaces (for example, bathrooms, locker rooms, pools, trainers) and unconditioned spaces, use corrosion-resistant anchors/fasteners or with approval by the manufacturer, waterproof silicone adhesive. Anchorage not otherwise specified or shown must include slotted inserts, expansion shields, and powder-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; lag bolts and screws for wood. Exposed anchor and fastener materials must be compatible with metal to which applied and must have matching color and finish. At interior applications in heavy traffic areas, firmly attach signage to structure walls with tamper-proof fasteners.

- a. Signs mounted to painted gypsum board surfaces must be removable for painting maintenance.
- b. Mount signs mounted to lay-in ceiling grids with clip connections to ceiling tees.
- c. Install signs mounted on metal surfaces with magnetic tape.
- d. Install signs mounted on fabric surfaces with hook and loop tape or pin mount.

### 3.1.2 Protection and Cleaning

Protect the work against damage during construction. Hardware and electrical equipment must be adjusted for proper operation. Glass, frames, and other sign surfaces must 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 21 13

TOILET COMPARTMENTS  
08/17

PART 1 GENERAL

1.1 REFERENCES

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

ALUMINUM ASSOCIATION (AA)

AA DAF45 (2003; Reaffirmed 2009) Designation System for Aluminum Finishes

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M (2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A167 (2011) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

ASTM A336/A336M (2018) Standard Specification for Alloy Steel Forgings for Pressure and High-Temperature Parts

ASTM A385/A385M (2017) 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 B36/B36M (2018) Standard Specification for Brass Plate, Sheet, Strip, and Rolled Bar

ASTM B86 (2018) Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings

ASTM D7611/D7611M (2013; E 2014) Standard Practice for Coding Plastic Manufactured Articles for Resin Identification

INTERNATIONAL CODE COUNCIL (ICC)

ICC A117.1 COMM (2017) Standard And Commentary Accessible and Usable Buildings and Facilities

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS SCS Global Services (SCS) Indoor Advantage

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE AMS2460 (2013; Rev A) Plating, Chromium

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-60003 (Basic) Partitions, Toilet, Complete

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

36 CFR 1191 Americans with Disabilities Act (ADA)  
Accessibility Guidelines for Buildings and  
Facilities; Architectural Barriers Act  
(ABA) Accessibility Guidelines

UNDERWRITERS LABORATORIES (UL)

UL 2818 (2013) GREENGUARD Certification Program  
For Chemical Emissions For Building  
Materials, Finishes And Furnishings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 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

Toilet Enclosures

Urinal Screens

Pilaster Shoes

Finishes; G

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; G

SD-11 Closeout Submittals

### 1.3 CERTIFICATIONS

#### 1.3.1 Indoor Air Quality

##### 1.3.1.1 Laminated Plastic and Solid Phenolic Products

Provide products certified to meet indoor air quality requirements by UL 2818 (Greenguard) Gold, SCS Global Services Indoor Advantage Gold or provide certification or validation by other third-party program that products meet the requirements of this Section. Provide current product certification documentation from certification body. When product does not have certification, provide validation that product meets the indoor air quality product requirements cited herein.

### 1.4 REGULATORY REQUIREMENTS

Conform to ICC A117.1 COMM code for access for the handicapped operation of toilet compartment door and hardware.

### 1.5 DELIVERY, STORAGE, AND HANDLING

Deliver materials in the manufacturer's original unopened packages with the brand, item identification, and project reference clearly marked. Store components in a dry location that is adequately ventilated; free from dust, water, other contaminants, and damage during delivery, storage, and construction.

### 1.6 WARRANTY

Provide certification or warranties that toilet partitions will be free of defects in materials, fabrication, finish, and installation and will remain so for a period of not less than 3 years after completion.

PART 2 PRODUCTS

2.1 SYSTEM REQUIREMENTS

Provide a complete and usable toilet partition system, including toilet enclosures, room entrance screens, urinal screens, system of panels, hardware, and support components. Furnish the partition system from a single manufacturer, with a standard product as shown in the most recent catalog data. Submit Fabrication Drawings for toilet partitions and urinal screens consisting of fabrication and assembly details to be performed in the factory. Submit manufacturer's Cleaning and Maintenance Instructions with Fabrication Drawings for review.

2.1.1 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.

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.

2.2 MATERIALS

2.2.1 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.

2.2.2 Brackets

Wall brackets must be two-ear panel brackets, T-style, 1-inch stock. Provide stirrup style panel-to-pilaster brackets.

2.2.3 Hardware and Fittings

2.2.3.1 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.

Material	Conformance Standard
Cold-rolled sheet steel	ASTM A336/A336M, commercial quality
Zinc-base alloy	ASTM B86, Alloy AC41-A
Brass	ASTM B36/B36M, Alloy C26800
Aluminum	ASTM B221
Corrosion-resistant steel	ASTM A167, Type 302

#### 2.2.3.2 Finishes

- a. Finish must conform to SAE AMS2460, Class I, Type I.
- b. Corrosion-resistant steel must have a No. 4 finish.
- c. Exposed fasteners must match the hardware and fittings.

#### 2.2.4 Door Hardware

##### 2.2.4.1 Hinges

Hinges must 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 must be the cutout-insert type with exposed parts on interior of stall and have gravity return movement.

##### 2.2.4.2 Latch and Pull

Latch and pull must be a combination rubber-faced door strike and keeper equipped with emergency access.

##### 2.2.4.3 Coat Hooks

Coat hooks must be combination units with hooks and rubber tipped pins.

#### 2.3 PARTITION PANELS AND DOORS

Fabricate partition panels, doors, and pilasters from high density polyethylene (HDPE), fabricated from polymer resins compounded under high pressure. Panels, doors, and pilasters shall be 1 inch thick with edges rounded to 1/4 inch radius.

##### 2.3.1 Toilet Enclosures

Provide and conform toilet enclosures to CID A-A-60003, Type I, Style C, overhead braced. Furnish width, length, and height of toilet enclosures as shown. Provide a width of 1 inch. Finish surface of panels must be

solid polyethylene, Finish 5; water resistant; graffiti resistant; non-absorbent; 1/4 inch radius beveled edges. 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 must not rotate within their fittings.

### 2.3.2 Urinal Screens

Provide and conform urinal screens to CID A-A-60003, Type III, Style A, floor supported. Provide finish for surface of screens as solid polyethylene, Finish 5; water resistant; graffiti resistant; non-absorbent; 1/4 inch radius beveled edges. 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 stainless steel fittings and fasteners.

### 2.4 OVERHEAD-BRACED PARTITIONS

Pilasters must 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 must 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 stainless steel.

### 2.5 PILASTER SHOES

Provide shoes at pilasters to conceal floor-mounted anchorage. Pilaster shoes must be one piece molded HDPE. See Section 01 33 29.00 06 SUSTAINABILITY REPORTING for cumulative total recycled content requirements. Height must be 3 inches.

### 2.6 HARDWARE

Provide hardware for the toilet partition system that conforms to CID A-A-60003 for the specified type and style of partitions. Provide hardware pre-drilled by manufacturer. Use a hardware finish that is highly resistant to alkalis, urine, and other common toilet room acids. Provide latching devices and hinges for handicap compartments complying with 36 CFR 1191 and stainless steel door latches that operate without either tight grasping or twisting of the wrist of the operator. Use stainless steel, tamper proof type screws and bolts. Wall mounting brackets must be continuous, full height, stainless steel, in accordance with toilet compartment manufacturer's instructions.

### 2.7 COLORS AND FINISHES

#### 2.7.1 Colors

Provide manufacturer's standard color charts for color of finishes for toilet partition system components. Color of pilaster shoes must match

the core of solid plastic compartments and screens. Submit three samples showing a finished edge on two adjacent sides and core construction, each not less than 12-inch square

### 2.7.2 Finishes No.4 and No. 5

Provide solid plastic fabricated of polymer resins (polyethylene) formed under high pressure rendering a single component section not less than one inch thick. Colors must 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 must 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

Do not install items that show visual evidence of biological growth. Install partitions rigid, straight, plumb, and level, with the panels centered between the fixtures. Provide a panel clearance of not more than

1/2 inch and secure the panels to walls and pilasters with 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 must 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 must 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 must have a load-carrying strength of not less than 600 pounds per anchor.
- d. Submit Installation Drawings for toilet partitions and urinal screens showing plans, elevations, details of construction, hardware, reinforcing and blocking, fittings, mountings and escutcheons. Indicate on drawings the type of partition, location, mounting height, cutouts, and reinforcement required for toilet-room accessories.

### 3.3 OVERHEAD-BRACED PARTITIONS

Secure pilasters to the floor with the anchorage device specified. Make all leveling devices readily accessible for leveling, plumbing, and tightening the installation. Secure overhead brace to the pilaster face with not less than two fasteners per face. Expansion shields must have a minimum 2-inch penetration into the concrete slab. Make tops of doors parallel with the overhead brace when doors are in a closed position.

### 3.4 FINAL ADJUSTMENT

After completion of the installation, make final adjustments to the pilaster-leveling devices, door hardware, and other working parts of the partition assembly. Doors must have a uniform vertical edge clearance of approximately 3/16 inch and must rest open at approximately 30 degrees when unlatched.

### 3.5 CLEANING

Baked enamel finish must be touched up with the same color of paint that was used for the finish. Clean all surfaces of the work, and adjacent surfaces soiled as a result of the work, in an approved manner compliant

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Caven Point Training Building Revitalization

W912QR20R0018-0000  
W912QR-18-F-0500  
P2: 475970

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 22 13.00 48

WIRE MESH PARTITIONS

01/11

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 A 36/A 36M (2005) Carbon Structural Steel

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. The following shall be submitted in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

Acceptable Manufacturer Products:

Manufacturer's products listed in this specification are referenced to establish a standard of quality. When the specific product listed is submitted by the Contractor that submittal will be considered as 'For Information Only'(FIO). When an equal to that named in this specification is submitted it shall be 'For Government Approval'(G). The following manufacturer products are specifically mentioned in this specification:

Wire Crafters  
6208 Strawberry Lane  
Louisville, Ky. 40214-2900  
(800)626-1816  
www.wirecrafters.com

California Wire Products Corp.  
11128 W. Bradford Circle  
Corona, CA 92882  
(951)735-1070  
www.cawire.com

SpaceGuard Products  
711 S. Commerce Dr.  
Seymour, IN 47274  
(800) 841-0680  
www.spaceguardproducts.com

Alabama Metals  
Birmingham, Alabama.  
205.787.2611

W.A Scmidt

Sounderton, Pa  
800.523.6719

Manufacturers product submitted as an 'or equal'; G, ED

SD-02 Shop Drawings

Wire mesh partitions

Show layout, details, materials, dimensions, finishes, and all information necessary for fabrication and installation.

SD-03 Product Data

Wire mesh partitions

Submit for each type of partition and door.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver materials in manufacturer's original, unopened containers or packaging with labels intact and legible. Deliver, store, and handle materials so as to prevent damage. Replace damaged or defective materials with new.

1.4 DESCRIPTION OF WORK

Wire mesh partitions shall be all wire type and shall be provided complete with fasteners, panels, bracing, swinging and sliding doors, hardware, and other items necessary for a complete, useable, and rigid installation.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Steel Shapes, Plates, and Bars

ASTM A 36/A 36M.

2.1.2 Wire Mesh

Carbon steel wire, woven 1" x 2" mesh.

2.2 NORMAL DUTY PARTITIONS

2.2.1 Wire Mesh

10 gage wire, 1" x 2" woven or welded mesh. (welded not allowed in arms vault)

2.2.2 Vertical Frames

2" x 2" x 14 gauge steel tube frames with 2" x 7" base plate securely welded to one end. Height of frames shall match the panel height.

2.2.3 Panel Frames

1 1/4"x1 1/4"x1/8" steel angle frames with 7/8"x7/16" slotted holes for mounting to posts and adjacent panels.

#### 2.2.4 Panel Stiffeners

One 1/4" x 3/4" flat bar stiffener shall be securely welded to frame behind mesh on panels of 4' to 7' wide, panels 7' to 10' wide shall have two equally spaced stiffeners.

#### 2.2.5 Corner Posts

Shall be 2" x 2" x 14 gauge steel tubing, drilled with 1/2" holes to accept hardware for mounting panel and shall have 1/4" x 2" x 7" base plate securely welded to floor end, plastic cap other end.

#### 2.2.6 Hinged Doors

Frames shall be 1 1/4" by 1 1/4" by 3/16 inch angle. with 2" x 1" 10 gauge rectangular steel mesh. Provide high and low lugs for padlocks on each door and frame. Provide 4 x 4 x 10 gauge spun pin hinges. Provide factory applied door closure. Provide two horizontal and one vertical flat stiffener of 1/4 inch by 3/4 inch steel. Stiffeners in door panel to prevent twisting action and allow unauthorized access into the caged areas. The vault areas shall only receive hinges swinging doors.

### 2.4 FABRICATION

#### 2.3 STANDARD PANELS

Wire shall be 10 gauge 2" x 1" steel mesh securely welded into 1 1/4" x 1 1/4" x 1/8" steel angle frame. Panels four feet wide to seven feet wide shall have one 1/4" x 3/4" flat stiffeners welded to the frame behind the mesh panels. Panels seven feet or wider shall have a minimum of two equally spaced stiffeners.

Wall panels shall be secured to structure above or caging areas with high ceilings shall have non-load bearing caging ceilings.

#### 2.4.2 Sheet Metal Base Panels

Panels may be supplied with 16 gauge sheet metal in lieu of the 2" x 1" mesh in areas difficult to fabricate and secure mesh.

#### 2.4 FINISH

Thoroughly clean ferrous metal, prep for proper coating adhesion and paint with one coat of shop applied acrylic enamel.

#### 2.5 NUMBER PLATES

Provide rectangular 1" high x 2" long metal plates with consecutive numbers 1/2 inch high of block font style, in contrasting color. Each cage shall receive an individual consecutive number.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

##### 3.1.1 Wire Mesh Partitions

Install plumb, level, and true to line, within a tolerance of 1/8 inch in 10 feet or the height or run of the partition, if less than 10 feet.

Anchor floor sockets to the floor with expansion bolts. Vertical frames and posts shall be bolted together with 1/4 inch bolts 12 inches o.c. for normal duty partitions. Coordinate the caging dimensions with standard caging manufacturer's dimensioning and the standard sizing of the shelving manufacturer's provided on the project.

### 3.1.2 Doors

Install in accordance with the manufacturers' recommendations. Adjust as required so that doors and hardware operate freely and properly.

### 3.1.3 Bracing

Brace free standing partitions more than 20 feet in length, at intervals not greater than 20 feet with a steel channel brace connected to the top angle and anchored to the building wall or framing member .

### 3.1.4 Touch-Up

Clean and paint scratches, abrasions, and other damage to shop painted surfaces to match the shop-applied finish.

### 3.1.5 Exposed Fasteners

Tamperproof fasteners shall be used on all bolted connections. Tamperproof fasteners shall be manufactured products designed to be nonremovable. Bolted connections shall not be welded, peened, deformed, or damaged in any manner to render them nonremovable. Sliding doors shall be fabricated and installed so they cannot be removed from the base or head retainer channels when in locked position.

-- End of Section --

SECTION 10 28 00.00 48

TOILET AND BATH ACCESSORIES  
04/06

PART 1 GENERAL

1.1 REFERENCES

ASTM INTERNATIONAL (ASTM)

ASTM A123/A123M (2017) Standard Specification for Zinc  
(Hot-Dip Galvanized) Coatings on Iron and  
Steel Products

ASTM A167 (2011) Standard Specification for  
Stainless and Heat-Resisting  
Chromium-Nickel Steel Plate, Sheet, and  
Strip

INTERNATIONAL CODE COUNCIL (ICC)

ICC/ANSI A117.1 (2009) Accessible and Usable Buildings and  
Facilities

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. The following shall be  
submitted in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

Acceptable Manufacturer Products;

Manufacturers products listed in this specification are referenced  
to establish a standard of quality. When the specific product  
listed is submitted by the Contractor, that submittal will be  
considered For Information Only. When an equal to that named in  
this specification is submitted, it shall be for Government  
Approval (G). The following manufacturer products are  
specifically mentioned in this specification:

American Specialties Inc. (ASI)  
441 Saw Mill River Road  
Yonkers, NY 10701-4913  
(914) 476-9000  
www.americanspecialties.com

Bobrick Washroom Equipment, Inc.  
100 Bobrick Drive  
Jackson, TN.38301-5635  
(731) 424-7000  
www.bobrick.com

Bradley  
W142 N9101 Fountain Blvd.  
Menomonee Falls, WI 53052-0309  
(262) 251-5817 or 1-800 Bradley  
www.bradleycorp.com

Manufacture Products submitted as an "or equal"; G, ED

#### SD-03 Product Data

Toilet and Shower Accessories; G

Provide manufacturer's data on all accessories describing size, finish, details of function, attachment methods.

#### SD-08 Manufacturer's Instructions

Toilet and Bath Accessories; G

Indicate manufacturer's installation procedures, perimeter conditions requiring special attention, and anchorage.

### 1.3 REGULATORY REQUIREMENTS

Conform to ICC/ANSI A117.1 code for access for the handicapped.

### 1.4 FIELD MEASUREMENTS

Verify that field measurements are as indicated on product data.

### 1.5 COORDINATION

Coordinate the work with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

### 1.6 WARRANTY

Manufacturer's standard performance guarantees or warranties that extend beyond a one (1-yr) year period shall be provided.

### 1.7 DELIVERY, STORAGE, AND HANDLING

Toilet accessories shall be wrapped for shipment and storage, and delivered to the jobsite in manufacturer's original packaging, and stored in a clean, dry area protected from construction damage and vandalism.

## PART 2 PRODUCTS

### 2.1 MAUFACTURED UNITS

Toilet accessories shall be provided where indicated in accordance with paragraph 3.4 SCHEDULE. Porcelain type, tile-wall accessories are specified in Section 09 30 10, CERAMIC, QUARRY, AND GLASS TILING. Each accessory item shall be complete with the necessary corrosion resistant mounting plates.

#### 2.1.1 Anchors and Fasteners

Anchors and fasteners shall be capable of developing a restraining force

commensurate with the strength of the accessory to be mounted and shall be suited for use with the supporting construction. Exposed fasteners shall be of tamperproof design and shall be finished to match the accessory.

#### 2.1.2 Stainless Steel Sheet:

ASTM A167, Type 304.

#### 2.1.3 Adhesive:

Two component epoxy type waterproof.

#### 2.1.4 Expansion Shields:

Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

### 2.2 FABRICATION

Weld and grind joints of fabricated components, smooth.

Form exposed surfaces from single sheet of stock, free of joints. Form surfaces flat without distortion. Maintain surfaces without scratches or dents.

Fabricate grab bars free of visible joints, return to wall with end attachment flanges. Form grab bar with minimum 38mm (1 1/2-inches) clearance from wall surface. All grab bar installations shall withstand forces in excess of 13.4 kN.

Shop assemble components and package complete with anchors and fittings.

Provide steel anchor plates, adapters, and anchor components for installation.

### 2.3 KEYING

Supply 2 keys for each accessory to Contracting Officer.

### 2.4 FINISHES

#### 2.4.1 Galvanizing:

ASTM A123/A123M to 42.36g/sq. m. Galvanize ferrous metal and fastening devices.

#### 2.4.2 Shop Primed Ferrous Metals:

Pretreat and clean, spray apply one coat primer and bake.

#### 2.4.3 Stainless Steel:

All metal appearance finishes shall be No. 4 satin luster finish, unless otherwise noted.

#### 2.4.4 Back Painting Components:

Back paint components where contact is made with building finishes to prevent electrolysis.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

Verify that site conditions are ready to receive work and dimensions are as indicated on shop drawings.

Verify exact location of accessories for installation.

#### 3.2 PREPARATION

Deliver inserts and rough-in frames to site for timely installation.

Provide templates and rough-in measurements as required.

#### 3.3 INSTALLATION

Install accessories in accordance with manufacturers' instructions and ICC/ANSI A117.1.

Install plumb and level, securely and rigidly anchored to substrate at the locations indicated on the drawings.

#### 3.4 SCHEDULE

##### 3.4.1 A1, Mop and Broom Holder

ASI (1315-6), Bobrick (B-224), Bradley (9986) - Strip shall be constructed of 1.31mm (18 gage) Type 302 stainless steel no. 4 satin finish. Strip shall be formed with a return flange to the wall on top and a returned flange to the wall at the bottom. Holder pieces shall be constructed from molded resilient rubber with ribbed gripping surface. Strip shall be 1200mm (36-inches) long with 6 holders.

##### 3.4.2 A2, Stainless Steel Framed Mirror

ASI (0600), Bobrick (2908), Bradley (780) - Mirror, 460 x 760mm (18 x 30 inches), shall be framed with one-piece, type 304, stainless steel angle, 19 x 19mm with continuous integral stiffener on all sides and beveled edge to hold frame tightly against mirror. Corners shall be heliarc welded, ground and polished smooth. All exposed surfaces shall be satin finish. Mirror shall be No. 1 quality 6mm (1/4-inch) tempered glass. All edges shall be protected by high impact plastic filler strips. Back of mirror shall be protected by shock-absorbing, waterproof, non-abrasive 6.4mm thick polystyrene padding. Galvanized steel back shall have integral hanging brackets for mounting on concealed rectangular wall hanger(s) and be secured with concealed Phillips-head locking screws in lower frame.

##### 3.4.3 A3, Tilted Mirror

ASI (0535), Bobrick (B-293-1830), Bradley (740) - Sloping tilt mirror frame, 460 x 760mm (18 x 30 inches), shall be type 304 stainless steel with beveled front to hold frame tightly against mirror. Corners shall be heliarc welded, ground, and polished smooth. All exposed surfaces shall have satin finish with vertical grain. Mirror shall be 6.4mm tempered glass. All edges shall be protected by full-size, shock-absorbing, water-resistant, nonabrasive polystyrene padding. Back and inner

stiffener frame shall be galvanized steel, one piece welded construction with slots for mounting screws and integral screw-head lock.

#### 3.4.4 A6a, Partition Mounted Double Toilet Tissue Dispenser with Feminine Napkin Disposal For Servicing Two Toilet Compartments

(A6) ASI (0481), Bobrick (B-357), Bradley (591) and (A7) ASI (0481-HC), Bobrick (B-3571), Bradley (5911) - Partition mounted double roll toilet tissue dispenser each side shall be type 304 stainless steel with all welded construction. Exposed surfaces shall have satin finish. Toilet seat dispenser shall hold up to 1000 single or half folded toilet seat covers. Front of door shall be drawn, one piece, seamless construction. Toilet seat dispenser door shall be secured to cabinet with piano hinge equipped with a flush tumbler lock. Unit shall dispense two standard core toilet tissue rolls up to 133mm (5 1/4") in diameter on each side. Unit shall include four heavy duty, one-piece molded polyethylene spindles. Dual feminine napkin disposal shall be constructed entirely of type 302 stainless steel. Sanitary napkin dispenser door shall be secured to cabinet with a spring loaded, full length stainless steel piano hinge and equipped with international graphic symbol.

#### 3.4.5 A6b, Partition Mounted Double Toilet Tissue Dispenser with Feminine Napkin Disposal

(A6) ASI (0481), Bobrick (B-357), Bradley (591) and (A7) ASI (0481-HC), Bobrick (B-3571), Bradley (5911) - Partition mounted double roll toilet tissue dispenser each side shall be type 304 stainless steel with all welded construction. Exposed surfaces shall have satin finish. Toilet seat dispenser shall hold up to 1000 single or half folded toilet seat covers. Front of door shall be drawn, one piece, seamless construction. Toilet seat dispenser door shall be secured to cabinet with piano hinge equipped with a flush tumbler lock. Unit shall dispense two standard core toilet tissue rolls up to 133mm (5 1/4") in diameter on each side. Unit shall include four heavy duty, one-piece molded polyethylene spindles. Dual feminine napkin disposal shall be constructed entirely of type 302 stainless steel. Sanitary napkin dispenser door shall be secured to cabinet with a spring loaded, full length stainless steel piano hinge and equipped with international graphic symbol.

#### 3.4.6 A8, Recessed Double Toilet Tissue Dispenser with Feminine Napkin Disposal

ASI (04833), Bobrick (B-35704), Bradley (5942). Recessed double roll toilet tissue dispenser shall be type 304 stainless steel with all welded construction. Exposed surfaces shall have satin finish. Toilet seat dispenser shall hold up to 1000 single or half-folded toilet seat covers. Front of door shall be drawn, one piece, seamless construction. Toilet seat dispenser door shall be secured to cabinet with piano hinge equipped with a flush tumbler lock. Sanitary napkin dispenser door shall be secured to cabinet with a spring loaded, full-length stainless steel piano hinge and equipped with international graphic symbol. Unit shall dispense two standard core toilet tissue rolls up to 133.4mm in diameter. Unit shall include two heavy-duty, one-piece molded polyethylene spindles.

#### 3.4.7 A9a, Partition Mounted Double Toilet Tissue Dispenser For Servicing Two Toilet Compartments

ASI (0484), Bobrick (B-347), Bradley (592) and (A10) ASI (0484-HC), Bobrick (3471), Bradley (5921) - Partition mounted double roll toilet

tissue dispenser each side shall be type 304 stainless steel with all welded construction. Exposed surfaces shall have satin finish. Toilet seat dispenser shall hold up to 1000 single or half-folded toilet seat covers. Front of door shall be drawn, one piece, seamless construction. Toilet seat dispenser door shall be secured to cabinet with piano hinge equipped with a flush tumbler lock. Unit shall dispense two standard core toilet tissue rolls up to 133mm (5 1/4") in diameter on each side. Unit shall include four heavy duty, one-piece molded polyethylene spindles. Unit A10 has one side flush with the face of the toilet partition to allow for grab bar clearance.

#### 3.4.8 A9b, Partition Mounted Double Toilet Tissue Dispenser

ASI (0484), Bobrick (B-347), Bradley (592) and (A10) ASI (0484-HC), Bobrick (3471), Bradley (5921) - Partition mounted double roll toilet tissue dispenser each side shall be type 304 stainless steel with all welded construction. Exposed surfaces shall have satin finish. Toilet seat dispenser shall hold up to 1000 single or half-folded toilet seat covers. Front of door shall be drawn, one piece, seamless construction. Toilet seat dispenser door shall be secured to cabinet with piano hinge equipped with a flush tumbler lock. Unit shall dispense two standard core toilet tissue rolls up to 133mm (5 1/4") in diameter on each side. Unit shall include four heavy duty, one-piece molded polyethylene spindles. Unit A10 has one side flush with the face of the toilet partition to allow for grab bar clearance.

#### 3.4.9 A11, Recessed Double Toilet Tissue Dispenser

ASI (0486), Bobrick (B-3474), Bradley (5922) - Recessed double roll toilet tissue dispenser shall be type 304 stainless steel with all welded construction. All exposed surfaces shall have a satin finish. Toilet seat dispenser shall hold 500 paper covers. Door shall be one-piece seamless construction secured to cabinet with a full-length stainless steel piano hinge, and equipped with a tumbler lock. Unit shall dispense two standard core toilet tissue rolls up to 135mm in diameter. Unit shall include two one-piece molded polyethylene spindles.

#### 3.4.10 A12, Surface-Mounted Soap Dispenser with Shelf

ASI (0315), Bobrick (B-2014), Bradley (662) - Soap vessel and shelf are satin-finish stainless steel. Valve shall be corrosion resistant design. Soap container shall be removable and have a capacity of 2.4L (80 fl oz) with unbreakable refill window. Adequate adjustments/accessories shall be provided to allow dispenser to work in location indicated in the drawings.

#### 3.4.11 A12-b, Lavatory-Mounted Soap Dispenser

(Bradley Model No. 6324, Bobrick Model B-82216)- Lavatory Mounted Soap Dispenser shall dispense liquid and lotion soaps, and synthetic detergents. Valve shall be operable with one hand and with less than 5 lbs. of force to comply with barrier free accessibility. Piston and spout assembly shall be type 304 stainless steel with bright polished finish. Escutcheon shall lock to body with concealed locking mechanism that is opened only with special key provided. Spout shall rotate 360 degrees without damage to valve mechanism. Piston, spout and supply tube assembly shall be removable from top for filling and maintenance. Valve shall be equipped with plastic cylinder, stainless steel spring, U-packing seal and duckbills. Shank shall accommodate mounting thickness up to 1 inch. Translucent, shatter resistant polyethylene container shall have a

capacity of 20 oz.

3.4.12 A13, Stainless Steel Utility Hook:

ASI (7340), Bobrick (B-670), Bradley (9115) - Utility Hook shall be constructed entirely of type 304 stainless steel with satin finish. Flange and support arm shall be 22 gauge and equipped with a concealed, 1/16 inch mounting bracket secured to a 1/16 inch wall plate with a stainless steel set screw. Hook shall be .11 inch welded to support arm. Fastenings and mounting plates shall be concealed.

3.4.13 A14, Stainless Steel Grab Bars With Concealed Mounting

ASI (3201-01-36), Bobrick (B-5806-36), Bradley (812-001-36) - Grab bar shall be constructed of type 304 stainless steel with satin finish. It shall have wall thickness of 1.31mm (18 gage) and outside diameter of 38mm (1 1/2-inches). Distance from inside of grab bar to finished wall shall be 38mm (1 1/2-inches). Flanges shall be 3.13mm (11-gage) stainless steel, 75mm (3-inch) diameter and each shall have 4 stainless steel set screws. Ends of grab bar shall pass thru flanges and be heliarc welded to form one structural unit. Flange covers shall be 22 gauge., 3 3/8" in diameter, and 1/2 in deep and shall snap over mounting flange to conceal mounting screws. grab bar shall comply with ADAAG guidelines for structural strength. Concealed mounting plates shall be 2.37mm (13-gage) stainless steel with 3 slotted screw holes.

3.4.14 A16, Heavy-Duty Shower Curtain Rod with Concealed Mounting

ASI (1214), Bobrick (B-207), Bradley (9539) - Unit shall be of type 304 stainless steel, 1.006mm (20-gage), with satin finish. Outside diameter shall be 25.4mm (1-inch). Flanges shall be 80mm (3 3/16-inch) maximum diameter with satin finish. Unit shall include concealed mounting brackets.

3.4.15 A17, Stainless Steel Curtain Hook

ASI (1200-SHU), Bobrick (B-204-1), Bradley (9536) - Shower curtain hooks shall type 304 stainless steel. Hooks shall be usable with curtain rod specified for Item A15. Hooks shall snap open to allow placement on curtain rod.

3.4.16 A18, Opaque White Vinyl Shower Curtain

ASI (1200-V), Bobrick (B-204-3), Bradley (9537) - Shower curtain shall be opaque, matte white vinyl. Curtain shall include rust-proof grommets along top, one at every 150mm (6") intervals. Bottom and sides shall be hemmed. Curtain shall be 1830mm (72") high and 1778mm (70") wide.

3.4.17 A21, Stainless Steel Frame Mirror (Full Length)

ASI (0600), Bobrick (B-290), Bradley (780) - Angle framed mirror, 1830mm x 915mm (72" x 36"), shall be stainless steel with a satin finish. Mirror shall be No.1 quality, 6mm (1/4-inch) select float glass selected for silvering, electrolytically copper-plated by the galvanic process, and guaranteed for 15 years against silver spoilage. All edges protected by plastic filler strips. Back is protected by full-size, shock-absorbing, water-resistant, nonabrasive, 5mm (3/16-inch) thick polyethylene padding.

3.4.18 A23, Solid Phenolic Folding Shower Seat

Bobrick Model B-5191) Folding Shower Seat shall have a frame constructed of type 304, satin finish stainless steel, that consists of square tubing and seamless tubing. Seat shall be one-piece, solid phenolic laminate with matte finish, ivory colored, melamine surfaces, and black phenolic-resin core; secured to frame with stainless steel carriage bolts and acorn nuts. Shower seats shall be equipped with two mounting flanges constructed of type 304, satin finish stainless steel; a guide bracket constructed of type 304, satin finish stainless steel; and a spring constructed of type 301, stainless steel spot welded to a baseplate of type 304 heavy gauge stainless steel. Seat shall remain in upright position when not in use. Shower seat shall comply with ADAAG barrier free guidelines.

3.4.19 A24, Electric Hand Dryer (EHD)

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 chrome plated steel. 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.

-- End of Section --

SECTION 10 51 52.00 48

METAL WARDROBE LOCKERS AND BENCH SEAT  
04/06

PART 1 GENERAL

1.1 REFERENCES

ASTM INTERNATIONAL (ASTM)

ASTM A653/A653M (2018) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

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. The following shall be submitted in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings; FIO

Indicate locker plan layout and numbering plan.

SD-03 Product Data

Provide data on locker types, sizes and accessories.

Lockers; G

Locker Manuf. Product submitted as an "or equal"; G

SD-04 Samples

Samples; FIO

Submit two samples 3 x 6 inches in size, of each color selected; applied to specified base metal.

1.3 DELIVERY, STORAGE, AND PROTECTION

Transport, handle, store, and protect products.

Protect locker finish and adjacent surfaces from damage.

1.3.1 FIELD MEASUREMENTS

To ensure proper fits, make field measurements prior to the preparation of drawings and fabrication.

## PART 2 PRODUCTS

### 2.1 MATERIALS

Designer to determine what type of lockers are required and edit this list as needed.

#### 2.1.1 Sheet Steel

ASTM A653/A653M Grade D, Coating Designation G90, stretcher leveled; to the following minimum thicknesses:

1. Body and Shelf: 20 gage
2. Door Outer Face: 16 gage
3. Door Inner Face: 20 gage
4. Door Frame: 16 gage
5. Hinges: 14 gage
6. Base: 20 gage
7. Sloping Top: 20 gage
8. Trim: 20 gage

#### 2.1.2 Single Tiered Locker

Size 12 inches wide, 18 inches deep, 72 inches high (Dust covers around the entire perimeter of the base will increase height by 6 inches to 78 inches.) Provide dust covers with sloped tops and end covers to preclude dust accumulation. End panels as required per drawing configuration. Maximum size of grouping units is three lockers per unit. Latch hook to have bevel on front upper edge to allow latch clip to ride up slope as door closes. Steel door frames of minimum 16 gauge metal with three hinges of minimum 14 gauge steel. Vertical members shall have an additional flange to form continuous door strike. Minimum gauge for top, bottom, shelves, sides, back and row ends of 20 gauge steel. Eyelet for padlock must accept a 5/16" padlock shank, providing a secured locking three point latching mechanism. Lockers will be sequentially numbered with a plate beginning with #1. Locker will contain a single shelf at top with hanging rod and wall hooks on both sides. Louvers for circulation both at top and bottom. Lockers are to be installed in the room with dust covers installed.

#### 2.1.3 Double Tiered Locker

Size shall be a minimum 12 inches wide, 18 inches deep, 36 inches high, 72 inches overall (Dust covers around the entire perimeter of the base will increase height by 6 inches to 78 inches). Provide dust covers with sloped tops and end covers to preclude dust accumulation. End panels required per drawing configuration. Maximum size of grouping units is three lockers per unit. Latch hook to have bevel on front upper edge to allow latch clip to ride up slope as door closes. Steel door frames with a minimum of three hinges of minimum 14 gauge steel. Vertical members shall have an additional flange to form continuous door strike. Eyelet for padlock must accept a 5/16 inch padlock shank, providing a secured locking three point latching mechanism. Lockers will be sequentially numbered with a plate beginning with #1. Locker will contain a single shelf at top and wall hooks on both sides. Louvers for circulation both at top and bottom. Lockers will be installed in the room with dust covers installed. Color shall be selected by the Architect and approved by the Government.

## 2.2 ACCESSORIES

### 2.2.1 Lockers

Each All Metal, Quiet Type Wardrobe Locker: Two double prong wall hooks, coat hanger bar, rubber bumper.

## 2.3 FABRICATION

### 2.3.1 Locker Unit

Locker Units: Configuration and size as previously indicated.  
Mounting: Surface mounted.  
Base: Metal base.  
Base Height: 4 inch.  
Top: Sloped metal with closures.  
Locking: Equipped with padlock lugs  
Ventilation Method: Louvered top and bottom frame and top and bottom of door.  
Class: Quiet

### 2.3.2 Locker Body

Formed and flanged; with steel stiffener ribs; electric spot welded.

### 2.3.3 Frames

Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.

### 2.3.4 Doors

Hollow channel construction, 1 3/16 inch thick; welded construction, channel reinforced top and bottom with intermediate stiffener ribs, grind and finish edges smooth. Provide ventilation openings at top and bottom of each locker. Form recess for operating handle and locking device.

### 2.3.5 Hinges

Two for doors under 42 inches high; three for doors over 42 inches high; weld securely to locker body and door.

### 2.3.6 Integral Cylinder Lock

Five (5) pin type, master keyed; provide two keys per lock and four master keys.

### 2.3.7 Number Plates

Provide oval shaped aluminum plates. Form numbers 1/2 inch high of block font style, in contrasting color.

### 2.3.8 Ends and Closure

Fabricate ends and closure pieces as required to create locker units in configuration as indicated on the drawings.

2.3.9 Base

Fabricate 4 inch high steel bases with end closures.

2.3.10 Coat Hooks

Provide two chrome or zinc plated coat hooks in each unit.

2.3.11 Door Handles

Provide zinc alloy or steel handles with a chromium coating.

2.3.12 Silencers

Provide manufacturer's standard silencers.

2.4 FINISHES

Lockers to be factory finished with two coats of baked enamel. Color shall be as per the drawings.

PART 3 EXECUTION

3.1 EXAMINATION

Verify that prepared bases and embedded anchors are properly sized and are in the correct position and configuration.

3.2 INSTALLATION

3.2.1 Lockers

Install in accordance with manufacturer's instructions. Install lockers plumb and square. Secure lockers with anchor devices to suit substrate materials at floor and/or wall with a minimum Pullout Force of 100 lb. Bolt adjoining locker units together to provide rigid installation. Install end panels, filler panels, sloped tops, bases and accessories. Replace components that do not operate smoothly or have been damaged or dented. Touch up any scratches. Install number plates on lockers consecutively.

3.3 CLEANING

Cleaning installed work. Clean locker interiors and exterior surfaces. Clean locker adjacent surfaces soiled as a result of the locker installation.

---END OF SECTION---

SECTION 10 56 13.00 48

METAL STORAGE SHELVING  
10/05

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI MH28.1 (2005) Multi-Level Shelving Systems  
Utilizing Industrial Grade Steel Shelving

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. The following shall be submitted in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings; FIO

Submit shop drawings showing location, ranges and extent of metal shelving systems. Show installation details at any special or non-standard conditions.

Initial Selection Purposes: Submit manufacturer's standard size samples of colors and finishes.

Verification Purposes: Submit 6" square samples of each color and finish required. Prepare from same material to be used for the work.

SD-03 Product Data

Acceptable Manufacturer Products; FIO

Manufacturers products listed in this specification are referenced to establish a standard of quality. When the specific product listed is submitted by the Contractor, that submittal will be considered For Information Only. When an equal to that named in this specification is submitted, it shall be for Government Approval (G). The following manufacturer products are specifically mentioned in this specification:

Shelving: Penco Products Inc.; FIO  
99 Brower Avenue  
P. O. Box 378  
Oaks, PA 19456-0378

800.562.1000  
www.pencoproducts.com

Shelving: Republic Storage Systems Co., Inc.; FIO  
1038 Beldon Avenue, NE  
Canton, OH 44705  
800.477.1255  
www.republicstorage.com

Shelving: Manuf. Product submitted as an "or equal"; G

#### SD-04 Samples

Metal Shelving; FIO

Manufacturer's standard color samples of specified finishes.

#### SD-05 Design Data

Seismic Calculations; G

Submit detailed calculations of seismic forces for fully loaded shelving, indicating compliance with seismic design requirements.

### 1.3 QUALITY ASSURANCE

#### 1.3.1 Manufacturer Qualifications

Firm (material producer) with not less than 3 years of production experience, whose published literature clearly indicates general compliance of products with requirements of this section.

#### 1.3.2 Installer Qualifications

Firm specializing in metal storage shelving installation with not less than 2 years of experience in installation of metal storage shelving similar to that required for this project.

#### 1.3.3 Single Source Responsibility

Provide material produced by a single manufacturer for each shelving unit type.

### 1.4 DELIVERY, STORAGE AND HANDLING

Comply with instructions and recommendations of manufacturer for special delivery, storage, and handling requirements.

### 1.5 WARRANTY

Special Project Warranty: Submit a written warranty, executed by the Contractor, Installer and the Manufacturer, agreeing to repair or replace shelving units which fail in materials or workmanship within the specified warranty period. This warranty shall be in addition to and not a limitation of other rights the Government may have against the Contractor under the Contract Documents.

Warranty period is 2 years after the date of Substantial Completion.

## 1.6 MAINTENANCE

### 1.6.1 Maintenance Instructions

Submit manufacturer's printed instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated use conditions. Include precautions against materials and methods which may be detrimental to finishes and performance.

### 1.6.2 Replacement Materials

After completion of work, deliver not less than 2 of each type, color, and pattern of metal storage shelving, exclusive of material required to properly complete installation. Furnish 2% of accessory components as scheduled. Furnish replacement materials from same production run as materials installed. Package replacement materials with protective covering, identified with appropriate labels.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 General

Minimum 20 gauge cold-rolled steel sheet metal, washed to receive powder coated baked enamel finish, higher gauge where indicated to provide appropriate loading capacity. Shelving shall meet the requirements of ANSI MH28.1.

#### 2.1.2 Open Shelving

Provide heavy-duty open shelving units consisting of four upright corner pilasters, slotted to receive clips clipped together with shelves as indicated. Provide cross-braces laterally and at ends as required for stability with intended load and solid sheet metal backing. Shelves adjustable 1-1/2" on center. Provide 32" wide by 87" high units, unless otherwise indicated on drawings or in specifications.

Provide number of shelves as indicated of standard 24" depth.

#### 2.1.3 Lateral Cross Braces

Minimum 12 gauge, 1" wide steel band, formed and punched at each end, capable of bolting to T sections. provide one pair of cross braces for every three sections of under 30".

#### 2.1.4 Crosswise Dividers

Minimum 24 gauge steel for shelves up to 18" high and 24" deep, minimum 20 gauge steel for shelves over 18" high and 24" deep, punched for attaching to shelves.

#### 2.1.5 Lengthwise Dividers

Steel gauge as required by shelf spacing.

#### 2.1.6 Bases

Channel-shaped to engage upright T sections with spring fasteners, minimum

20 gauge for 3" base, minimum 18 gauge for 6" base.

## 2.2 FINISHES

Provide units in finishes and colors as selected by the Contracting Officer from manufacturer's standard finishes and colors.

### 2.2.1 General

Pallet rack system shall be designed for a load capacity of 38,000 pounds per bay, minimum 1/16 inch cold-rolled steel, higher gauge where indicated to provide appropriate loading capacity, dimensions as indicated on the drawings.

### 2.2.2 Main Beams

Minimum 1/16 inch cold-rolled steel, sized for clear span of 60 inches. Beam end connectors shall be heavy gauge steel with prong connection or attachment to upright slots at 3 inches o.c. Penco Type "N" for a 120 inches span.

### 2.2.3 Frame Bracing

Steel tube, channel or angles welded to uprights as required for specified loads.

### 2.2.4 Upright Columns

Continuous steel post, roll formed with slanted slots on both sides of upright columns at 3 inches o.c. to accept beams.

### 2.2.5 Frame Protector

Minimum 2 x 2 inch steel angle, 18 inches high, bolted or welded to upright column.

### 2.2.6 Bases

Heavy gauge steel plate welded to upright column to provide load distribution over a minimum 13.7 sq. in. and two holes to allow for anchoring to floor from either side of the frame.

### 2.2.7 Rigid Row Spacers

Manufacturer's standard for connecting and spacing rows of racks back-to-back, bolted type attachment. Back-to-back separation shall be 12 inches.

### 2.2.8 Unit Configuration

Provide pallet units in configuration as indicated on the drawings.

## PART 3 EXECUTION

### 3.1 INSPECTION

Inspect areas and conditions in which metal storage shelving will be installed. Verify locations of power feeds, positioning of exits and aisle ways and overall dimensions of space, including height and HVAC

venting.

### 3.2 PREPARATION

Prior to installation of shelving system, vacuum floor surface to remove dust, debris and loose particles. Resilient flooring wet mopped and dried or finish buffed. Verify that components, including size and finish are those specified before installing.

### 3.3 INSTALLATION

Install shelving system and accessories after finishing operations, including painting have been completed. Install system to comply with final layout drawings, in strict compliance with manufacturers printed instructions. Position units level, plumb; at proper location relative to adjoining units and related work. Adjust accessories to provide visually acceptable installation.

### 3.4 FIELD QUALITY CONTROL

Remove and replace shelving components which are chipped, scratched, or otherwise damaged and which do not match adjoining work. Provide new matching units, installed as specified and in manner to eliminate evidence of replacement.

### 3.5 ADJUST

Adjust components and accessories to provide visually acceptable installation.

### 3.6 CLEANING

Immediately upon completion of installation, clean components and surfaces following manufacturer's recommended procedures.

Remove surplus materials, rubbish and debris resulting from installation upon completion of work and leave areas of installation in neat, clean condition.

### 3.7 DEMONSTRATION

Upon completion of installation of system, inspect and determine capability and compliance with requirements. Repair or replace units which are not functional. All shelves and/or accessories shall be smoothly in place with no visual buckling or non-alignment of parts evident.

### 3.8 PROTECTION

Protect system against damage during remainder of construction period. Advise owner of additional protection needed to ensure that system will be without damage or deterioration at time of Substantial Completion.

---END OF SECTION---

SECTION 10 90 00.00 48

MISCELLANEOUS SPECIALTIES (PARTIAL OMAR FUNDED)  
04/06

PART 1 GENERAL

1.1 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. The following shall be submitted in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Mail Boxes; FIO

Drawings showing construction and installation details.

SD-03 Product Data

Product certification and installation recommendation data.

Acceptable Manufacturer Products; FIO

Manufacturers products listed in this specification are referenced to establish a standard of quality. When the specific product listed is submitted by the Contractor, that submittal will be considered For Information Only. When an equal to that named in this specification or Section 09915 is submitted, it shall be for Government Approval (G). The following manufacturer products are specifically mentioned in this specification:

Refrigerator, G

Microwave, G

Ballet Rail; G

Letter Drop  
(Same manufacturer as mail boxes.)

Mail Boxes, FIO

Mail Box Manuf. Product submitted as an "or equal"; G

Security Mesh: FIO

Woven Wire Products Association Member  
[www.wovenwire.org](http://www.wovenwire.org)

Security Mesh Manuf. Product submitted as an "or equal"; G

Provide data describing security mesh installation and recommendations.

Mooring Eye Floor Casting: Neenah Foundry Co. No. R-3490/R3490-A.;  
FIO

Box 729  
Neenah,WI 54957 414-725-7000

Mooring Eye Manuf. Product submitted as an "or equal"; G

SD-04 Samples

Color Charts; FIO

Submit color chart for mailbox.

## 1.2 DELIVERY AND STORAGE

All items shall be delivered to the project site in manufacturer's undamaged containers.

## 1.3 WARRANTY

Provide manufacturer's standard warranty for the items.

## PART 2 PRODUCTS

### 2.1 MAILBOXES

#### 2.1.1 General

Mailboxes shall be U.S. Postal Service approved. Mailboxes, materials, sizes, construction, and installation shall comply with U.S. Postal Service regulations and shall be fully approved by the U.S. Postal Service.

#### 2.1.2 Materials

Quantities and arrangement of mailboxes shall be as indicated on the drawings. Mailboxes shall be rear-loading type with sheet aluminum rear door with a continuous piano hinge on one side and a keyed lock on the other side strengthened with formed sheet aluminum stiffeners. Framework supporting compartment doors shall be fabricated from high strength extruded aluminum alloy. Compartment doors shall be fabricated from high strength extruded aluminum alloy, with a minimum of 3.2 mm thickness, and swing on concealed hinge pins. The compartment door shall be double wide to accept minimum 8.5" x 11" size mail without bending. When closed, the door shall interlock with frame member along hinge side and shall be precision fitted to preclude prying. Doors shall be reinforced vertically along both sides and near center with integral ribs. Locks on individual compartment doors shall be springlatch type lock actuated by a cam type lock with two change keys per lock and a minimum of 1000 available key changes. All locks within project shall be keyed differently. Compartment construction shall be double-walled high strength sheet aluminum alloy with vertical stiffeners of formed aluminum. Finish shall be as indicated on the drawings. Mail box manufacturer shall furnish aluminum channel type cardholders with pressure sensitive backing to accommodate 7/16" by 2 1/2 inch cards for individual and/or unit names. Provide spring hinged front door letter drop with finish to match mail boxes. Door shall have engraved "Mail Drop". Minimum size of 5" high x

12 5/8" wide. Provide wall liner secured to letter drop.

### 2.1.3 Color

Color shall be in accordance with finish schedule located on drawings.

## 2.2 SECURITY MESH

Security mesh shall be a minimum of (8) .025 plain steel mesh 1/16" thick and weigh a minimum of .75 pounds per square foot. The mesh shall be diamond type with a minimum of 73 percent open area. The overall mesh size and orientation shall be as recommended by the manufacturer.

## 2.3 MOORING EYE

Mooring eye shall be a standard casting product constructed of ductile iron and made to be installed in concrete with top of casting flush with top of finish concrete.

### 2.3.1 Open Work Bench

Open work bench, adjustable height unit from 30 to 60 inch with laminated hardwood top. Provide back and end stops; riser with electric stop; case and drawer 22 inch wide, 72 inch shelf and stringer. Standard finish for all steel parts shall be "Gray" baked enamel.

### 2.3.2 Refrigerator

UL 250, refrigerator with frostproof top freezer, minimum 20 cubic feet, automatic defrosting, two vegetable bottom baskets, two door shelves and minimum 12 egg container in the door, separate interior shelves, multiple door shelves, and door mounted ice and water dispenser. Provide reversible left and right swing doors. Provide four fixed rollers or adjustable leg levelers. Refrigerator shall be white.

### 2.3.3 Microwave

UL 923, with black glass window door, minimum 1.5 cubic feet capacity, automatic oven light, browning element, 10 power levels, automatic temperature controls, minimum two automatic memory levels, digital time controllers, and electronic touch-control panel. Microwave shall be white.

#### 2.3.3.1 Refrigerator

UL 250, refrigerator with frostproof top freezer, minimum 20 cubic feet, automatic defrosting, two vegetable bottom baskets, two door shelves and minimum 12 egg container in the door, separate interior shelves, multiple door shelves, and door mounted ice and water dispenser. Provide reversible left and right swing doors. Provide four fixed rollers or adjustable leg levelers. Refrigerator shall be white.

#### 2.3.3.2 Compact Or Undercounter Refrigerator

Refrigerator assembly with freezer, corrosion-resistant inner lining, and minimum net capacity of 5.6. Provide minimum one ice cube tray, removable shelves, automatic interior light, adjustable cold controls, and manual (pushbutton) defrost.

PART 3 EXECUTION

3.1 INSTALLATION

Install all items in strict accordance with manufacturer's recommendations at the locations indicated on the drawings. Align and plumb all items with adjacent surfaces and set accurately in location.

3.2 PROTECTION AND CLEANING

Protect the work from other trades and remove all protective wrappings when appropriate. Clean all surfaces in accordance with manufacturer's recommendations.

3.3 INSTALLATION OF KITCHEN EQUIPMENT

Install kitchen equipment in accordance with manufacturers' instructions and NFPA 70.

-- End of Section --

SECTION 11 46 01.00 48

KITCHEN EQUIPMENT

12/09

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.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2017; ERTA 1-2 2017; TIA 17-1; TIA 17-2;  
TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6;  
TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10;  
TIA 17-11; TIA 17-12; TIA 17-13; TIA  
17-14) National Electrical Code

NSF INTERNATIONAL (NSF)

NSF Product Listing (2002) NSF Product Listings of Food  
Equipment and Related Products,  
Components, and Materials

UNDERWRITERS LABORATORIES (UL)

UL 197 (2003) Commercial Electric Cooking  
Appliances

UL 471 (2006) Commercial Refrigerators and  
Freezers

UL 489 (2016) UL Standard for Safety Molded-Case  
Circuit Breakers, Molded-Case Switches and  
Circuit-Breaker Enclosures

UL 710 (1995; Rev thru Apr 1999) Exhaust Hoods  
for Commercial Cooking Equipment

UL Elec Equip Dir (2003) Electrical Appliance and  
Utilization Equipment Directory

1.2 GENERAL REQUIREMENTS

Food service equipment shall be of the sizes and types shown and specified. Equipment, materials, and fixtures required for use in conjunction with the items to be furnished by the Government shall be furnished and installed by the Contractor. Equipment, materials, and fixtures indicated on the drawings and schedules shown as Contractor furnished and installed, shall be furnished and installed by the Contractor.

#### 1.2.1 Mechanical, Electrical, and Plumbing Work

Plumbing systems, including final connections, shall be in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE. Electrical equipment, motors, wiring, and final connections shall be in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Duct work and accessories shall be in accordance with Section 23 00 00 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEMS. Painting shall be in accordance with Section 09 90 00 PAINTS AND COATINGS. Air-conditioning systems shall be in accordance with Section 23 00 00 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEMS.

#### 1.2.2 National Sanitation Foundation Standards

Food service equipment shall meet the requirements set forth by the National Sanitation Foundation (NSF). Acceptable evidence of meeting the requirements of the applicable NSF standards shall be either the equipment listed in NSF Product Listing 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.

#### 1.2.3 Verification of Dimensions and Coordination of Project Data

The Contractor shall become familiar with all details of the work and shall advise the Contracting Officer of any discrepancy before performing any work. The Contractor shall perform the following:

- a. Horizontal and vertical dimensions shall be field verified.
- b. Contract drawings and submittal data shall be reviewed for accuracy and completeness.
- c. The installed utility capacity and location shall be field checked.
- d. Critical systems/components shall be reviewed for application and capacities such as for exhaust hoods, refrigeration systems, fire suppression systems, water, and steam/condensate line sizes and manifold configurations.
- e. Delivery shall be coordinated for access through finished openings and vertical handling limitation within the building.

#### 1.2.4 Standard Products

Materials and equipment shall be the standard products of manufacturer regularly engaged in the manufacture of the products and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. The experience used shall include applications of equipment and materials under similar circumstances and of similar size. When two or more of the same products are supplied they shall be products of one manufacturer. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

### 1.2.5 Nameplates

Each item of equipment shall bear a stainless steel, aluminum, or engraved polyester nameplate, as standard with the manufacturer, located in a conspicuous position and permanently fastened to the equipment. Name or identification plates shall be of the size standard with the manufacturer for the particular piece of equipment provided. Name plates shall reflect 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. Separate equipment identification plates with the contract number marked thereon, shall be securely fastened to the surface of each piece of equipment.

### 1.2.6 Underwriters Laboratories Standards

Electrically operated equipment shall be in accordance with applicable UL standards such as UL 471, UL 489, UL 710 and UL 197. Evidence of meeting the requirements shall be a UL label on the equipment, 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.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

Detail Drawings; G

Detail Drawings, as specified.

#### SD-03 Product Data

Food Service Equipment; G

Manufacturer's descriptive and technical literature, performance charts and curves, catalog cuts, and installation instructions. Brochures shall have front and rear protective covers with labeled project name and include an index indicating item number, quantity, description, and manufacturer, a fly sheet for each component indicating item number, name, quantity, manufacturer, optional equipment, modification, special instruction, and utility requirements, and catalog specifications sheets.

#### SD-06 Test Reports

Testing

Test reports in booklet format showing all field tests performed to prove compliance with the specified performance criteria, upon

completion and testing of the installed system. Each test report shall indicate the final position of controls.

#### SD-10 Operation and Maintenance Data

##### Food Service Equipment

Six complete copies of the service manual, not later than 3 months prior to the date of Contract Required Completion Date, with data for each different item of material and equipment specified.

#### 1.4 DELIVERY AND STORAGE

1.4.1 Delivery unless otherwise directed, the following procedures shall apply:

a. Field assembled fixed equipment integrated into structure shall be sent to jobsite when required.

b. Fixed equipment not integrated into structure shall be sent to the jobsite after completion of finished ceilings, lighting, and acidizing of the finished floor and wall systems, including painting.

c. Major movable equipment shall be delivered 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. Minor appliances and loose items shall be delivered to the jobsite when the Contracting Officer is prepared to receive and inventory such items.

#### 1.4.2 Storage

Items delivered and placed into storage shall be stored with protection from weather, humidity, and temperature variation, dirt and dust, or other contaminants.

#### 1.4.3 Protection of Fixed/Fabricated Manufactured Equipment

Fiberboard or plywood shall be taped to surfaces as required by equipment shape and installation access requirements.

#### 1.4.4 Prohibited Use of Equipment

Food service equipment shall not be used as tool and material storage, work bench, scaffold, or stacking area.

#### 1.4.5 Damaged Equipment

Contractor shall immediately submit documentation to the Contracting Officer with a recommendation of action for repair or replacement and the impact on project schedule.

#### 1.5 DETAIL DRAWINGS

Data consisting of a complete list of equipment and materials shall be submitted. Detail drawings showing complete wiring, piping, and schematic diagrams, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall 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 shall be separate drawings and shall be the Contractor's standard sheet size, but not smaller than the contract drawings, and indicate the food service equipment and cold storage assemblies with itemized schedule, and special conditions drawings indicating size and location of slab depressions, cores, wall openings, blockouts, ceiling pockets, blocking grounds, ceiling, and/or wall, access panels, and above ceiling hanger assemblies, rough-in plumbing/mechanical systems and rough-in electrical systems.

b. Detail drawings by manufacturer shall be separate drawings; sheet size shall be 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.

c. Detail drawings by the Contractor that show the size, type, and location of equipment drain lines, and floor drains. Drawings shall 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.

## PART 2 PRODUCTS

### 2.1 EQUIPMENT

Manufacturer's listed herein are for design basis only and do not limit vendor selection. Compliance with specified parameters is required.

#### 2.1.1 ITEM NO.:1, HAND SINK, SOAP & TOWEL DISPENSER

MANUFACTURER: ADVANCE TABCO (OR EQUAL)

MODEL NO.: 7-PS-81

STD FEATURES:

- A. STAINLESS STEEL HAND SINK, COMBINATION UNIT WITH SOAP AND TOWEL DISPENSERS.
- B. ONE PIECE DEEP DRAWN STAINLESS STEEL SINK.
- C. SPLASH-MOUNTED ELECTRONIC GOOSENECK FAUCET, BATTERY OPERATED.
- D. LEVER OPERATED DRAIN.

ACCESSORIES:

NONE

#### 2.1.2 ITEM NO.:2, VEGETABLE SINK

MANUFACTURER: ADVANCE TABCO (OR EQUAL)

MODEL NO.: 94-42-48-24L/R

STD FEATURES:

- A. STAINLESS STEEL (20"x20") INDIVIDUAL DEEP DRAWN SINK BOWLS WITH INTEGRAL LEFT AND RIGHT DRAINBOARDS.
- B. STAINLESS STEEL LEGS
- C. ALL WELDED CONSTRUCTION

ACCESSORIES:

- A. 24 INCHES DRAINBOARDS.
- B. ONE 12 INCHES SPLASH MOUNTED SWING SPOUT (ITEM 2B),

- HOT AND COLD WATER.
- C. ONE 12 INCHES SPLASH MOUNTED SPOUT, COLD FILTERED WATER.
- D. TWO LEVER WASTE DRAINS WITH BUILT IN OVERFLOW. (ITEM 2C)
- E. RIGHT SIDE SPLASH WITH ENCLOSED EXPOSED SIDE.
- F. FILTERED WATER FOR SINGLE FAUCET FROM WATER FILTER ITEM #5.

2.1.3 ITEM NO.:3A, THREE COMPARTMENT SINK, POWERED

MANUFACTURER: HOBART (OR EQUAL)  
MODEL NO.: TURBOWASH 2  
STD FEATURES:

- A. 14 GAUGE STAINLESS STEEL CONSTRUCTION.
- B. WATERPROOF CONTROLS.
- C. THREE LEVERWASTE DRAINS WITH OVERFLOW.
- D. 1.5 INCHES ROLLED EDGE, SOILED END.
- E. 42 INCHES DRAINBOARD, SOILED.
- F. 18 INCHES DISPOSER SINK.
- G. 14 INCHES DRAINBOARD.
- H. 36 INCHES WASH SINK.
- I. 24 INCHES RINSE SINK.
- J. 24 INCHES SANITIZER SINK.
- K. 33 INCHES DRAINBOARD, CLEAN END.
- L. 2.5 INCHES SIDE SPLASH, CLEAN END.

ACCESSORIES:

- A. INSTALL DISPOSER COLLAR FOR ITEM #3E IN DISPOSER SINK.
- B. INSTALL SANITIZING SINK HEATER ITEM #3C ON FINAL RINSE TANK.
- C. INSTALL PRE-RINSE SPRAY ASSEMBLY ITEM #3B ON BACKSPLASH.
- D. I.D. PLATE "WARNING 180-DEGREE F WATER" MOUNTED ON BACKSPLASH AT RINSE COMPARTMENT.
- E. CONTROL BRACKET FOR ITEM #38 CONTROLS.
- F. TWO MIXING FAUCETS.

2.1.4 ITEM NO.:3B, PRE-RINSE SPRAY ASSEMBLY

MANUFACTURER: HOBART (OR EQUAL)  
MODEL NO.:  
STD FEATURES:

- A. 8 INCHES CENTER BACKSPLASH MOUNTED FAUCET
- B. 18 INCHES RISER
- C. SPRAY VALVE
- D. FINGER HOOK
- E. 36 INCHES STAINLESS STEEL HOSE LENGTH

ACCESSORIES:

- A. WALL BRACKET
- B. VACUUM BREAKER

2.1.5 ITEM NO.:3C, SANITIZING SINK HEATER FOR 3-COMPARTMENT SINK, POWERED,  
ITEM # 3A

MANUFACTURER: HATCO (OR EQUAL)  
MODEL NO.: 3CS-9  
STD FEATURES:

- A. ON AND OFF SWITCH WITH INDICATING LIGHT
- B. ENERGY CUT-OFF WIRED INTO THE ELECTRICAL
- C. DUAL RESERVOIR SYSTEM
- D. SIDE DRAIN

- E. SANITIZING TEMPERATURE INDICATOR
- F. LOW WATER LIGHT
- G. BALANCED 3-PHASE ELECTRICAL POWER

ACCESSORIES:

- A. ALL STAINLESS STEEL BODY AND BASE
- B. SANITIZING TEMPERATURE MONITOR

MOUNTED UNDER FINAL RINSE COMPARTMENT OF 3-COMPARTMENT  
SINK, POWERED, ITEM # 3A

2.1.6 ITEM NO.:3D, HOT WATER BOOSTER HEATER

MANUFACTURER: HATCO (OR EQUAL)

MODEL NO.: C-15

STD FEATURES:

- A. CASTONE TANK.
- B. LOW-WATER CUT-OFF.
- C. TEMPERATURE/PRESSURE RELIEF VALVE.
- D. CAST IRON PRESSURE REDUCING VALVE.
- E. TWO TEMPERATURE/PRESSURE GAUGES, INDICATOR LIGHT, AND ON/OFF SWITCH

ACCESSORIES:

- A. ALL STAINLESS STEEL BODY AND BASE.
- B. BRASS PRESSURE REDUCING VALVE IN LIEU OF CAST IRON.
- C. ADJUSTABLE STAINLESS STEEL LEGS.
- D. SHOCK ABSORBER.
- E. INTERCONNECTED WITH FAUCET OVER SANITIZING SINK OF POT SINK, ITEM #3A.

2.1.7 ITEM NO.:3E, GARBAGE DISPOSAL

MANUFACTURER: HOBART (OR EQUAL)

MODEL NO.: FD4/50

STD FEATURES:

- A. 1/2 HP GARBAGE DISPOSER, CONNECT TO ITEM 3A.
- B. WATERPROOF CONTROL CENTER.
- C. 18 INCHES DIAMETER SINK BOWL ASSEMBLY, INSTALL IN THREE COMPARTMENT SINK, POWERED, ITEM #3A.

2.1.8 ITEM NO.:5, WATER FILTER

MANUFACTURER: EVERPURE (OR EQUAL)

MODEL NO.: EV9330-42

STD FEATURES:

- A. CONNECT TO ITEMS 6, 19B, AND 19C (refer to drawings).
- B. STANDARD CARTRIDGES.

2.1.9 ITEM NO.: 6, ICE MACHINE (BONA FIDE NEED EQUIPMENT

MANUFACTURER: MANITOWOC ICE INC (OR EQUAL)

MODEL NO.: S-MODEL SERIES 322, #SY-0324A

STD FEATURES:

- A. HALF DICE CUBE SIZE, 340 lbs/24HR
- B. AIR COOLED
- C. R404A REFRIGERANT
- D. 1/2 H.P. COMPRESSOR
- E. STAINLESS STEEL FINISH

ACCESSORIES:

- A. B-320 STAINLESS STEEL BIN WITH POLYETHYLENE SEAMLESS BIN

LINER

2.1.10 ITEM NO.:7, FREEZER, 1-SECTION MOBILE (BONA FIDE NEED EQUIPMENT)

MANUFACTURER: DELFIELD (OR EQUAL)

MODEL NO.: SSF1-S

STD FEATURES:

- A. STAINLESS STEEL INTERIOR AND EXTERIOR
- B. BUILT-IN DOOR LOCKS WITH HEAVY DUTY STRIKES
- C. RECESSED METAL HANDLE
- D. PRESSURE RELIEF VALVE TO PREVENT DOOR VAPOR LOCK
- E. EXTERIOR DIGITAL THERMOMETER WITH HIGH/LOW TEMPERATURE ALARM.
- F. THREE WIRE SHELVES PER SECTION
- G. 10' POWER CORD
- H. 6" ADJUSTABLE LEGS
- I. 2 YEAR PARTS AND LABOR WARRANTY
- J. 5 YEAR COMPRESSOR WARRANTY

2.1.11 ITEM NO.:8, REFRIGERATOR, 2-SECTION MOBILE (BONA FIDE NEED EQUIPMENT)

MANUFACTURER: DELFIELD (OR EQUAL)

MODEL NO.: SSR2-S

STD FEATURES:

- A. STAINLESS STEEL INTERIOR AND EXTERIOR
- B. BUILT-IN DOOR LOCKS WITH HEAVY DUTY STRIKES
- C. RECESSED METAL HANDLE
- D. PRESSURE RELIEF VALVE TO PREVENT DOOR VAPOR LOCK
- E. EXTERIOR DIGITAL THERMOMETER WITH HIGH/LOW TEMPERATURE ALARM.
- F. THREE WIRE SHELVES PER SECTION
- G. 10' POWER CORD
- H. 6" ADJUSTABLE LEGS
- I. 2 YEAR PARTS AND LABOR WARRANTY
- J. 5 YEAR COMPRESSOR WARRANTY

2.1.12 ITEM NO.:12, WORK TABLE, MOBILE (BONA FIDE NEED EQUIPMENT)

MANUFACTURER ADVANCE TABCO (OR EQUAL)

MODEL NO.: VSS-365

- A. TWO 5 INCHES DIAMETER NON-MARKING, BALL BEARING, STEM-TYPE CASTERS (MODEL #TA-25)
- B. TWO CASTERS WITH LOCKING BRAKES (MODEL #TA-25B)
- C. 20 INCHES X 20 INCHES X 5 INCHES DEEP STAINLESS STEEL DRAWER WITH REMOVABLE INSET (MODEL #SHD-2020)

2.1.13 ITEM NO.:13A, FOOD PREPARATION TABLE (BONA FIDE NEED EQUIPMENT)

MANUFACTURER: ADVANCE TABCO (OR EQUAL)

MODEL NO.: VSS-306/SWT-72

STD FEATURES:

- A. CANTILEVER 2-BAR STAINLESS STEEL POT RACK WITH POT HOOKS (18)
- B. 20 INCHES X 20 INCHES X 5 INCHES DEEP STAINLESS STEEL DRAWER WITH REMOVABLE INSET (MODEL #SHD-2020)
- C. STAINLESS STEEL UNDERSHELF

2.1.14 ITEM NO.:13C, CAN OPENER, MANUAL (BONA FIDE NEED EQUIPMENT)

MANUFACTURER: EDLUND (OR EQUAL)

MODEL NO.: S-11

STD FEATURES:

- A. MANUAL OPERATED, MOUNTED TO FOOD PREPARATION TABLE ITEM #13A.

2.1.15 ITEM NO.:14, COLD FOOD COUNTER, MOBILE (BONA FIDE NEED EQUIPMENT)

MANUFACTURER: DELFIELD (OR EQUAL)

MODEL NO.: SCSC-60B

STD FEATURES:

- A. 7" DEEP STAINLESS STEEL REFRIGERATED COLD PAN
- B. FOUR 5 INCHES DIAMETER, HEAVY DUTY, DOUBLE BALL BEARING SWIVEL CASTERS WITH NON-MARKING RUBBER TIRES.
- C. TWO CASTERS WITH BRAKES.
- D. MECHANICAL REFRIGERATION.
- E. ON/OFF SWITCH, PILOT LIGHT AND NEMA 5-15P PLUG WITH 6 FOOT THREE-WIRE CORD UL LISTED.
- F. 1 INCH IPS DRAIN WITH VALVE AT BOTTOM OF UNIT.
- G. STAINLESS STEEL EXTERIOR BODY.

ACCESSORIES:

- A. TWO TIER DISPLAY WITH GLASS SHELVES AND ADJUSTABLE SNEEZE GUARDS (MODEL DCFSH) WITH FLUORESCENT LIGHT FIXTURE ON BOTH TIERS.
- B. 10" FOLD DOWN STAINLESS STEEL WORKSHELF ON KITCHEN SIDE.
- C. DRY STORAGE COMPARTMENT BELOW - DOUBLE DOOR (MODEL SG5B).

2.1.16 ITEM NO.: 15, HOT FOOD COUNTER, MOBILE (BONA FIDE NEED EQUIPMENT)

MANUFACTURER: DELFIELD (OR EQUAL)

MODEL NO.: SH-4-NU

STD FEATURES:

- A. 1000 WATT HEATING SYSTEM FOR EACH FOOD PAN WELL WITH ADJUSTABLE CONTROL THERMOSTAT WITH "OFF" POSITION AND NEON PILOT LIGHT
- B. FOUR 5 INCHES DIAMETER, HEAVY DUTY, DOUBLE BALL BEARING SWIVEL CASTERS WITH NON-MARKING RUBBER TIRES
- C. TWO CASTERS WITH BRAKES
- D. 6 FOOT CORD AND PLUG SET
- E. STAINLESS STEEL EXTERIOR BODY.

ACCESSORIES:

- A. GLASS FOOD PROTECTOR AND ADJUSTABLE SNEEZE GUARD (MODEL DCFSFS) WITH FLUORESCENT LIGHT FIXTURES AND SLIMLINE HEAT LAMP.
- B. FOOD WELLS WITH INDIVIDUAL DRAINS MANIFOLDED TO ONE 3/4 INCH DRAIN VALVE.
- C. 10" FOLD DOWN STAINLESS STEEL WORKSHELF ON KITCHEN SIDE.
- D. DRY STORAGE COMPARTMENT BELOW - DOUBLE DOOR (MODEL SGSB).

2.1.17 ITEM NO.:16A, MIXER (BONA FIDE NEED EQUIPMENT)

MANUFACTURER: HOBART (OR EQUAL)

MODEL NO.: HL120

STD FEATURES:

- A. STAINLESS STEEL BOWL GUARD
- B. 1/2 H.P. MOTOR
- C. 15-MINUTE TIMER

- D. THREE FIXED SPEEDS PLUS STIR SPEED
- E. 6 FEET CORD AND PLUG

ACCESSORIES:

- A. STANDARD ACCESSORY PACKAGE, INCLUDES 12 QUART STAINLESS STEEL BOWL, FLAT "B" BEATER, "D" WIRE LOOP WHIP.

2.1.18 ITEM NO.:16B, MIXER STAND (BONA FIDE NEED EQUIPMENT)

MANUFACTURER: ADVANCE TABCO (OR EQUAL)

MODEL NO.: MX-SS-302

STD FEATURES:

- A. STAINLESS STEEL UNDERSHELF
- B. STAINLESS STEEL LEGS
- C. UTENSIL RACK

ACCESSORIES:

- A. TA-25 CASTERS IN LIEU OF LEGS

2.1.19 ITEM NO.:17, SECURITY SHELF UNIT (BONA FIDE NEED EQUIPMENT)

MANUFACTURER: INTERMETRO INDUSTRIES CORP (OR EQUAL)

MODEL NO.: SUPER ERECTA SHELF MOBILE SECURITY UNIT SEC55LC

STD FEATURES:

- A. APPROXIMATE SIZE: 50 1/2 INCHES L X 28 INCHES W X 68 1/2 INCHES H.
- B. HEAVY DUTY MOBILE SECURITY STORAGE RACKS WITH HEAVYGAUGE OPEN WIRE CONSTRUCTION; CHROME PLATED STEEL MODEL NUMBER SEC55LC
- C. FULL LENGTH REINFORCED DOOR SWINGS 270-DEGREES, CAN BE SECURED TO SIDES OF UNIT
- D. DOOR INCLUDES ERGONOMIC HANDLE WITH HASP TO ALLOW USE OF PADLOCK
- E. HEAVY-GAUGE ALUMINUM DOLLY WITH BOLTED CONSTRUCTION, WRAP AROUND ALUMINUM REINFORCED EXTRUDED VINYL BUMPERS
- F. HEAVY DUTY 5" CORROSION RESISTANT POLYMER SWIVEL CASTERS WITH ABRASION RESISTANT, NON-MARKING, SHOCK ABSORBING POLYURETHANE TREADS; BEARINGS SEALED AND PERMANENTLY LUBRICATED
- G. FRONT CASTERS WITH BRAKES
- H. 300 LB CASTER LOAD RATING
- I. ASSEMBLY WITHOUT USE OF NUBS, BOLTS OR SPECIAL TOOLS

ACCESSORIES:

- A. INTERMEDIATE SUPER ADJUSTABLE SUPER ERECTA SHELVES, CHROME PLATED STEEL, 24"X48", TWO EACH UNIT, MODEL NUMBER A2448NC

2.1.20 ITEM NO.:18, SHELVING UNIT (BONA FIDE NEED EQUIPMENT)

MANUFACTURER: INTERMETRO INDUSTRIES CORP. (OR EQUAL)

MODEL NO.: 1842FS WITH 63PS POSTS.

STD FEATURES:

- A. APPROXIMATE SIZES: 42INCHES L X 18 INCHES W X 68 1/2 INCHES H.
- B. HEAVY DUTY FLAT SHELF WITH FOUR TURNED DOWN EDGES, STAINLESS STEEL, FIVE SHELVES PER UNIT.
- C. HEAVY DUTY POSTS, STAINLESS STEEL, FOUR POSTS PER UNIT.

ACCESSORIES:

- A. STEM CASTERS MODEL 5PC, 2 PER UNIT; MODEL 5PCB, 2 PER UNIT

2.1.21 ITEM NO.:19A, WORKTABLE WITH BACKSPLASH (BONA FIDE NEED EQUIPMENT)

MANUFACTURER: ADVANCE TABCO (OR EQUAL)

MODEL NO.: TVKS-307

STD FEATURES:

- A. 14 GAUGE STAINLESS STEEL TOP WITH INTEGRAL BACKSPLASH
- B. STAINLESS STEEL LEGS

2.1.22 ITEM NO.:19B, ITEM: ICE-WATER DISPENSER, MANUAL LOAD (BONA FIDE NEED EQUIPMENT)

MANUFACTURER: SERVEND (OR EQUAL)

MODEL NO.: M-90

STD FEATURES:

- A. UP TO 90 LB ICE CAPACITY.
- B. CORD AND PLUG.

ACCESSORIES:

- A. WATER DISPENSER.
- B. FILTERED WATER FROM WATER FILTER ITEM #5.

2.1.23 ITEM NO.:19C, COFFEE BREWER (BONA FIDE NEED EQUIPMENT)

MANUFACTURER: BUNN (OR EQUAL)

MODEL NO. : U3

STD FEATURES:

- A. ALL STAINLESS STEEL CONSTRUCTION
- B. TOP MOUNTED COMPONENTS
- C. 16.3 GALLONS OF COFFEE PER HOUR

ACCESSORIES:

- A. DRIP TRAY (MODEL 07284.0000)
- B. 1 CASE OF FILTERS (MODEL 20109.0000)

2.1.24 ITEM NO.:21, HOOD, TYPE 1 OVER ITEMS 9,10A, AND 11

See kitchen and mechanical drawings and specifications.

MANUFACTURER: HALTON (OR EQUAL)

MODEL NO.: KVE CAPTURE JET

STD FEATURES:

- A. UL LISTED EXHAUST HOOD WITH AIR CURTAIN SUPPLY PLENUM, CEILING MOUNTED.
- B. FIRE DAMPER IN SUPPLY DUCT COLLAR.
- C. FULL LENGTH GREASE TROUGH WITH REMOVABLE GREASE CONTAINER.
- D. SIZE AS INDICATED.

ACCESSORIES:

- A. ALL 16 GAUGE WELDED STAINLESS STEEL CONSTRUCTION.
- B. STAINLESS STEEL BAFFLE-TYPE REMOVABLE GREASE FILTERS.
- C. ONE 12 INCHES SPLASH MOUNTED SPOUT, COLD FILTERED WATER.
- D. THERMAL SENSORS.
- E. SIX LED LIGHTS WIRED TO JUNCTION BOX AT TOP OF HOOD.
- F. MATCHING STAINLESS STEEL ENCLOSURE PANELS FROM TOP OF HOOD TO FINISHED CEILING.
- G. MATCHING STAINLESS STEEL END PANELS.
- H. HOOD LIGHT SWITCH LOCATED AT FRONT OF HOOD.

2.1.25 ITEM NO.:22, HOOD, TYPE 2 FOR 3-COMPARTMENT SINK, POWERED, ITEM #3A

See kitchen and mechanical drawings and specifications.

MANUFACTURER: HALTON (OR EQUAL)

MODEL NO. : CH

STD FEATURES:

- A. REMOVABLE CONDENSATE BAFFLES
- B. FULL PERIMETER WELDED GUTTER
- C. STAINLESS STEEL DRAIN
- D. ALL 18 GAUGE STAINLESS STEEL CONSTRUCTION
- E. LIGHT SWITCH ON RIGHT SIDE OF HOOD
- F. FAN SWITCH ON LEFT SIDE OF HOOD

2.1.26 ITEM NO.:25, FLOOR MAT (BONA FIDE NEED EQUIPMENT)

MANUFACTURER: TEKNOR (OR EQUAL)  
MODEL NO.: APEX 755315  
STD FEATURES:  
A. GREASE RESISTANT

2.1.27 ITEM NO.:28, AIR CURTAIN

MANUFACTURER: MARS (OR EQUAL)  
MODEL NO.: STD42  
STD FEATURES:  
A. 1/2 H.P. MOTOR  
B. WALL MOUNTED CONTROL PANEL FOR ONE (1) MOTOR, MOUNTED ON WALL  
RIGHT OF DOOR  
C. BATTLE SHIP GRAY FINISH  
ACCESSORIES:  
A. MOTOR CONTROL PANEL  
B. DOOR LIMIT SWITCH

2.1.28 ITEM NO.:29A, FOOD PREPARATION TABLE (BONA FIDE NEED EQUIPMENT)

MANUFACTURER: ADVANCE TABCO (OR EQUAL)  
MODEL NO.: TVSS-240  
STD FEATURES:

2.2.34 ITEM NO.:30, 6 OPEN BURNERS AND 24 INCH GRIDDLE

MANUFACTURER: VULCAN (OR EQUAL)  
MODEL NO.: SX60F-6B24GN  
STD FEATURES:  
A. Stainless steel front, backriser, lift-off high shelf  
B. 6" stainless steel adjustable legs  
C. 28,000 BTU/hr open top burners with lift-off heads  
D. Shrouded flash tube pilot system (one pilot per two burners)  
E. 12" x 12" cast top grates with aeration bowls  
F. Welded crumb tray  
G. 30,000 BTU/hr. standard oven cavity measures  
26-3/4" w x 26" d x 13-3/4" h  
H. Oven thermostat adjusts from 250° to 500°F  
I. One oven rack and four rack positions for each oven  
J. 3/4" thick x 24" w griddle, 30,000 BTU/hr. total  
K. 3/4" rear gas connection and gas pressure regulator  
L. One year limited parts and labor warranty  
ACCESSORIES:  
A. Extra oven rack  
B. Reinforced backriser and high shelf for mounting salamander  
broiler  
C. Set of six casters (two locking)

## 2.2 UTILITY DISTRIBUTION SYSTEMS

Utility distribution systems shall be UL listed and conform to NFPA 70. Systems shall be prewired and preplumbed to one final connection point. Systems shall include an electrical distribution assembly and a mechanical manifold assembly as indicated. Systems shall be provided with removable 16 gauge stainless steel panels for ease of access. Systems shall be provided with floor mounting pedestals with vertical extensions for overhead service connections.

## 2.3 ELECTRICAL WORK

Electrical systems, components and accessories shall be certified to be in accordance with NFPA 70 and the following:

### 2.3.1 Installed Equipment Load

Should the electrical load of the approved equipment differ from that specified or shown on the drawings, the Contractor shall provide and install electrical service compatible with the approved equipment.

### 2.3.2 Electrical Equipment and Components

Food service equipment furnished under this section shall have loads, voltages, and phases compatible with building system, and shall conform to manufacturer standards.

### 2.3.3 Cords and Caps

Food service equipment cord/caps shall be coordinated with related receptacles. All 120/208/240 volt "plug-in" equipment shall have Type SO or SJO cord and a plug with ground, fastened to frame/body of item. Mobile equipment shall have 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.) shall have cord/cap assembly with cord-hanger as provided by the manufacturer.

### 2.3.4 Switches and Controls

Each motor-driven appliance or electrically-heated unit shall be equipped with control switch and overload protection per UL 197 and UL 471. Switches, controls, control transformers, starters, equipment protection and enclosures shall be Industry standards for the equipment environment.

### 2.3.5 Motors

Motors at 120, 240, 208/240 and 460/480 volts shall have starter with overload protection and short circuit motor protection per manufacturer standards.

### 2.3.6 Heating Elements

Electrically-heated equipment shall have thermostatic controls. Water heating equipment shall be equipped with a positive low-water shut-off.

### 2.3.7 Receptacles and Switches

Receptacles which are located in vertical panels of closed base bodies

shall be installed 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. Receptacles which are located in closed base fixtures shall be prewired to a junction box located within 6 inches from the bottom of the utility compartment. Receptacles which are installed in/on fabricated equipment shall be horizontally-mounted in a metal box with a stainless steel cover plate.

#### 2.3.8 Light Fixtures

Light fixtures with lamps which are installed in/on fabricated or field-assembled equipment shall be prewired to a junction box for final connection (fixtures shall be continuous run when indicated). Fluorescent display light shall be installed the full-length of the display stand and serving shelf with stud bolts or as indicated, and shall be prewired through a support post to a recess-mounted switch. Heat lamps shall be installed to underside of serving shelf assemblies as specified. Heat lamp length for chassis shall be sized per manufacturer or as indicated on the drawings. Cold storage light fixtures shall be electrically connected through the hub fitting located on the top of the fixture. Horizontal conduit shall be above the ceiling panels. Plastic sleeves shall be installed through ceiling panels for electrical conduit and the penetrations shall be sealed airtight at both sides of panel.

#### 2.3.9 Final Electrical Connection Provisions

Final electrical connection points of equipment shall be tagged with item number, name 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, shall 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) shall have electrical components completely interconnected by this section for final connection as indicated on utility connection drawing. The following groups of cold storage assembly electrical devices shall be prewired 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.

#### 2.3.10 Lamps

Food service equipment containing light fixtures shall have standard appliance type bulbs or energy efficient appliance type bulbs as indicated on the drawings. Exposed fluorescent lamps above or within a food zone shall have plastic coated T-8 energy efficient lamps or standard lamps, sleeved in plastic tube with end caps.

#### 2.4 COLOR

Color shall be in accordance with Section 09 90 00 PAINTS AND COATINGS.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Equipment shall be installed at locations shown in accordance with NSF Product Listing and the manufacturer's written instructions. The Contractor shall make provision for the plumbing, heating, and electrical connections and for equipment indicated as being furnished and installed by the Government.

#### 3.1.1 Equipment Connections

Equipment connections shall be complete for all utilities. Unless otherwise specified, exposed piping shall be chromium-plated copper alloy. Steam operating pressure shall be as indicated.

#### 3.1.2 Backflow Preventers

Backflow preventers shall be furnished 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. Backflow preventers shall be installed 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. Backflow preventers shall be provided 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 Plumbing Work

Plumbing final connection points of equipment shall be tagged, indicating item number, name of devices or components, and type of utility (water, steam, drain). Extensions of indirect waste fitting shall be provided to open-sight hub drain, floor sink or floor drains from food service equipment.

### 3.2 TESTING

Equipment shall be inspected and tested under operating conditions after installation. If inspection or test shows defects, such defects shall be corrected, and inspection and test shall be repeated.

#### 3.2.1 Operating Tests

An operating test shall be performed on all items after complete installation and adjustment. The failed test item shall be corrected and the test shall be rerun.

#### 3.2.2 Clean and Adjust

Debris resulting from this work, as the installation progresses, shall be removed from the jobsite. All food service equipment, prior to demonstration, shall be cleaned and polished, both interior/exterior. Drawer slides and casters shall be lubricated and adjusted. Pressure regulating valves, timed-delay relays, thermostatic controls, temperature sensors, and exhaust hood grilles shall be adjusted, as required, for proper operation. Faucet aerators and line strainers shall be cleaned or

replaced. Damage to painted finishes shall be touched up.

### 3.2.3 Equipment Start-Up/Demonstration

The Contractor shall obtain the services of the manufacturer's representative experienced in the installation, adjustment and operation of the equipment specified. The representative shall supervise the start-up, adjustment, and testing of the equipment, prior to the demonstration. Selected items of equipment and attendees shall be scheduled, with the Contracting Officer, at least 2 weeks in advance of demonstration periods. Equipment shall be carefully tested, adjusted, and regulated in accordance with the manufacturer's instructions and shall be so certified in writing. A thorough operational demonstration shall be provided of all equipment and instructions furnished for general and specific care and maintenance. The Contractor shall submit maintenance manuals as specified in the Submittals paragraph 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. The instructions shall 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.

-- End of Section --

SECTION 12 24 13

ROLLER WINDOW SHADES  
08/17

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

Provide roller window shades, complete with necessary brackets, fittings, and hardware as indicated on the drawing. Mount and operate equipment in accordance with manufacturer's instructions. Windows to receive a shade must 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 minimum 6 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 (2015) Standard Practice for 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

1.3 SUBMITTALS

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

are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES

SD-02 Shop Drawings

Installation; G

SD-03 Product Data

Window Shades; G

Recycled Content for various fiber components; S

SD-04 Samples

Window Shades; G

SD-06 Test Reports

Window Shades

SD-08 Manufacturer's Instructions

Window Shades

SD-10 Operation and Maintenance Data

Window Shades

SD-11 Closeout Submittals

Warranty; G

1.4 QUALITY ASSURANCE

1.4.1 Qualifications

1.4.1.1 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.

1.4.1.2 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.

1.4.2 Flammability Requirements

Passes in accordance with NFPA 701 small and large-scale vertical burn. Materials tested must be identical to products proposed for use.

#### 1.4.3 Anti-Microbial Requirements

'No Growth' per ASTM G21 results for fungi ATCC9642, ATCC 9644, ATCC9645.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

Deliver components to the jobsite in the manufacturer's original packaging with the brand or company name, item identification, and project reference clearly marked. Store components in a dry location that is adequately ventilated and free from dust, water, or other contaminants and has easy access for inspection and handling. Store materials flat in a clean dry area with temperature maintained above 50 degrees F. Do not open containers until needed for installation unless verification inspection is required.

#### 1.6 WARRANTY

Provide 10 year minimum limited warranty.

### PART 2 PRODUCTS

#### 2.1 WINDOW SHADES

Roller tube must operate smoothly and be of sufficient diameter and thickness to prevent excessive deflection. Provide brackets that are appropriate for inside mount. The shade cloth must meet the performance described in NFPA 701, small scale test. Treat steel features for corrosion resistance.

Provide Various Fiber Components with a minimum of 60 percent recycled content. Provide data identifying percentage of recycled content for various fiber components.

##### 2.1.1 Light Filtering Shades

Provide light filtering window shades to conform with the following:

- a. Roller tube must 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 must allow easy installation and removal of roller. Fabric must be connected to the roller tube with doublesided adhesive specifically developed to attach coated textiles to metal to eliminate horizontal impressions in fabric or attached with a spline lock system.
- b. Fascia must 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.
- c. End caps must be stamped steel with universal design suitable for mounting to window mullions. Provide size compatible with roller size. End cap covers must match fascia/headbox finish.
- d. Provide hardware that allows for field adjustment or removal of shade roller tube and other operable hardware component 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 must 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 must 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 must be adjustable for future change. Provide positive mechanical engagement of drive mechanism to shade roller tube. The drive bracket must be fully integrated with all accessories. Drive chain must be #10 stainless steel chain rated to 90 lb. minimum breaking strength.

#### 2.1.2 Room Darkening Shades/Features

Provide sill and side channels for shades in classroom, for additional light blockage with the following:

Provide light trap made of sheet steel having a minimum thickness of 22 gauge or anodized, extruded, aluminum. The legs of the channels must 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 must be smooth pile light seal. The exposed face of the head box must be hinged or removable for access to the shade roller. The interior or unexposed surfaces of the light trap must have a finish coat of flat black enamel. The exposed portions of the light trap must have a factory-applied priming coat of gray paint.

#### 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 must be 3 percent.

### 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

Do not install building construction materials that show visual evidence of biological growth.

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, must 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 14 24 23

HYDRAULIC PASSENGER ELEVATORS

05/16

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2015; Errata 1 2015; Errata 2 2016)  
Structural Welding Code - Steel

ASME INTERNATIONAL (ASME)

ASME A17.1/CSA B44 (2016) Safety Code for Elevators and Escalators

ASME A17.2 (2017) Guide for Inspection of Elevators, Escalators, and Moving Walks Includes Inspection Procedures for Electric Traction and Winding Drum Elevators, Hydraulic Elevators, and Escalators and Moving Walks

ASME B16.11 (2016) Forged Fittings, Socket-Welding and Threaded

ASME B16.9 (2018) Factory-Made Wrought Buttwelding Fittings

ASTM INTERNATIONAL (ASTM)

ASTM A106/A106M (2018) Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service

ASTM A53/A53M (2018) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41 (1991; R 1995) Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits

INTERNATIONAL CODE COUNCIL (ICC)

ICC IBC (2018) International Building Code

NATIONAL ELEVATOR INDUSTRY, INC. (NEII)

NEII-1 (2000; R thru 2017) Building  
Transportation Standards and Guidelines,  
including the Performance Standards Matrix  
for New Elevator Installation

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 101 (2018; TIA 18-1; TIA 18-2; TIA 18-3) Life  
Safety Code

NFPA 70 (2017; ERTA 1-2 2017; TIA 17-1; TIA 17-2;  
TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6;  
TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10;  
TIA 17-11; TIA 17-12; TIA 17-13; TIA  
17-14; TIA 17-15; TIA 17-16; TIA 17-17 )  
National Electrical Code

NFPA 70E (2018; TIA 18-1; TIA 81-2) Standard for  
Electrical Safety in the Workplace

NFPA 72 (2019; TIA 19-1; ERTA 2019) National Fire  
Alarm and Signaling Code

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-560-01 (2017, with Change 1, 2018) Operations and  
Maintenance: Electrical Safety

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

36 CFR 1191 Americans with Disabilities Act (ADA)  
Accessibility Guidelines for Buildings and  
Facilities; Architectural Barriers Act  
(ABA) Accessibility Guidelines

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation;  
submittals not having a "G" designation are for information only. When  
used, a designation following the "G" designation identifies the office  
that will review the submittal for the Government. Submittals with an "S"  
are for inclusion in the Sustainability eNotebook, in conformance with  
Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in  
accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Elevator System; G

Elevator Components; G

Elevator Machine; G

Elevator Controller; G

Wiring Diagrams; G

SD-03 Product Data

Elevator and Accessories; G  
Elevator Components; G  
Data Sheets; G  
Elevator Microprocessor Controller; G

SD-05 Design Data

Emergency Power Systems  
Heat Loads  
Reaction Loads

SD-07 Certificates

Elevator Parts and Components Price Lists; G  
Warranty  
Endorsement Letter  
Welders' Qualifications  
Elevator Controller Certification; G

SD-10 Operation and Maintenance Data

Elevator, Data Package 4; G  
Maintenance Control Program (MCP); G  
Software and Documentation; G

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA and 01 78 24.05 20 FACILITY OPERATION AND MAINTENANCE SUPPORT INFORMATION.

1.2.1 Shop Drawing Requirements

Provide assembly and arrangement of elevator, accessories, and elevator components. Show location of elevator machine in machinery space (MS). Show location of elevator controller in elevator control room (CR). Provide details for materials and equipment, including but not limited to operating and signal fixtures, doors, door and car frames, car enclosure, controllers, motors, guide rails and brackets, layout of hoistway in plan and elevation, and other layout information and clearance dimensions.

1.2.2 Product Data Requirements

Provide manufacturers' product data for all elevator components, including but not limited to the following: elevator controller, hydraulic pump unit, hydraulic pump and motor, hydraulic cylinder, hydraulic piping and fittings, car and hall fixture buttons and switches, cab and control room communication devices, door operator, door protection system, car roller

guides, and buffers. For data sheets, provide document identification number or bulletin number, published or copyrighted prior to the date of contract bid opening. Provide controller manufacturer's published procedures for performance of each and all testing required by ASME A17.1/CSA B44.

### 1.2.3 Design Data

#### 1.2.3.1 Reaction Loads

Provide calculations by registered professional engineer for reaction loads imposed on building by elevator system. Demonstrate calculations complying with ASME A17.1/CSA B44

#### 1.2.3.2 Heat Loads

Provide calculations from elevator manufacturer, or by registered professional engineer, for total anticipated heat loads generated by all of the elevator equipment.

#### 1.2.3.3 Emergency Power Systems

Where the facility does have an emergency power system, confirm the elevators that will be connected to the emergency power system. Confirm the complete emergency power system and sequence of operation for all elevators, including operation of the elevator lobby manual selection switch. Provide wiring diagrams for building emergency power interface with elevator controls. For elevators not supplied by an emergency power system, provide manufacturers' product data for auxiliary power systems.

#### 1.2.4 Welders' Requirements

Comply with AWS D1.1/D1.1M, Section 5. Include certified copies of field welders' qualifications. List welders' names with corresponding code marks to identify each welder's welding work

#### 1.2.5 Maintenance Control Program (MCP)

For each elevator, prepare and provide a written Maintenance Control Program (MCP) that complies with ASME A17.1/CSA B44 Section 8.6, including written documentation that details the test procedures for each and every test that is required to be performed by ASME A17.1/CSA B44. Assemble all MCP documentation, and supporting technical attachments, in a single MCP package and provide in both electronic and hard copy. Assemble entire hard copy MCP in 3-ring binders. For each elevator provided, the MCP must include only documentation and instruction that apply to the elevator specified.

For each elevator, provide an additional, separate binder that includes all maintenance, repair, replacement, call back, and other records required by ASME A17.1/CSA B44. The records binder must be kept in the elevator mechanical room, maintained by elevator maintenance and service personnel, and be available at all times to authorized personnel.

Provide detailed information regarding emergency service procedures and elevator installation company personnel contact information. Provide a listing of all tools to be provided to the Contracting Officer as components of the elevator system.

### 1.3 QUALITY ASSURANCE

#### 1.3.1 Qualification

Provide a designed and engineered elevator system by an elevator contractor regularly engaged in the installation of elevator systems. Provide elevator components manufactured by companies regularly engaged in the manufacture of elevator components. Utilize only licensed and certified elevator personnel for the installation, adjusting, testing, and servicing of the elevators.

##### 1.3.1.1 Elevator Contractor's Elevator Technicians

For elevator installations in the United States, including United States territories, perform all elevator related work under the direct guidance of a state certified elevator technician with a minimum of three years of experience in the installation of elevator systems of the type and complexity specified in the contract documents. Provide an endorsement letter from the elevator manufacturer, certifying that the elevator specialist is qualified. All elevator technicians must carry a current certification issued by one of the following organizations:

- a. National Association of Elevator Contractors (NAEC)
- b. National Elevator Industry Education Program (NEIEP)

##### 1.3.2 Manufacturers' Technical Support

Provide elevator components from manufacturers that provide factory training and online and live telephone elevator technical support to any elevator installation, service, and maintenance contractor. Provide elevator components from manufacturers that guarantee accessibility to all replacement and repair parts and components to any elevator installation, service, and maintenance contractor. Use only elevator component manufacturers that provide current published price lists for all elevator parts and components.

##### 1.3.3 Operation and Maintenance Data

Assemble all shop drawing and product data material into O&M Data Packages in accordance with Article SUBMITTALS. Provide two complete O&M Data Packages in hard copy and two complete electronic O&M data packages on separate CDs, in PDF format. Provide all O&M Data Packages to Contracting Officer. Include controller diagnostic documentation and software as required under Article CONTROL EQUIPMENT.

##### 1.3.4 Wiring Diagrams

Provide complete wiring diagrams and sequence of operations, which show electrical connections and functions of elevator systems. Provide one set (11 inch by 17 inch minimum size) of wiring diagrams, with individual sheets laminated in plastic and assembled in binder, to be stored in the machine room or control room cabinet. Provide one additional hard copy set and two complete electronic sets on separate CDs, in PDF format. Provide all wiring diagram sets to the Contracting Officer. Coded diagrams are not acceptable unless fully identified.

#### 1.3.5 Control Room Cabinet

For storage of O&M Data Packages and Wiring Diagrams, provide locking metal cabinet with a minimum size of 20 inch W by 12 inch D by 30 inch H. Cabinet must be sized large enough to accommodate all O&M Data and hardware required in paragraphs OPERATION AND MAINTENANCE DATA and WIRING DIAGRAMS. Coordinate location of cabinet with Contracting Officer Representative..

#### 1.4 NEW INSTALLATION SERVICE

Provide elevator warranty service in accordance with the manufacturer's maintenance plan, warranty requirements and applicable safety codes, for a period of 12 months after the date of acceptance by Contracting Officer. Perform this work during regular working hours. Provide supplies and parts to keep elevator system in operation. Perform service only by factory trained personnel. Provide Monthly services to include repairs, adjustments, greasing, oiling, and cleaning. Provide service log and update Monthly, throughout the one-year warranty period.

Provide 24-hour emergency service, with one hour on-site response time, during this period without additional cost to the Government.

##### 1.4.1 Periodic Elevator Certification Inspection and Testing

Provide elevator mechanic to support QEI Certified Elevator Inspector in the periodic six-month and the annual Category 1 elevator certification inspection and testing. Perform Category 1 inspection and testing no greater than 30 days prior to the end of the warranty period. Perform all elevator certification testing in the presence of QEI Certified Elevator Inspector.

In conjunction with the testing noted above, test systems for Emergency Power Operation, Earthquake Emergency Operation, and Hospital Emergency Commandeering Service Operation, as applicable. Schedule so that testing does not interfere with building operations.

#### 1.5 FIRE PROTECTION SYSTEM

Coordinate interface between building fire protection system and elevator controls.

Additional fire protection requirements are located in: Section 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM; Section 21 13 13.00 10 WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION; and Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

##### 1.5.1 Fire Alarm Initiating Devices

Fire alarm initiating devices are specified in Section 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM, including conduit and wiring from each detector to fire protection addressable modules in elevator machine room or control room.

##### 1.5.2 Fire Sprinklers

Provide fire sprinklers in accordance with all applicable safety codes and with Section 21 13 13.00 10 WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION. Provide shutoff valve, check valve, and non-adjustable, zero time-delay

flow switch, in each sprinkler line immediately outside of each machine room, control room, and hoistway, as applicable. Provide inspectors' test valve for periodic testing of flow switch and shunt trip disconnect.

Pipe sprinkler piping serving these spaces in a series manner with no laterals. Locate inspectors' test connection at the end of pipe runs such that operation of the test connection will purge air from system piping.

### 1.5.3 Shunt Trip Disconnect

Provide flow switches specified in paragraph FIRE SPRINKLERS to comply with ASME A17.1/CSA B44 and NFPA 72 for shunt trip of the main line power supply. For each elevator, provide control wiring connecting the flow switch to a shunt trip equipped circuit breaker located in the elevator machine room or control room. Upon flow of water, flow switch will instantaneously cause opening of the shunt-trip circuit breaker and remove power from the elevator. Flow switch must also send a signal to fire alarm control panel to indicate water flow condition.

## PART 2 PRODUCTS

### 2.1 ELEVATOR DESCRIPTION

Provide elevator system that complies with ASME A17.1/CSA B44 in its entirety, ASME A17.2 in its entirety, and additional requirements specified herein. Provide elevator system that meets or exceeds the NEII-1 Ride Quality Performance Standards Matrix (RQPSM). Comply with the RQPSM "Intermediate Performance" criteria.

Provide and install elevators in accordance with 36 CFR 1191 - ABAAS, ICC IBC, IEEE C62.41, NFPA 70 and NFPA 101 requirements.

#### 2.1.1 Elevator Design Parameters

##### 2.1.1.1 Elevator No.1 - Emergency Medical Service Accessibility (EMSA)

Provide elevator with minimum size and arrangement to accommodate an ambulance stretcher 24-inch by 84-inch with not less than 5-inch radius corners, in the open, horizontal position.

- a. Type: Holeless/Machine-Roomless
- b. Rated load: 3500 lb.
- c. Rated Speed: 125 fpm
- d. Car Door Type: Single-speed side slide.
- e. Car Door Opening Width: 3 ft.-6 in. minimum.

#### 2.1.2 Cab Enclosure and Hoistway Entrance Assemblies

Provide finishes as indicated on the drawings.

- a. Floor; Refer to finish schedule.
- b. Walls; laminated plastic on plywood. Provide each cab wall with equally spaced and equally sized wall panels. All wall panel fasteners must be concealed.

Wall trim; stainless steel.

Accessories; Provide hand rails on full length of back wall and side walls of elevator cab.

c. Car doors, car door returns, and wall reveals; stainless steel.

d. Ceilings; supported eggcrate.

Ceiling frame; stainless steel.

e. Hoistway Entrance Assembly Material and Finishes; stainless steel.

## 2.2 ELEVATOR OPERATION

ASME A17.1/CSA B44, Introduction, Section 3, Definitions.

### 2.2.1 Single, Two-Stop, Automatic Operation

Provide Single Two-Stop Automatic Operation.

## 2.3 SPECIAL OPERATION AND CONTROL

Provide the following special operations and control systems.

### 2.3.1 Keys for Elevator Key Switches

Provide a minimum of twelve keys per unique cylinder used on all key switches for a single elevator. If there is more than one elevator, additional keys will not be required unless there are additional unique lock cylinders. Provide keys with brass or fiberglass tags marked "PROPERTY OF THE U.S. GOVERNMENT" on one side with function of key or approved code number on the other side.

### 2.3.2 Firefighters' Emergency Operation (FEO)

Provide FEO equipment and signaling devices. The designated level for the FEO Phase I key operated switch is the ground floor. In the FEO Phase I fixture, provide FEO Operating Instructions.

#### 2.3.2.1 Firefighters' Emergency Operation (FEO) Key Box

Provide flush mounted, locking, FEO Key Box of a minimum size of 5 inch W by 9 inch H by 1.5 inch D. Install at a height of 6 feet above floor level and directly above the FEO Phase I key switch. Provide box equipped with lock that uses the FEO K1 key.

### 2.3.3 Hoistway Access Operation

Provide hoistway access operation with switches at top and bottom terminal landings. Locate switch 6 feet above floor level, within 12 inches of elevator hoistway entrance frame or with the ferrule exposed when located in the elevator entrance frame.

### 2.3.4 In-Car Inspection Operation

Provide In-Car Inspection Operation.

### 2.3.5 Independent Service

Provide exposed key-operated switch in car operating panel to enable independent service and simultaneously disable in-car signals and landing-call responses. Provide indicator lights that automatically illuminate during independent service. For duplex or group operation, if one car is removed from group another car will respond to its hall calls.

### 2.3.6 Elevator Auxiliary Power Operating System

Provide elevator auxiliary power operating system for all elevators.

## 2.4 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 Ride Quality Standard, including elevator ride quality and noise levels in car.

### 2.4.1 Hydraulic Pump Unit

Provide self-contained pump unit, including oil-hydraulic elevator pump, electric motor, suction-line oil strainer, 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 100 and 130 degrees F regardless of ambient temperature. Limit acoustic output.

#### 2.4.1.1 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 mega ohm 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.

### 2.4.2 Hydraulic Controls and Equipment

Provide control valve, overspeed safety valve, blowout-proof muffler, and hydraulic pump discharge strainer in the hydraulic oil supply line. Provide two 1/4 turn, ball valve type manual shutoff valves. Provide one in the elevator hoistway pit and one in the machinery space.

#### 2.4.2.1 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 must have built-in adjustment capability to operate the elevator at 140 percent of rated speed to facilitate periodic testing of the overspeed safety valve.

#### 2.4.2.2 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 must not be equipped with a manual or automatic lowering feature. Provide adjustable valve with means to seal adjustment after inspection and testing by certified elevator inspector.

#### 2.4.3 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. Provide hangers or supports for all piping and components.

##### 2.4.3.1 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 must be 3 inches larger than the outside diameter of the hydraulic oil supply line pipe and couplings.

#### 2.4.4 Hydraulic Elevator Type

Provide a holeless direct plunger type hydraulic elevator. Elevators with telescopic or inverted cylinder-plungers are not acceptable and may not be used. Rope hydraulic elevator design is not acceptable and may not be used.

##### 2.4.4.1 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.

#### 2.5 CONTROL EQUIPMENT

Enclose all elevator control equipment in factory-primed and baked-enamel coated sheet-metal cabinets with ventilation louvers and removable or hinged doors. Mount cabinets at a height of 10 inches above finish floor.

##### 2.5.1 Motor Control Equipment

Provide elevator motor control with electronic, soft-start motor starter.

##### 2.5.2 Elevator Microprocessor Controller

For each individual elevator controller, and for each group controller, provide a microprocessor controller that complies with the following paragraphs. Provide controller(s) package that includes all hardware and software required for the installation, maintenance, and service of the elevator, in its' entirety. Provide verification of technical support service that the controller manufacturer provides to any licensed elevator installation, service, and maintenance company.

Provide an elevator controller from a manufacturer that provides

comprehensive factory training to include controller installation, adjustment, service, and maintenance. The training must be identified as available to any licensed elevator contractor. Provide verification of an established and documented training schedule, with pricing, for factory training classes that manufacturer has provided for a minimum period of one year prior to contract award date.

The elevator controller must be identified as available for purchase and installation by any licensed elevator contractor. All components, parts, diagnostic tools, and software must be available for purchase and installation and use by any licensed elevator contractor; "exchange-only" provisions for the purchase of spare parts are not acceptable. The elevator controller manufacturer must publish an industry competitive price listing for all controller parts, diagnostic tools, and software.

Provide verification of telephone and internet based technical support service that the elevator controller manufacturer provides to any licensed elevator installation, service, and maintenance company at an industry competitive price. The service must include live telephone based technical support for installation, adjustment, maintenance, and troubleshooting of the elevator controller and related elevator components. The service must be available during standard working hours.

Provide an elevator controller that is designed to automatically reestablish normal elevator operation following any temporary loss of power, regardless of duration.

#### 2.5.2.1 Elevator Controller Interface Cabinet

For each individual elevator microprocessor controller, provide a separate elevator control cabinet with an integrated human interface system. For group elevator installations, a single cabinet and interface system with full access to each elevator controller may be utilized. The separate controller interface cabinet must be supplied by the elevator controller manufacturer and include a minimum 12 inch wide keyboard and a minimum 10 inch monitor. The elevator controller interface cabinet must comply with arc-flash protection requirements of NFPA 70E and UFC 3-560-01.

##### 2.5.2.1.1 Elevator Microprocessor Human Interface

The interface system must provide complete elevator controller interface capability and must include the elevator controller manufacturer's comprehensive package of installation and diagnostic software. The microprocessor interface system must provide unrestricted access to all parameters, all levels of adjustment, and all flags necessary for installation, adjustment, maintenance, and troubleshooting of each elevator and for the elevator group. All software programming must be stored in non-volatile memory. The elevator controller fault log must provide non-volatile memory fault log storage of all faults, trouble calls, and fault history for a minimum of one year and the ability to download or print the fault log. The controller interface must also provide the capability to display and diagnose trouble calls, faults, and shutdowns. Expiring software, degrading operation, and "key" access controls are not acceptable.

#### 2.5.2.2 Software and Documentation

Provide three copies of the manufacturer's maintenance and service diagnostic software, with complete software documentation, that will

enable the same level of unrestricted access to all controllers of the same make and model, regardless of the installation date or location. Provide signed certification, from the manufacturer's corporate headquarters, that guarantees that the microprocessor software and access system will not terminate the unlimited and unrestricted access at any future date.

#### 2.5.2.3 Elevator Controller Certification

For elevator installations in the United States, including United States territories, provide an elevator microprocessor controller that has a current certificate of safety code compliance issued by the Technical Standards and Safety Authority (TSSA), Toronto, Canada.

### 2.6 OPERATING PANELS, SIGNAL FIXTURES, AND COMMUNICATIONS CABINETS

For all panels and fixtures, provide identical and uniform panel and fixture design, material, finish, and components for all elevators. For all panels and fixtures, legibly and indelibly identify all buttons, devices, and all operating positions for each device. Use engraving and backfilling, or photo etching, for button and device designations. Do not use attached signs. Provide elevator manufacturers' standard grade for all key switches unless otherwise specified. All illuminating panels and fixture components must utilize LED lighting for energy efficiency.

#### 2.6.1 Car and Hall Buttons

For all cab and landing fixture buttons, provide industry-standard, vandal resistant push buttons with positive-stop assembly design. Buttons must be minimum 3/4 inch diameter, satin-finish stainless steel, with illuminating LED halo.

#### 2.6.2 Passenger Car-Operating Panel

Provide each car with one car operating panel that contains operation controls and communication devices. Provide exposed, flush mounted buttons for the controls identified in subparagraph PASSENGER CONTROLS. Provide a lockable service cabinet for the controls listed in subparagraph SERVICE CONTROLS. Use engraving and backfilling or photo etching for button and switch designations. Do not use attached signs.

##### 2.6.2.1 Passenger Controls

In addition to ASME A17.1/CSA B44 requirements, provide the following operating controls, identified as indicated:

- a. Illuminating car-call buttons identified to correspond to landings served by the elevator.
- b. "DOOR OPEN" and "DOOR CLOSE" buttons. For front and rear openings at the same floor, include the identification "F" and "R" for each opening.
- c. Red, illuminating "ALARM" button.
- d. Key-operated "Independent Service" switch.
- e. "Help" communication device to include communication between elevator cab and elevator machine room or control room.

#### 2.6.2.2 Service Controls

In addition to ASME A17.1/CSA B44 requirements, provide the following operating controls, identified as indicated:

- a. Provide a key-operated, three-position switch for "In car Inspection Operation" and "Hoistway Access". The center switch position will provide normal, automatic operation.
- b. "Car Light" switch.
- c. "Car Fan" switch with two speed settings identified.
- d. 120-volt ac 60 Hz single-phase duplex electrical outlet of ground-fault-circuit-interrupt (GFCI) design.

#### 2.6.2.3 Certificate Window

Provide a minimum 4 inch wide by 6 inch high certificate window for elevator inspection certificate. Locate window in the Service Controls door of the Car Operating Panel.

#### 2.6.2.4 Emergency Signaling Devices

Provide an audible signaling device, operable from the Car Operating Panel button marked "ALARM". The audible signaling device must have a sound pressure rating between 80 and 90 dBA at 10 ft. Provide battery backup power capable of operating the audible signaling device for at least one hour.

#### 2.6.3 Elevator In-Car Position Indicators

For all elevators, provide illuminating position indicator in the Car Operating Panel.

#### 2.6.4 Elevator In-Car Direction Indicators

For 2-stop elevator installations, provide visual direction indicators and audible car arrival signal in the elevator car door jamb, in accordance with ABA Standards. Visual indicators must be visible from the hall call fixture.

#### 2.6.5 Hall Call Landing Fixtures

Provide a hall call fixture adjacent to each elevator. Provide a single push-button for terminal landings and dual push-buttons, up and down, at intermediate landings.

##### 2.6.5.1 Designated Landing Hall Call Fixture

###### 2.6.5.1.1 Location of COMMUNICATION MEANS FAILURE (CMF) Visual Signal

When required by ASME A17.1/CSA B44, provide an elevator CMF audible and illuminating signal, and reset switch, in the FEO Designated Landing hall call fixture. Mount the signal and reset switch at a minimum of 7 inches above the "UP" hall call button.

#### 2.6.5.1.2 COMMUNICATION MEANS FAILURE (CMF) Visual and Audible Signal Operation

Provide a CMF visual and audible signal system that conforms to ASME A17.1/CSA B44. Provide continuous verification of operability of the telephone line and immediate activation of audible and visual signals when verification means determines that the telephone line is not functioning. Provide illumination of visual signal at one second intervals. Provide a minimum of 65 dBA audible signal at 30 second intervals.

#### 2.6.5.1.3 Firefighters' Emergency Operation Phase I Switch and Visual Signal

When required by ASME A17.1/CSA B44, provide an elevator Firefighters' Emergency Operation Phase I switch and illuminating visual signal in the FEO Designated Landing hall call fixture. Provide FEO Phase I visual signal that is designed with intermittent, flashing, illumination when actuated by the machine room, control room, or hoistway fire alarm initiating device. Locate FEO Phase I key switch above the CMF visual signal with a minimum of 6 inches vertical between the centerlines of the CMF signal and the FEO Phase I key switch. Locate FEO Phase I visual signal directly above the Phase I switch. In addition, locate Elevator Corridor Call Station Pictograph at top of hall call fixture.

#### 2.6.6 Elevator Car Position and Direction Indicators and Car Arrival Signal

For elevator installations with three or more stops, provide a separate hall landing fixture that includes the visual elevator position indicator, visual direction indicators, and audible car arrival signal, in accordance with ABA Standards.

#### 2.6.7 Designated Landing Elevator Identification Fixture

For duplex and group elevator installations, provide a separate elevator identification fixture for each elevator, with identification engraved and backfilled with a contrasting color. Number elevators from left to right, as seen during primary approach from building main entrance to elevator lobby. For multiple elevator groups, begin numbering with group that is closest to the building main entrance.

#### 2.6.8 Emergency or Standby Power

When emergency or standby power is provided for elevator operation, provide an elevator emergency power visual indicator that conforms to ASME A17.1/CSA B44. Locate the visual signal in the Firefighters Emergency Operation fixture for each simplex elevator and for each elevator group. When an emergency power selector switch is required, provide switch in a separate, flush mounted fixture located at the designated level, in view of all elevator entrances.

### 2.7 CAR DOOR EQUIPMENT

#### 2.7.1 Car Door Operator

Provide elevator door operator equipment and circuitry that is designed and installed as discreet communication. Serial communication must not be used for this system.

## 2.7.2 Infra-red Curtain Unit

Provide Infra-red Curtain Unit (ICU) with multiple infra-red beams that protect to the full height and width of the door opening. Provide door nudging operation.

## 2.8 PASSENGER ELEVATOR GUIDES, PLATFORM, AND ENCLOSURE

### 2.8.1 Roller Guides

Provide coil-spring loaded roller guide assemblies in adjustable mountings on each side of car and counterweight frames in accurate alignment at top and bottom of frames.

### 2.8.2 Car Enclosure Wall Panels, Return Panels, Doors, Entrance Columns, and Transom

Provide 14 Gauge minimum stainless steel cab wall panels and entrance components. Use same material and finish for all hoistway and car entrance assemblies. Apply sound-deadening material on exterior of all cab wall panels.

### 2.8.3 Car Enclosure Top

Provide reinforced, 12 gauge minimum steel car enclosure top. Provide hinged emergency exit with lock that complies with the seismic risk zone 2 or greater design requirements of ASME A17.1/CSA B44. Locate emergency exit hinge towards the rear of the elevator cab. Design and configure the elevator cab interior ceiling to provide convenient and unobstructed access to, and use of, emergency exit from inside the elevator cab.

### 2.8.4 Car Door

Provide 16 gauge minimum stainless steel car doors of sandwich construction with flush surfaces on car and landing sides. Provide a minimum of 2 door guide assemblies per door panel, one guide at leading and one at trailing door edge with guides in the sill groove their entire length of travel.

### 2.8.5 Car Entrance Sill

Provide one piece cast nickel silver, stainless steel, or white bronze entrance sill(s). Set sills level and flush with floor finish. Use same material for hoistway and car entrance sills.

### 2.8.6 Cab Finish Floor

Provide cab finish floor with top of finish floor flush with the cab sill.

### 2.8.7 Car Fan

Provide 2-speed fan for car enclosure forced ventilation. Fan must be mounted in the car enclosure top.

### 2.8.8 Car Lighting

Utilize LED lighting for elevator car interior illumination. Provide a minimum of 10 foot-candles, measured at all areas of the car enclosure floor. Provide automatic car lighting operation that will turn off car

lights after 3 minutes of inactivity. Car lights must automatically turn on upon actuation of an elevator car or hall call.

#### 2.8.9 Car Protection Pads and Hooks

Provide fire retardant, hanging car protection pads that provide protection for all car interior wall panels. Provide permanently installed studs in car that are designed for hanging the car protection pads in the car.

#### 2.9 PASSENGER ELEVATOR HOISTWAY DOORS AND ENTRANCES

Provide hoistway entrance assemblies with a minimum 1-1/2 hour fire rating. Use same material and finish for all hoistway and car entrance assemblies.

##### 2.9.1 Hoistway Entrance Frames

Provide 14 gage minimum stainless steel hoistway entrance frames. Solidly grout uprights of entrance ways to height of 5 feet.

##### 2.9.2 Hoistway Entrance Sills

Provide one-piece cast nickel silver, stainless steel, or white bronze entrance sills. Set top of landing sill flush with top of finish floor. Solidly grout under full length of sill. Use same material for all hoistway and car entrance sills.

##### 2.9.3 Hoistway Entrance Doors

Provide stainless steel non-vision construction hoistway entrance doors with flush surfaces on car and landing sides. Provide a minimum of 2 door guide assemblies per door panel, one guide at leading edge and one at trailing edge with guides in the sill groove the entire length of door travel. Use same material and finish for all hoistway and car entrance assemblies.

##### 2.9.4 Hoistway Entrance Door Track Dust Covers

Provide sheet metal hoistway door track dust covers at each landing. Dust covers must cover top and hoistway side of door locks and door roller tracks, and extend the full width of the door track and associated hardware. Dust cover sections will not exceed 3 feet in length.

#### 2.10 HOISTWAY EQUIPMENT

##### 2.10.1 Car Guide Rails and Fastenings

Provide T-section type guide rails for car. Paint rail shanks with one coat of black enamel.

##### 2.10.2 Pit Equipment and Support Channels

Provide rail-to-rail pit channels to serve as mounting surface for main guide rails, hydraulic cylinder and car buffers. Method of installation of channels, brackets and buffer mounts must be such that pit waterproofing is not punctured.

### 2.10.3 Pit "STOP" Switch

Provide push-to-stop/pull-to-run type pit "STOP" switch.

### 2.10.4 Traveling Cables

Suspend traveling cables by means of self-tightening webbed devices or internal suspension members.

### 2.10.5 Hoistway Pit Ladder

Provide continuous horizontal rungs for the full height of the pit ladder.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Install in accordance with DOD design criteria, contract specifications, manufacturer's instructions, NEII-1 Building Transportation Standards and Guidelines, and all applicable building and safety code requirements.

#### 3.1.1 Structural Members and Finish Materials

Do not cut or alter structural members. Do not alter finish materials from manufacturer's original design. Restore any damaged or defaced work to original condition.

#### 3.1.2 Miscellaneous Requirements

Provide recesses, cutouts, slots, holes, patching, grouting, and refinishing to accommodate elevator installation. Use core drilling to drill all new holes in concrete. Finish work to be straight, level, and plumb. During installation, protect machinery and equipment from dirt, water, or mechanical damage. At completion, clean all work and spot paint.

### 3.2 FIELD QUALITY CONTROL

The Contractor will provide and utilize a third-party licensed and certified Qualified Elevator Inspector (QEI) to conduct elevator pre-acceptance inspection and testing. The QEI must perform inspections and witness tests to ensure that the installation conforms to all applicable safety codes and contract requirements. The QEI will be directly employed by the Contractor and independent of the elevator contractor.

Upon completion, the QEI must provide written test data for all ASME A17.1/CSA B44 Acceptance Tests and written certification that the elevator is complete and ready for final Acceptance Inspection, Testing, and Commissioning.

### 3.3 ACCEPTANCE INSPECTION, TESTING AND COMMISSIONING

When elevator system installation is complete and ready for final inspection, notify Contracting Officer that elevator system is ready for Acceptance Inspection, Testing, and Commissioning. Provide QEI certification specified in Article FIELD QUALITY CONTROL.

Contracting Officer will obtain the services of a third-party QEI Certified Elevator Inspector. The QEI must utilize an Elevator Acceptance

Inspection Form to record the results of inspection and all testing and to identify safety code and contract deficiencies. Specific values must be provided for all tests required by ASME A17.1/CSA B44, ASME A17.2, and contract documents. Upon completion of inspection and testing, the QEI must sign a copy of the completed forms and provide to the Contracting Officer. Within 2 weeks of the inspection, the QEI must also prepare a formal inspection report, including all test results and deficiencies. Upon successful completion of inspection and testing, the QEI will complete, sign, and provide a certificate of compliance with ASME A17.1/CSA B44.

### 3.3.1 Acceptance Inspection Support

Prime and Elevator Contractors must provide inspection support and perform all required tests, in order to demonstrate proper operation of each elevator system and to prove that each system complies with contract requirements and all applicable building and safety codes. Inspection procedures in ASME A17.2 form a part of this inspection and acceptance testing. All inspection and testing must be conducted in the presence of the Qualified Elevator Inspector (QEI).

If the elevator does not comply with all contract and safety code requirements on the initial Acceptance Inspection and Test, the Contractor is responsible for all costs involved with re-inspection and re-testing required as a result of contractor delays and discrepancies discovered during inspection and testing.

### 3.3.2 Testing Materials and Instruments

Furnish all testing materials and instruments necessary for Acceptance Inspection, Testing and Commissioning. At a minimum, include calibrated test weights, tachometer, accelerometer, hydraulic pressure gauge, 600-volt mega ohm meter, volt meter and ammeter, infrared temperature gauge, door pressure gage, dynamometer, and 20 foot tape measure.

### 3.3.3 Field Tests

#### 3.3.3.1 Endurance Tests

Test each elevator for a period of one hour continuous, automatic operation, with specified rated load in the elevator cab. During the one hour test, stop car at each floor, in both directions of travel, and allow automatic door open and close operation. The requirements for Automatic Operation, Rated Speed, Leveling, Temperature Rise and Motor Amperes must be met throughout the duration of the Endurance Test. Restart the one hour test period from the beginning, following any shutdown or failure.

#### 3.3.3.2 Speed Tests

Determine actual speed of each elevator, in both directions of travel, with rated load and with no load in elevator car. Make Speed tests at the beginning and at the end of the Endurance test. Determine speed by tachometer reading or accelerometer, excluding accelerating and slow-down zones. Under all conditions, minimum acceptable elevator speed is the Rated speed specified. Maximum acceptable elevator speed is 110 percent of Rated speed.

### 3.3.3.3 Leveling Tests

Test elevator car leveling operation and provide a leveling accuracy equal to or less than 1/8 inch at each floor with no load in car, and with rated load in car, in both directions of travel. Determine leveling accuracy at the beginning and at the end of the endurance tests.

### 3.3.3.4 Temperature Rise Tests

Determine temperature rise of elevator pump motor and hydraulic fluid during one-hour full-load test run. Under these conditions, maximum temperature rise must not exceed acceptable temperature rise indicated on manufacturer's data plate. Start test only when equipment is within 5 degrees C of ambient temperature.

### 3.3.3.5 Motor Ampere Tests

At beginning and end of Endurance test, measure and record motor amperage in both directions of travel and in both no-load and rated load conditions.

### 3.3.3.6 Elevator Performance and Ride Quality Testing

Evaluate elevator performance to ensure compliance with specification requirements related to the NEII-1 Performance Standards Matrix for New Elevator Installations.

### 3.3.3.7 Hydraulic Safety Valve (Automatic Shutoff Valve) Tests

In order to ensure consistent performance, regardless of hydraulic oil temperature, test the Hydraulic Safety Valve twice. Test once before the one-hour endurance test and once immediately after the one-hour test. For elevator certification, safety valve must perform to code in both tests.

### 3.3.3.8 Hydraulic Pressure Tests

Check the hydraulic static pressure and rated-speed operating pressure at the hydraulic control valve, under both no load and rated load conditions.

### 3.3.3.9 Pressure Test of Liner/Cylinder Assembly

Perform 20 psig pressure test of the completed and installed liner/cylinder assembly. Test liner/cylinder assembly as a sealed unit. Provide safety relief valve set to relieve at 20 psig; 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 must 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 Certified Elevator Inspector.

-- End of Section --

SECTION 21 13 13.00 10

WET PIPE SPRINKLER SYSTEM, FIRE PROTECTION  
05/09

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C104/A21.4	(2016) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C110/A21.10	(2012) Ductile-Iron and Gray-Iron Fittings for Water
AWWA C111/A21.11	(2017) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C151/A21.51	(2017) Ductile-Iron Pipe, Centrifugally Cast
AWWA C203	(2008) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied

ASME INTERNATIONAL (ASME)

ASME B16.1	(2015) Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250
ASME B16.11	(2016) Forged Fittings, Socket-Welding and Threaded
ASME B16.21	(2011) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.3	(2011) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.4	(2011) Standard for Gray Iron Threaded Fittings; Classes 125 and 250
ASME B16.9	(2012) Standard for Factory-Made Wrought Steel Buttwelding Fittings
ASME B18.2.2	(2015) Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)

ASTM INTERNATIONAL (ASTM)

ASTM A135/A135M	(2009; R2014) Standard Specification for Electric-Resistance-Welded Steel Pipe
ASTM A183	(2014) Standard Specification for Carbon Steel Track Bolts and Nuts
ASTM A449	(2014) Standard Specification for Hex Cap Screws, Bolts, and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
ASTM A47/A47M	(1999; R 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 A536	(1984; R 2014) Standard Specification for Ductile Iron Castings
ASTM A795/A795M	(2013) Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use
ASTM F436	(2011) Hardened Steel Washers

FM GLOBAL (FM)

FM APP GUIDE	(updated on-line) Approval Guide <a href="http://www.approvalguide.com/">http://www.approvalguide.com/</a>
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MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-71	(2011; Errata 2013) Gray Iron Swing Check Valves, Flanged and Threaded Ends
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NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 13	(2016; TIA 16-1; TIA 16-2; TIA 16-3 2016; Errata 17-1; Errata 17-2) Standard for the Installation of Sprinkler Systems
NFPA 1963	(2014) Standard for Fire Hose Connections
NFPA 24	(2016; ERTA 2016) Standard for the Installation of Private Fire Service Mains and Their Appurtenances

NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES (NICET)

NICET 1014-7	(2012) Program Detail Manual for Certification in the Field of Fire Protection Engineering Technology (Field
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Code 003) Subfield of Automatic Sprinkler  
System Layout

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 3-310-04 (2013; with Change 1) Seismic Design for  
Buildings

UNDERWRITERS LABORATORIES (UL)

UL 668 (2004; Reprint Jul 2016) UL Standard for  
Safety Hose Valves for Fire-Protection  
Service

UL Bld Mat Dir (updated continuously online) Building  
Materials Directory

UL Fire Prot Dir (2012) Fire Protection Equipment Directory

## 1.2 SYSTEM DESCRIPTION

Furnish piping offsets, fittings, and any other accessories as required to provide a complete installation and to eliminate interference with other construction. Install sprinkler system over and under ducts, piping and platforms when such equipment can negatively effect or disrupt the sprinkler discharge pattern and coverage. Provide wet pipe sprinkler system in all areas of the building areas indicated on the drawings . Except as modified herein, the system shall be designed and installed in accordance with NFPA 13 . Pipe sizes which are not indicated on drawings shall be determined by hydraulic calculation. Design any portions of the sprinkler system that are not indicated on the drawings including locating sprinklers, piping and equipment, and size piping and equipment when this information is not indicated on the drawings or is not specified herein. The design of the sprinkler system shall be based on hydraulic calculations, and the other provisions specified herein.

### 1.2.1 Hydraulic Design

Hydraulically design the system to discharge the densities/design areas indicated on the drawings over the hydraulically most demanding floor area. The minimum pipe size for branch lines in gridded systems shall be 1-1/4 inch. Hydraulic calculations shall be in accordance with the Area/Density Method of NFPA 13. Water velocity in the piping shall not exceed 20 ft/s.

#### 1.2.1.1 Hose Demand

Add an allowance for exterior hose streams of 250 gpm to the sprinkler system demand at the fire hydrant shown on the drawings closest to the point where the water service enters the building.

#### 1.2.1.2 Basis for Calculations

The design of the system shall be based upon a water supply with a static pressure of 80, and a flow of 1190 at a residual pressure of 76. Water supply shall be presumed available at the point of connection to existing. Hydraulic calculations shall be based upon the Hazen-Williams formula with a "C" value of 120 for steel piping, 150 for copper tubing, 140 for new cement-lined ductile-iron piping, and 100 for existing underground piping.

### 1.2.1.3 Hydraulic Calculations

Submit hydraulic calculations, including a drawing showing hydraulic reference points and pipe segments and as outlined in NFPA 13, except that calculations shall be performed by computer using software intended specifically for fire protection system design using the design data shown on the drawings. Software that uses k-factors for typical branch lines is not acceptable. Calculations shall be based on the water supply data shown on the drawings to substantiate that the design area used in the calculations is the most demanding hydraulically. Water supply curves and system requirements shall be plotted on semi-logarithmic graph paper so as to present a summary of the complete hydraulic calculation. Provide a summary sheet listing sprinklers in the design area and their respective hydraulic reference points, elevations, actual discharge pressures and actual flows. Elevations of hydraulic reference points (nodes) shall be indicated. Documentation shall identify each pipe individually and the nodes connected thereto. Indicate the diameter, length, flow, velocity, friction loss, number and type fittings, total friction loss in the pipe, equivalent pipe length and Hazen-Williams coefficient for each pipe. For gridded systems, calculations shall show peaking of demand area friction loss to verify that the hydraulically most demanding area is being used. Also for gridded systems, a flow diagram indicating the quantity and direction of flows shall be included. A drawing showing hydraulic reference points (nodes) and pipe designations used in the calculations shall be included and shall be independent of shop drawings.

### 1.2.2 Sprinkler Coverage

Sprinklers shall be uniformly spaced on branch lines. In buildings protected by automatic sprinklers, sprinklers shall provide coverage throughout 100 percent of the building. This includes, but is not limited to, telephone rooms, electrical equipment rooms, boiler rooms, switchgear rooms, transformer rooms, and other electrical and mechanical spaces. Coverage per sprinkler shall be in accordance with NFPA 13, but shall not exceed 100 square feet for extra hazard occupancies, 130 square feet for ordinary hazard occupancies, and 225 square feet for light hazard occupancies.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

Shop Drawings; G, AE  
As-Built Drawings

#### SD-03 Product Data

Fire Protection Related Submittals  
Materials and Equipment; G, AE  
Spare Parts

Preliminary Tests; G, AE  
Final Acceptance Test; G, AE  
Onsite Training; G, AE  
Fire Protection Specialist; G, AE  
Sprinkler System Installer; G, AE

SD-05 Design Data

Sway Bracing; G, AE  
Hydraulic Calculations; G, AE

SD-06 Test Reports

Preliminary Test Report  
Final Acceptance Test Report

SD-07 Certificates

Inspection by Fire Protection Specialist

SD-10 Operation and Maintenance Data

Operating and Maintenance Manuals; G

1.4 QUALITY ASSURANCE

Compliance with referenced NFPA standards is mandatory. In the event of a conflict between specific provisions of this specification and applicable NFPA standards, this specification governs. Interpret reference to "authority having jurisdiction" to mean the Contracting Officer.

1.4.1 Fire Protection Specialist

Perform work specified in this section under the supervision of and certified by the Fire Protection Specialist who is an individual registered professional engineer who has passed the fire protection engineering written examination administered by the National Council of Examiners for Engineering and Surveys (NCEES) or who is certified as a Level IV Technician by National Institute for Certification in Engineering Technologies (NICET) in the Automatic Sprinkler System Layout subfield of Fire Protection Engineering Technology in accordance with NICET 1014-7. Submit the name and documentation of certification of the proposed Fire Protection Specialists, no later than 14 days after the Notice to Proceed and prior to the submittal of the sprinkler system drawings and hydraulic calculations. The Fire Protection Specialist shall prepare and submit a list of the fire protection related submittals, no later than 7 days after the approval of the Fire Protection Specialist, from the Contract Submittal Register that relate to the successful installation of the sprinkler systems(s). The submittals identified on this list shall be accompanied by a letter of approval signed and dated by the Fire Protection Specialist when submitted to the Government. The Fire Protection Specialist shall be regularly engaged in the design and installation of the type and complexity of system specified in the contract documents, and shall have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months.

#### 1.4.2 Sprinkler System Installer

Work specified in this section shall be performed by the Sprinkler System Installer who is regularly engaged in the installation of the type and complexity of system specified in the contract documents, and who has served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months. Submit the name and documentation of certification of the proposed Sprinkler System Installer, concurrent with submittal of the Fire Protection Specialist Qualifications.

#### 1.4.3 Shop Drawings

Shop Drawings shall conform to the requirements established for working plans as prescribed in NFPA 13. Submit 3 copies of the Sprinkler System shop drawings, no later than 21 days prior to the start of sprinkler system installation. Drawings shall include plan and elevation views demonstrating that the equipment will fit the allotted spaces with clearance for installation and maintenance. Each set of drawings shall include the following:

- a. Descriptive index of drawings in the submittal with drawings listed in sequence by drawing number. A legend identifying device symbols, nomenclature, and conventions used.
- b. Floor plans drawn to a scale not less than 1/8" = 1'-0" which clearly show locations of sprinklers, risers, pipe hangers, seismic separation assemblies, sway bracing, inspector's test connections, drains, and other applicable details necessary to clearly describe the proposed arrangement. Each type of fitting used and the locations of bushings, reducing couplings, and welded joints shall be indicated.
- c. Actual center-to-center dimensions between sprinklers on branch lines and between branch lines; from end sprinklers to adjacent walls; from walls to branch lines; from sprinkler feed mains, cross-mains and branch lines to finished floor and roof or ceiling. A detail shall show the dimension from the sprinkler and sprinkler deflector to the ceiling in finished areas.
- d. Longitudinal and transverse building sections showing typical branch line and cross-main pipe routing as well as elevation of each typical sprinkler above finished floor.
- e. Details of each type of riser assembly; pipe hanger; sway bracing for earthquake protection, and restraint of underground water main at point-of-entry into the building, and electrical devices and interconnecting wiring. Submit load calculations for sizing of sway bracing, for systems that are required to be protected against damage from earthquakes.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

All equipment delivered and placed in storage shall be housed in a manner to preclude any damage from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Additionally, all pipes shall either be capped or plugged until installed.

## 1.6 EXTRA MATERIALS

Submit spare parts data for each different item of material and equipment specified. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of parts recommended by the manufacturer to be replaced after 1 year and 3 years of service. Include a list of special tools and test equipment required for maintenance and testing of the products supplied.

## PART 2 PRODUCTS

### 2.1 STANDARD PRODUCTS

Provide materials and equipment which are standard products of a manufacturer regularly engaged in the manufacture of such products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

### 2.2 NAMEPLATES

All equipment shall have a nameplate that identifies the manufacturer's name, address, type or style, model or serial number, and catalog number.

### 2.3 REQUIREMENTS FOR FIRE PROTECTION SERVICE

Provide Materials and Equipment that have been tested by Underwriters Laboratories, Inc. and are listed in UL Fire Prot Dir or approved by Factory Mutual and listed in FM APP GUIDE. Where the terms "listed" or "approved" appear in this specification, such shall mean listed in UL Fire Prot Dir or FM APP GUIDE. Submit manufacturer's catalog data included with the Sprinkler System Drawings for all items specified herein. The data shall be highlighted to show model, size, options, etc., that are intended for consideration. Data shall be adequate to demonstrate compliance with all contract requirements. In addition, provide a complete equipment list that includes equipment description, model number and quantity.

### 2.4 UNDERGROUND PIPING COMPONENTS

#### 2.4.1 Pipe

Piping from a point 6 inches above the floor to a point 5 feet outside the building wall shall be ductile iron with a rated working pressure of 175 psi conforming to AWWA C151/A21.51, with cement mortar lining conforming to AWWA C104/A21.4.

#### 2.4.2 Fittings and Gaskets

Fittings shall be ductile iron conforming to AWWA C110/A21.10 with cement mortar lining conforming to AWWA C104/A21.4. Gaskets shall be suitable in design and size for the pipe with which such gaskets are to be used. Gaskets for ductile iron pipe joints shall conform to AWWA C111/A21.11.

### 2.5 ABOVEGROUND PIPING COMPONENTS

Aboveground piping shall be steel.

## 2.5.1 Steel Piping Components

### 2.5.1.1 Steel Pipe

Except as modified herein, steel pipe shall be black as permitted by NFPA 13 and shall conform to applicable provisions of ASTM A795/A795M, ASTM A53/A53M, or ASTM A135/A135M. Pipe in which threads or grooves are cut or rolled formed shall be Schedule 40 or shall be listed by Underwriters' Laboratories to have a corrosion resistance ratio (CRR) of 1.0 or greater after threads or grooves are cut or rolled formed. Pipe shall be marked with the name of the manufacturer, kind of pipe, and ASTM designation.

### 2.5.1.2 Fittings for Non-Grooved Steel Pipe

Fittings shall be cast iron conforming to ASME B16.4, steel conforming to ASME B16.9 or ASME B16.11, or malleable iron conforming to ASME B16.3. Fittings into which sprinklers, drop nipples or riser nipples (sprigs) are screwed shall be threaded type. Plain-end fittings with mechanical couplings, fittings that use steel gripping devices to bite into the pipe and segmented welded fittings shall not be used.

### 2.5.1.3 Grooved Mechanical Joints and Fittings

Joints and fittings shall be designed for not less than 175 psi service and shall be the product of the same manufacturer; segmented welded fittings shall not be used. Fitting and coupling houses shall be malleable iron conforming to ASTM A47/A47M, Grade 32510; ductile iron conforming to ASTM A536, Grade 65-45-12. Gasket shall be the flush type that fills the entire cavity between the fitting and the pipe. Nuts and bolts shall be heat-treated steel conforming to ASTM A183 and shall be cadmium plated or zinc electroplated.

### 2.5.1.4 Flanges

Flanges shall conform to NFPA 13 and ASME B16.1. Gaskets shall be non-asbestos compressed material in accordance with ASME B16.21, 1/16 inch thick, and full face or self-centering flat ring type.

### 2.5.1.5 Bolts, Nut, and Washers

Bolts shall be conform to ASTM A449, Type 1 and shall extend no less than three full threads beyond the nut with bolts tightened to the required torque. Nuts shall be hexagon type conforming to ASME B18.2.2. Washers shall meet the requirements of ASTM F436. Flat circular washers shall be provided under all bolt heads and nuts.

## 2.5.2 Pipe Hangers

Hangers shall be listed in UL Fire Prot Dir or FM APP GUIDE and of the type suitable for the application, construction, and pipe type and sized to be supported.

## 2.5.3 Valves

### 2.5.3.1 Control Valve and Gate Valve

Manually operated sprinkler control valve and gate valve shall be outside stem and yoke (OS&Y) type and shall be listed in UL Bld Mat Dir or

FM APP GUIDE.

#### 2.5.3.2 Check Valve

Check valve 2 inches and larger shall be listed in UL Bld Mat Dir or FM APP GUIDE. Check valves 4 inches and larger shall be of the swing type with flanged cast iron body and flanged inspection plate, shall have a clear waterway and shall meet the requirements of MSS SP-71, for Type 3 or 4.

#### 2.5.3.3 Hose Valve

Valve shall comply with UL 668 and shall have a minimum rating of 300 psi. Valve shall be non-rising stem, all bronze, 90 degree angle type, with 2-1/2 inch American National Standard Fire Hose Screw Thread (NH) male outlet in accordance with NFPA 1963. Hose valve shall be provided with 2-1/2 to 1-1/2 inch reducer. Hose valves shall be equipped with lugged cap with drip drain, cap gasket and chain. Valve finish shall be polished brass.

#### 2.6 ALARM CHECK VALVE ASSEMBLY

Assembly shall include an alarm check valve, standard trim piping, pressure gauges, bypass, retarding chamber, testing valves, main drain, and other components as required for a fully operational system.

#### 2.7 WATERFLOW ALARM

Electrically operated, exterior-mounted, waterflow alarm bell shall be provided and installed in accordance with NFPA 13. Waterflow alarm bell shall be rated 24 VDC and shall be connected to the Fire Alarm Control Panel(FACP).

#### 2.8 ALARM INITIATING AND SUPERVISORY DEVICES

##### 2.8.1 Sprinkler Waterflow Indicator Switch, Vane Type

Switch shall be vane type with a pipe saddle and cast aluminum housing. The electro-mechanical device shall include a flexible, low-density polyethylene paddle conforming to the inside diameter of the fire protection pipe. The device shall sense water movements and be capable of detecting a sustained flow of 10 gpm or greater. The device shall contain a retard device adjustable from 0 to 90 seconds to reduce the possibility of false alarms caused by transient flow surges. The switch shall be tamper resistant and contain two SPDT (Form C) contacts arranged to transfer upon removal of the housing cover, and shall be equipped with a silicone rubber gasket to assure positive water seal and a dustproof cover and gasket to seal the mechanism from dirt and moisture.

##### 2.8.2 Valve Supervisory (Tamper) Switch

Switch shall be suitable for mounting to the type of control valve to be supervised open. The switch shall be tamper resistant and contain one set of SPDT (Form C) contacts arranged to transfer upon removal of the housing cover or closure of the valve of more than two rotations of the valve stem.

#### 2.9 FIRE DEPARTMENT CONNECTION

Fire department connection shall be projecting type with cast brass body,

matching wall escutcheon lettered "Auto Spkr" with a polished brass finish. The connection shall have two inlets with individual self-closing clappers, caps with drip drains and chains. Female inlets shall have 2-1/2 inch diameter American National Fire Hose Connection Screw Threads (NH) per NFPA 1963.

## 2.10 SPRINKLERS

Sprinklers with internal O-rings shall not be used. Sprinklers shall be used in accordance with their listed coverage limitations. Temperature classification shall be as indicated. Sprinklers in high heat areas including attic spaces or in close proximity to unit heaters shall have temperature classification in accordance with NFPA 13. Extended coverage sprinklers shall not be used.

### 2.10.1 Concealed Sprinkler

Concealed sprinkler shall be chrome-plated and shall have a nominal 1/2 inch or 17/32 inch orifice.

### 2.10.2 Recessed Sprinkler

Recessed sprinkler shall be chrome-plated and shall have a nominal 1/2 inch or 17/32 inch orifice.

### 2.10.3 Flush Sprinkler

Flush sprinkler shall be chrome-plated and shall have a nominal 1/2 inch or 17/32 inch orifice.

### 2.10.4 Pendent Sprinkler

Pendent sprinkler shall be of the fusible strut or glass bulb type, recessed type with nominal 1/2 inch or 17/32 inch orifice. Pendent sprinklers shall have a polished chrome finish.

### 2.10.5 Upright Sprinkler

Upright sprinkler shall be brass and shall have a nominal 1/2 inch or 17/32 inch orifice.

### 2.10.6 Sidewall Sprinkler

Sidewall sprinkler shall have a nominal 1/2 inch orifice. Sidewall sprinkler shall have a brass finish. Sidewall sprinkler shall be the quick-response type.

### 2.10.7 Corrosion Resistant Sprinkler

Corrosion resistant sprinkler shall be the upright or pendent type installed in locations as indicated. Corrosion resistant coatings shall be factory-applied by the sprinkler manufacturer.

## 2.11 ACCESSORIES

### 2.11.1 Sprinkler Cabinet

Spare sprinklers shall be provided in accordance with NFPA 13 and shall be packed in a suitable metal or plastic cabinet. Spare sprinklers shall be

representative of, and in proportion to, the number of each type and temperature rating of the sprinklers installed. At least one wrench of each type required shall be provided.

#### 2.11.2 Pendent Sprinkler Escutcheon

Escutcheon shall be one-piece metallic type with a depth of less than 3/4 inch and suitable for installation on pendent sprinklers. The escutcheon shall have a factory finish that matches the pendent sprinkler heads.

#### 2.11.3 Pipe Escutcheon

Escutcheon shall be polished chromium-plated zinc alloy, or polished chromium-plated copper alloy. Escutcheons shall be either one-piece or split-pattern, held in place by internal spring tension or set screw.

#### 2.11.4 Sprinkler Guard

Guard shall be a steel wire cage designed to encase the sprinkler and protect it from mechanical damage. Guards shall be provided on sprinklers located as indicated.

#### 2.11.5 Identification Sign

Valve identification sign shall be minimum 6 inches wide by 2 inches high with enamel baked finish on minimum 18 gauge steel or 0.024 inch aluminum with red letters on a white background or white letters on red background. Wording of sign shall include, but not be limited to "main drain," "auxiliary drain," "inspector's test," "alarm test," "alarm line," and similar wording as required to identify operational components.

### 2.12 FIRE HOSE REEL ASSEMBLY

Assembly shall include nozzle, fire hose, reel, 1-1/2 inch valve, and bracket suitable for wall mounting. The assembly shall be semi-automatic type complete with Underwriters clip which permits controlled one-man operation whereby control valve can be opened, hose unreeled and clip released by pulling on hose. Valve shall be non-rising stem, all bronze, angle type with 1-1/2 inch American National Standard Fire Hose Screw Thread (NH) male outlet in accordance with NFPA 1963. Reel shall be of steel construction with red enamel finish and shall be equipped with 100 feet of 1-1/2 inch rubber lined fire hose. Nozzle shall be of the industrial combination fog-straight stream type with shutoff. Components of the assembly shall be listed in UL Fire Prot Dir.

## PART 3 EXECUTION

### 3.1 FIELD MEASUREMENTS

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing the work.

### 3.2 INSTALLATION REQUIREMENTS

The installation shall be in accordance with the applicable provisions of NFPA 13, NFPA 24 and publications referenced therein. Installation of in-rack sprinklers shall comply with applicable provisions of NFPA 13.

### 3.3 INSPECTION BY FIRE PROTECTION SPECIALIST

Prior to ceiling installation and concurrent with the Final Acceptance Test Report, certification by the Fire Protection Specialist that the sprinkler system is installed in accordance with the contract requirements, including signed approval of the Preliminary and Final Acceptance Test Reports. The Fire Protection Specialist shall: 1) inspect the sprinkler system periodically during the installation to assure that the sprinkler system is being provided and installed in accordance with the contract requirements, 2) witness the preliminary and final tests, and sign the test results, 3) after completion of the system inspections and a successful final test, certify in writing that the system has been installed in accordance with the contract requirements. Any discrepancy shall be brought to the attention of the Contracting Officer in writing, no later than three working days after the discrepancy is discovered.

### 3.4 ABOVEGROUND PIPING INSTALLATION

#### 3.4.1 Protection of Piping Against Earthquake Damage

Seismically protect the system piping against damage from earthquakes. This requirement is not subject to determination under NFPA 13. Install the seismic protection of the system piping in accordance with UFC 3-310-04, NFPA 13 and Annex A. Include the required features identified therein that are applicable to the specific piping system.

#### 3.4.2 Piping in Exposed Areas

Install exposed piping without diminishing exit access widths, corridors or equipment access. Exposed horizontal piping, including drain piping, shall be installed to provide maximum headroom.

#### 3.4.3 Piping in Finished Areas

In areas with suspended or dropped ceilings and in areas with concealed spaces above the ceiling, piping shall be concealed above ceilings. Piping shall be inspected, tested and approved before being concealed. Risers and similar vertical runs of piping in finished areas shall be concealed.

#### 3.4.4 Pendent Sprinklers

Drop nipples to pendent sprinklers shall consist of minimum 1 inch pipe with a reducing coupling into which the sprinkler shall be threaded. Hangers shall be provided on arm-overs to drop nipples supplying pendent sprinklers when the arm-over exceeds 12 inches for steel pipe or 6 inches for copper tubing. Where sprinklers are installed below suspended or dropped ceilings, drop nipples shall be cut such that sprinkler ceiling plates or escutcheons are of a uniform depth throughout the finished space. The outlet of the reducing coupling shall not extend more than 1 inch below the underside of the ceiling. On pendent sprinklers installed below suspended or dropped ceilings, the distance from the sprinkler deflector to the underside of the ceiling shall not exceed 4 inches. Recessed pendent sprinklers shall be installed such that the distance from the sprinkler deflector to the underside of the ceiling shall not exceed the manufacturer's listed range and shall be of uniform depth throughout the finished area. Pendent sprinklers in suspended ceilings shall be a minimum of 6 inches from ceiling grid.

#### 3.4.5 Upright Sprinklers

Riser nipples or "sprigs" to upright sprinklers shall contain no fittings between the branch line tee and the reducing coupling at the sprinkler. Riser nipples exceeding 30 inches in length shall be individually supported.

#### 3.4.6 Pipe Joints

Pipe joints shall conform to NFPA 13, except as modified herein. Not more than four threads shall show after joint is made up. Welded joints will be permitted, only if welding operations are performed as required by NFPA 13 at the Contractor's fabrication shop, not at the project construction site. Flanged joints shall be provided where indicated or required by NFPA 13. Grooved pipe and fittings shall be prepared in accordance with the manufacturer's latest published specification according to pipe material, wall thickness and size. Grooved couplings, fittings and grooving tools shall be products of the same manufacturer. For copper tubing, pipe and groove dimensions shall comply with the tolerances specified by the coupling manufacturer. The diameter of grooves made in the field shall be measured using a "go/no-go" gauge, vernier or dial caliper, narrow-land micrometer, or other method specifically approved by the coupling manufacturer for the intended application. Groove width and dimension of groove from end of pipe shall be measured and recorded for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances. Grooved joints shall not be used in concealed locations, such as behind solid walls or ceilings, unless an access panel is shown on the drawings for servicing or adjusting the joint.

#### 3.4.7 Reducers

Reductions in pipe sizes shall be made with one-piece tapered reducing fittings. The use of grooved-end or rubber-gasketed reducing couplings will not be permitted. When standard fittings of the required size are not manufactured, single bushings of the face type will be permitted. Where used, face bushings shall be installed with the outer face flush with the face of the fitting opening being reduced. Bushings shall not be used in elbow fittings, in more than one outlet of a tee, in more than two outlets of a cross, or where the reduction in size is less than 1/2 inch.

#### 3.4.8 Pipe Penetrations

Cutting structural members for passage of pipes or for pipe-hanger fastenings will not be permitted. Pipes that must penetrate concrete or masonry walls or concrete floors shall be core-drilled and provided with pipe sleeves. Each sleeve shall be Schedule 40 galvanized steel, ductile iron or cast iron pipe and shall extend through its respective wall or floor and be cut flush with each wall surface. Sleeves shall provide required clearance between the pipe and the sleeve per NFPA 13. The space between the sleeve and the pipe shall be firmly packed with mineral wool insulation. Where pipes penetrate fire walls, fire partitions, or floors, pipes shall be fire stopped in accordance with Section 07 84 00 FIRESTOPPING. In penetrations that are not fire-rated or not a floor penetration, the space between the sleeve and the pipe shall be sealed at both ends with plastic waterproof cement that will dry to a firm but pliable mass or with a mechanically adjustable segmented elastomer seal.

#### 3.4.9 Escutcheons

Escutcheons shall be provided for pipe penetration of ceilings and walls. Escutcheons shall be securely fastened to the pipe at surfaces through which piping passes.

#### 3.4.10 Inspector's Test Connection

Unless otherwise indicated, test connection shall consist of 1 inch pipe connected to the remote branch line; a test valve located approximately 7 feet above the floor; a smooth bore brass outlet equivalent to the smallest orifice sprinkler used in the system; and a painted metal identification sign affixed to the valve with the words "Inspector's Test." The discharge orifice shall be located outside the building wall directed so as not to cause damage to adjacent construction or landscaping during full flow discharge.

#### 3.4.11 Drains

Main drain piping shall be provided to discharge at a safe point outside the building. Auxiliary drains shall be provided as required by NFPA 13.

#### 3.4.12 Installation of Fire Department Connection

Connection shall be mounted adjacent to and on the sprinkler system side of the backflow preventer. The piping between the connection and the check valve shall be provided with an automatic drip in accordance with NFPA 13 and arranged to drain to the outside.

#### 3.4.13 Identification Signs

Signs shall be affixed to each control valve, inspector test valve, main drain, auxiliary drain, test valve, and similar valves as appropriate or as required by NFPA 13. Hydraulic design data nameplates shall be permanently affixed to each sprinkler riser as specified in NFPA 13.

### 3.5 UNDERGROUND PIPING INSTALLATION

The fire protection water main shall be laid, and joints anchored, in accordance with NFPA 24. Minimum depth of cover shall be 3 feet. The supply line shall terminate inside the building with a flanged piece, the bottom of which shall be set not less than 6 inches above the finished floor. A blind flange shall be installed temporarily on top of the flanged piece to prevent the entrance of foreign matter into the supply line. A concrete thrust block shall be provided at the elbow where the pipe turns up toward the floor. In addition, joints shall be anchored in accordance with NFPA 24 using pipe clamps and steel rods from the elbow to the flange above the floor and from the elbow to a pipe clamp in the horizontal run of pipe. Buried steel components shall be provided with a corrosion protective coating in accordance with AWWA C203.

### 3.6 ELECTRICAL WORK

Except as modified herein, electric equipment and wiring shall be in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Alarm signal wiring connected to the building fire alarm control system shall be in accordance with 28 31 76 INTERIOR FIRE ALARM AND MASS NOTIFICATION SYSTEM.

### 3.7 PIPE COLOR CODE MARKING

Color code mark piping as specified in Section 09 90 00 PAINTS AND COATINGS.

### 3.8 PRELIMINARY TESTS

The system, including the underground water mains, and the aboveground piping and system components, shall be tested to assure that equipment and components function as intended. Submit proposed procedures for Preliminary Tests, no later than 14 days prior to the proposed start of the tests and proposed date and time to begin the preliminary tests. The underground and aboveground interior piping systems and attached appurtenances subjected to system working pressure shall be tested in accordance with NFPA 13 and NFPA 24. Upon completion of specified tests, submit 3 copies of the completed Preliminary Test Report, no later than 7 days after the completion of the Tests. The Report shall include both the Contractor's Material and Test Certificate for Underground Piping and the Contractor's Material and Test Certificate for Aboveground Piping. All items in the Preliminary Tests Report shall be signed by the Fire Protection Specialist.

#### 3.8.1 Underground Piping

##### 3.8.1.1 Flushing

Underground piping shall be flushed in accordance with NFPA 24. This includes the requirement to flush the lead-in connection to the fire protection system at a flow rate not less than the calculated maximum water demand rate of the system.

##### 3.8.1.2 Hydrostatic Testing

New underground piping shall be hydrostatically tested in accordance with NFPA 24. The allowable leakage shall be measured at the specified test pressure by pumping from a calibrated container. The amount of leakage at the joints shall not exceed 2 quarts per hour per 100 gaskets or joints, regardless of pipe diameter.

#### 3.8.2 Aboveground Piping

##### 3.8.2.1 Hydrostatic Testing

Aboveground piping shall be hydrostatically tested in accordance with NFPA 13 at not less than 200 psi or 50 psi in excess of maximum system operating pressure and shall maintain that pressure without loss for 2 hours. There shall be no drop in gauge pressure or visible leakage when the system is subjected to the hydrostatic test. The test pressure shall be read from a gauge located at the low elevation point of the system or portion being tested.

##### 3.8.2.2 Backflow Prevention Assembly Forward Flow Test

Each backflow prevention assembly shall be tested at system flow demand, including all applicable hose streams, as specified in NFPA 13. Provide all equipment and instruments necessary to conduct a complete forward flow test, including 2.5 inch diameter hoses, playpipe nozzles, calibrated pressure gauges, pitot tube gauge, plus all necessary supports to safely secure hoses and nozzles during the test. At the system demand flow, the

pressure readings and pressure drop (friction) across the assembly shall be recorded. Provide a metal placard on the backflow prevention assembly that lists the pressure readings both upstream and downstream of the assembly, total pressure drop, and the system test flow rate. The pressure drop shall be compared to the manufacturer's data.

### 3.8.3 Testing of Alarm Devices

Each alarm switch shall be tested by flowing water through the inspector's test connection. Each water-operated alarm devices shall be tested to verify proper operation.

### 3.8.4 Main Drain Flow Test

Following flushing of the underground piping, a main drain test shall be made to verify the adequacy of the water supply. Static and residual pressures shall be recorded on the certificate specified in paragraph SUBMITTALS. In addition, a main drain test shall be conducted each time after a main control valve is shut and opened.

### 3.9 FINAL ACCEPTANCE TEST

Begin the Final Acceptance Test only when the Preliminary Test Report has been approved. Submit proposed procedures for Final Acceptance Test, no later than 14 days prior to the proposed start of the tests, and proposed date and time to begin the Test, submitted with the procedures. Notification shall be provided at least 14 days prior to the proposed start of the test. Notification shall include a copy of the Contractor's Material & Test Certificates. The Fire Protection Specialist shall conduct the Final Acceptance Test and shall provide a complete demonstration of the operation of the system. This shall include operation of control valves and flowing of inspector's test connections to verify operation of associated waterflow alarm switches. After operation of control valves has been completed, the main drain test shall be repeated to assure that control valves are in the open position. Submit as-built shop drawings, at least 14 days after completion of the Final Tests, updated to reflect as-built conditions after all related work is completed. Drawings shall be on reproducible full-size mylar film. In addition, the representative shall have available copies of as-built drawings and certificates of tests previously conducted. The installation shall not be considered accepted until identified discrepancies have been corrected and test documentation is properly completed and received. Submit 3 copies of the completed Final Acceptance Test Report no later than 7 days after the completion of the Final Acceptance Tests. All items in the Final Acceptance Report shall be signed by the Fire Protection Specialist.as specified.

### 3.10 ONSITE TRAINING

The Fire Protection Specialist shall conduct a training course for operating and maintenance personnel as designated by the Contracting Officer. Submit proposed schedule, at least 14 days prior to the start of related training. Training shall be provided for a period of 8 hours of normal working time and shall start after the system is functionally complete and after the Final Acceptance Test. Submit 6 Operating and Maintenance Manuals listing step-by-step procedures required for system startup, operation, shutdown, and routine maintenance, at least 14 days prior to field training. The manuals shall include the manufacturer's name, model number, parts list, list of parts and tools that should be

kept in stock by the owner for routine maintenance including the name of a local supplier, simplified wiring and controls diagrams, troubleshooting guide, and recommended service organization (including address and telephone number) for each item of equipment. The Onsite Training shall cover all of the items contained in the approved manuals.

-- End of Section --

SECTION 21 21 03.00 10

WET CHEMICAL FIRE EXTINGUISHING SYSTEM  
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.

FM GLOBAL (FM)

FM APP GUIDE (updated on-line) Approval Guide  
<http://www.approvalguide.com/>

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 17A (2013) Standard for Wet Chemical  
Extinguishing Systems

NFPA 96 (2014) Standard for Ventilation Control  
and Fire Protection of Commercial Cooking  
Operations

UNDERWRITERS LABORATORIES (UL)

UL Fire Prot Dir (2012) Fire Protection Equipment Directory

1.2 SYSTEM DESCRIPTION

1.2.1 General

Protect each of the following cooking equipment items, including the exhaust hood, and exhaust duct serving the item by preengineered wet chemical fire extinguishing system. System shall be installed with all accessories necessary for system to operate in accordance with manufacturer's instructions and as specified herein.

1.2.2 Design and Installation Requirements

System application, design, and installation shall comply with NFPA 17A and NFPA 96, except as follows:

- a. System components shall be listed in UL Fire Prot Dir or approved by FM APP GUIDE for use with wet chemical fire extinguishing systems.
- c. Interpret reference to the "authority having jurisdiction" to mean the Contracting Officer.
- d. The use of grease extractors does not eliminate the requirement that duct systems, grease removal devices, and hoods be protected by the wet chemical extinguishing system.

### 1.2.3 System Controls

Each system shall be actuated by fusible link and by a remote manual actuation station connected to the extinguishing system release mechanism by cable. Remote manual actuation stations shall be located along the path of egress and shall automatically actuate the building fire alarm system. The system controls shall automatically shut off fuel flow and electrical power to the protected appliances and other appliances located under the ventilating system protected by the extinguishing system upon system actuation. All cables used shall be stainless steel with corner pulleys employing stainless steel ball bearings at all corners. All cable and wiring shall be enclosed in conduit.

### 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 eNotebook, in conformance to Section 01 33 29.00 06.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06.00 06 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

Installation Drawings; G

#### SD-03 Product Data

Similar Services

Standard Products; G

Preliminary Tests; G

Final Acceptance Tests; G

Field Training

#### SD-06 Test Reports

Preliminary Tests

Final Acceptance Tests

#### SD-07 Certificates

Installation Technician; G

Installation Drawings; G

#### SD-10 Operation and Maintenance Data

Operation and Maintenance Instructions; G

### 1.4 QUALITY ASSURANCE

Submit a statement demonstrating successful completion of similar services

on at least five projects of similar size and scope, at least 2 weeks before submittal of other items required by this section.

#### 1.4.1 Coordination of Trades

Each system shall be coordinated with the equipment, hood, and exhaust ducts that it protects along with other construction in order to eliminate any interference.

#### 1.4.2 Installation Technician

The installation technician shall have been trained by the system manufacturer for system installation, operation, and maintenance. Concurrent with statement of similar services, submit manufacturer's certification of installation technician.

#### 1.4.3 Installation Drawings

Provide installation drawings prepared by a representative of the manufacturer to ensure compliance with the requirements listed herein and with all manufacturer's requirements and recommendations. Submit drawings consisting of system layout including assembly and installation details and electrical connection diagrams; piping layout showing pipe sizes, lengths, and supports. Drawings shall include any information required to demonstrate that the system has been coordinated and will function as intended and shall show system relationship to items it protects and clearances required for operation and maintenance. Submit manufacturer's certification of the drawings. Drawings shall also include conduit, cables, manual actuation stations and fusible links. Include detail drawings for the following items:

- a. Storage containers and mounting brackets
- b. Fusible links, cables, conduit, corner pulleys, and link mounting frames/brackets
- c. Release mechanisms
- d. Valves
- e. Discharge nozzles
- f. Piping components
- g. Remote manual actuation stations
- h. Fuel and power shutoff
- i. Alarms, alarm devices, alarm interface(s), control panels

#### 1.5 DELIVERY, STORAGE, AND HANDLING

Protect equipment delivered and placed in storage from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

## PART 2 PRODUCTS

### 2.1 STANDARD PRODUCTS

- a. Provide system components which are the standard products of a manufacturer regularly engaged in the manufacturing of products that are of similar material, design and workmanship and that have been in satisfactory commercial or industrial use for 2 years before bid opening. The 2-year experience shall include installations of systems under similar circumstances and of similar size. Systems shall be supported by a service organization.
- b. Submit manufacturer's catalog data. The data shall be highlighted to show model, size, options, etc., that are intended for consideration and shall be adequate to demonstrate compliance with contract requirements.
- c. Locate identification signs at each remote manual actuation station. Signs shall be fabricated of rigid plastic, red in color, with engraved white letters that are a minimum 0.25 inches in height. Each sign shall be engraved with "Fire Extinguishing System" and with a brief description of the equipment protected.
- d. Replace the fire alarm panel zone identification label with a new label of similar construction which indicates the equipment is connected to the zone module. Discharge of the extinguishing system shall actuate the fire alarm control panel in the same manner as other actuating devices. Extinguishing system wiring shall be supervised in the same manner as other devices connected to the fire alarm system.

### 2.2 PIPING COMPONENTS

#### 2.2.1 Pipe and Fittings

Pipe and fittings shall be Schedule 40 stainless steel. Stainless steel tubing may be used in accordance with manufacturer's recommendations. Galvanized pipe shall not be used.

#### 2.2.2 Nozzles

Nozzles shall be stainless steel and shall be equipped with an integral strainer to prevent matter inside the distribution piping from clogging the nozzle orifice. Each nozzle orifice shall be provided with a seal to protect the nozzle from clogging by grease or other obstructions. This seal shall detach upon actuation.

### 2.3 WET CHEMICAL

The wet chemical shall not have an adverse effect on stainless steel during exposure periods of up to 24 hours.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Installation shall be performed by the installation technician in accordance with system manufacturer's instructions. Ductwork access doors shall be provided where indicated and at any items requiring service and inspection, including nozzles and fusible links. Ductwork access doors

shall be in accordance with Section 23 00 00 AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEM.

### 3.2 PRELIMINARY TESTS

Submit proposed test procedures for preliminary test, at least 2 weeks before the start of related testing. System diagrams that show system layout and typed condensed normal and emergency operating procedures, methods for checking the system for normal, safe operation, and procedures for manual actuation shall be framed under glass or laminated plastic. After approval, these items shall be posted where directed. After installation has been completed, each system shall be actuated by both fusible link and by remote actuation station to demonstrate proper function of all components, including alarms and fuel flow and power shut off. Actuation by fusible link shall be in a manner approved by the system manufacturer. Test containers, pressurized with either nitrogen or air to normal system operating pressure and of the same size as actual operating containers shall be discharged into system. The seals shall release as during normal actuation. After each discharge, the nozzles shall be removed, disassembled, and strainers shall be cleaned. System piping shall be inspected and cleaned as necessary. All functions of system operation shall be verified, including switches, shutdown of fuel and power to appliances protected by the system or served by the same ventilation system, uniform delivery of air or nitrogen, and activation of alarms. Nozzle seals/covers shall be replaced after the preliminary tests are complete. In the event portions of the tests are unsuccessful, repairs shall be made and the entire test repeated until successful. Submit test report for the preliminary tests in booklet form, upon completion of testing. Report shall document test results including repairs and adjustments made, and final test results.

### 3.3 FINAL ACCEPTANCE TESTS

Submit proposed test procedures for final acceptance test, at least 2 weeks before the start of related testing and proposed test schedule for acceptance test, at least 2 weeks before the start of related testing. System shall be actuated by both fusible link and remote manual actuation station and all system functions shall be verified as described in Paragraph PRELIMINARY TESTS using test containers specified for preliminary tests. Each nozzle shall be provided with a plastic container, hose, and hose fitting to capture all wet chemical discharged. All tests or checks recommended by the manufacturer shall also be performed. In the event portions of the tests are unsuccessful, repairs shall be made and the entire test repeated until successful. Nozzle seals/covers shall be replaced after the final acceptance tests are complete. The system shall be returned to normal operating condition after the completion of testing and wet chemical containers expended shall be recharged and verified leak tight. Extinguishing system and equipment and duct protected by the extinguishing shall be cleaned after completion of testing. Any damage shall be repaired by the Contractor. The weight of each storage container shall be recorded before final acceptance test and after test has been completed and containers recharged. Submit test report for the final acceptance tests in booklet form, upon completion of testing. Report shall document test results including repairs and adjustments made, and final test results. The weight of each storage container shall be recorded before final acceptance test and after test has been completed and containers recharged.

### 3.4 FIELD TRAINING

Submit proposed schedule for field training, at least 2 weeks before the start of related training. Conduct a training course for operating and maintenance personnel as designated by the Contracting Officer. Training shall be provided for a period of 4 hours of normal working time and shall start after the system is functionally complete and after the Final Acceptance Test. The field instruction shall cover all of the items contained in the approved Operation and Maintenance Instructions. Submit 2 manuals listing step-by-step procedures required for system actuation (automatic and manual), recharging, and routine maintenance, at least 2 weeks before field training. The manuals shall include the manufacturer's name, model number, parts list, list of tools and parts that should be kept in stock by the owner for routine maintenance including the name of a local supplier, simplified wiring and control diagrams, troubleshooting guide, and recommended service organization (including address and telephone number). Service organization shall be capable of providing 4 hour onsite response to a service call on an emergency basis.

-- End of Section --

SECTION 22 00 00

PLUMBING, GENERAL PURPOSE  
11/15

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- |                       |   |
|-----------------------|---|
| ANSI Z21.10.3/CSA 4.3 | (2017) Gas-Fired Water Heaters Vol.III, Storage Water Heaters With Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous |
| ANSI Z21.22/CSA 4.4   | (2015) Relief Valves for Hot Water Supply Systems   |

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

- |           |  |
|-----------|--|
| ASSE 1001 | (2016) Performance Requirements for Atmospheric Type Vacuum Breakers   |
| ASSE 1003 | (2009) Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems - (ANSI approved 2010)  |
| ASSE 1010 | (2004) Performance Requirements for Water Hammer Arresters (ANSI approved 2004)  |
| ASSE 1011 | (2004; Errata 2004) Performance Requirements for Hose Connection Vacuum Breakers (ANSI approved 2004)  |
| ASSE 1012 | (2009) Performance Requirements for Backflow Preventer with an Intermediate Atmospheric Vent - (ANSI approved 2009)  |
| ASSE 1013 | (2011) Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers - (ANSI approved 2010) |
| ASSE 1018 | (2001) Performance Requirements for Trap Seal Primer Valves - Potable Water Supplied (ANSI Approved 2002)  |
| ASSE 1019 | (2011; R 2016) Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance  |

- ASSE 1020 (2004; Errata 2004; Errata 2004)  
Performance Requirements for Pressure  
Vacuum Breaker Assembly (ANSI Approved  
2004)
- ASSE 1037 (2015; Reprint Sep 2017) Performance  
Requirements for Pressurized Flushing  
Devices for Plumbing Fixtures

AMERICAN WATER WORKS ASSOCIATION (AWWA)

- AWWA B300 (2010; Addenda 2011) Hypochlorites
- AWWA B301 (2010) Liquid Chlorine
- AWWA C203 (2008) Coal-Tar Protective Coatings and  
Linings for Steel Water Pipelines - Enamel  
and Tape - Hot-Applied
- AWWA C606 (2015) Grooved and Shouldered Joints
- AWWA C651 (2014) Standard for Disinfecting Water  
Mains
- AWWA C652 (2011) Disinfection of Water-Storage  
Facilities
- AWWA C700 (2015) Cold-Water Meters - Displacement  
Type, Metal Alloy Main Case
- AWWA C701 (2015) Cold-Water Meters - Turbine Type  
for Customer Service

AMERICAN WELDING SOCIETY (AWS)

- AWS A5.8/A5.8M (2011; Amendment 2012) Specification for  
Filler Metals for Brazing and Braze Welding
- AWS B2.2/B2.2M (2016) Specification for Brazing Procedure  
and Performance Qualification

ASME INTERNATIONAL (ASME)

- ASME A112.1.2 (2012; R 2017) Air Gaps in Plumbing  
Systems (For Plumbing Fixtures and  
Water-Connected Receptors)
- ASME A112.14.1 (2003; R 2017) Backwater Valves
- ASME A112.19.2/CSA B45.1 (2018; ERTA 2018) Standard for Vitreous  
China Plumbing Fixtures and Hydraulic  
Requirements for Water Closets and Urinals
- ASME A112.36.2M (1991; R 2017) Cleanouts
- ASME A112.6.1M (1997; R 2017) Floor Affixed Supports for  
Off-the-Floor Plumbing Fixtures for Public  
Use

ASME A112.6.3	(2016) Standard for Floor and Trench Drains
ASME B1.20.1	(2013) Pipe Threads, General Purpose (Inch)
ASME B16.12	(2009; R 2014) Cast Iron Threaded Drainage Fittings
ASME B16.15	(2013) Cast Copper Alloy Threaded Fittings Classes 125 and 250
ASME B16.18	(2018) Cast Copper Alloy Solder Joint Pressure Fittings
ASME B16.21	(2016) Nonmetallic Flat Gaskets for Pipe Flanges
ASME B16.22	(2013) Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME B16.23	(2011) Cast Copper Alloy Solder Joint Drainage Fittings - DWV
ASME B16.24	(2011) Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 600, 900, 1500, and 2500
ASME B16.29	(2017) Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings - DWV
ASME B16.3	(2016) Malleable Iron Threaded Fittings, Classes 150 and 300
ASME B16.34	(2017) Valves - Flanged, Threaded and Welding End
ASME B16.4	(2011) Standard for Gray Iron Threaded Fittings; Classes 125 and 250
ASME B16.5	(2017) Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard
ASME B16.50	(2013) Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings
ASME B16.51	(2013) Copper and Copper Alloy Press-Connect Pressure Fittings
ASME B31.1	(2016; Errata 2016) Power Piping
ASME B31.5	(2016) Refrigeration Piping and Heat Transfer Components
ASME B40.100	(2013) Pressure Gauges and Gauge Attachments
ASME BPVC SEC IV	(2017) BPVC Section IV-Rules for Construction of Heating Boilers
ASME CSD-1	(2016) Control and Safety Devices for

Automatically Fired Boilers

ASTM INTERNATIONAL (ASTM)

ASTM A105/A105M	(2014) Standard Specification for Carbon Steel Forgings for Piping Applications
ASTM A183	(2014) Standard Specification for Carbon Steel Track Bolts and Nuts
ASTM A193/A193M	(2017) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service and Other Special Purpose Applications
ASTM A47/A47M	(1999; R 2018; E 2018) Standard Specification for Ferritic Malleable Iron Castings
ASTM A515/A515M	(2017) Standard Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate- and Higher-Temperature Service
ASTM A516/A516M	(2017) Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service
ASTM A518/A518M	(1999; R 2018) Standard Specification for Corrosion-Resistant High-Silicon Iron Castings
ASTM A53/A53M	(2018) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A536	(1984; R 2014) Standard Specification for Ductile Iron Castings
ASTM A74	(2017) Standard Specification for Cast Iron Soil Pipe and Fittings
ASTM A888	(2018) Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
ASTM B117	(2016) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B152/B152M	(2013) Standard Specification for Copper Sheet, Strip, Plate, and Rolled Bar
ASTM B306	(2013) Standard Specification for Copper Drainage Tube (DWV)
ASTM B32	(2008; R 2014) Standard Specification for Solder Metal

ASTM B370	(2012) Standard Specification for Copper Sheet and Strip for Building Construction
ASTM B42	(2015a) Standard Specification for Seamless Copper Pipe, Standard Sizes
ASTM B43	(2014) Standard Specification for Seamless Red Brass Pipe, Standard Sizes
ASTM B584	(2014) Standard Specification for Copper Alloy Sand Castings for General Applications
ASTM B75/B75M	(2011) Standard Specification for Seamless Copper Tube
ASTM B813	(2016) Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
ASTM B88	(2016) Standard Specification for Seamless Copper Water Tube
ASTM B88M	(2018) Standard Specification for Seamless Copper Water Tube (Metric)
ASTM C1053	(2000; R 2010) Standard Specification for Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications
ASTM C564	(2014) Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM C920	(2018) Standard Specification for Elastomeric Joint Sealants
ASTM D2000	(2012; R 2017) Standard Classification System for Rubber Products in Automotive Applications
ASTM D2235	(2004; R 2016) Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings
ASTM D2564	(2012) Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D2661	(2014; E 2018) Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40, Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D2665	(2014) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings

ASTM D2822/D2822M (2005; R 2011; E 2011) Standard Specification for Asphalt Roof Cement, Asbestos-Containing

ASTM D2855 (2015) Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings

ASTM D2996 (2017) Standard Specification for Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe

ASTM D3122 (1995; R 2009) Solvent Cements for Styrene-Rubber (SR) Plastic Pipe and Fittings

ASTM D3138 (2004; R 2016) Standard Specification for Solvent Cements for Transition Joints Between Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Non-Pressure Piping Components

ASTM D3139 (1998; R 2011) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

ASTM D3212 (2007; R 2013) Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

ASTM D3311 (2017) Standard Specification for Drain, Waste, and Vent (DWV) Plastic Fittings Patterns

ASTM D4101 (2017) Standard Classification System and Basis for Specification for Polypropylene Injection and Extrusion Materials

ASTM E1 (2014) Standard Specification for ASTM Liquid-in-Glass Thermometers

ASTM F1760 (2016) Standard Specification for Coextruded Poly(Vinyl Chloride) (PVC) Non-Pressure Plastic Pipe Having Reprocessed-Recycled Content

ASTM F2389 (2017a) Standard Specification for Pressure-rated Polypropylene (PP) Piping Systems

ASTM F409 (2017) Standard Specification for Thermoplastic Accessible and Replaceable Plastic Tube and Tubular Fittings

ASTM F477 (2014) Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

ASTM F493 (2014) Solvent Cements for Chlorinated

Poly (Vinyl Chloride) (CPVC) Plastic Pipe  
and Fittings

ASTM F628 (2012; E 2013; E 2016; E 2018) Standard  
Specification for  
Acrylonitrile-Butadiene-Styrene (ABS)  
Schedule 40 Plastic Drain, Waste, and Vent  
Pipe with a Cellular Core

ASTM F891 (2016) Standard Specification for  
Coextruded Poly (Vinyl Chloride) (PVC)  
Plastic Pipe with a Cellular Core

CAST IRON SOIL PIPE INSTITUTE (CISPI)

CISPI 301 (2012) Hubless Cast Iron Soil Pipe and  
Fittings for Sanitary and Storm Drain,  
Waste, and Vent Piping Applications

CISPI 310 (2012) Coupling for Use in Connection with  
Hubless Cast Iron Soil Pipe and Fittings  
for Sanitary and Storm Drain, Waste, and  
Vent Piping Applications

COPPER DEVELOPMENT ASSOCIATION (CDA)

CDA A4015 (2016; 14/17) Copper Tube Handbook

INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICIALS  
(IAPMO)

IAPMO PS 117 (2005b) Press Type Or Plain End Rub  
Gasketed W/ Nail CU & CU Alloy Fittings 4  
Install On CU Tubing

INTERNATIONAL CODE COUNCIL (ICC)

ICC A117.1 COMM (2017) Standard And Commentary Accessible  
and Usable Buildings and Facilities

ICC IPC (2018) International Plumbing Code

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS  
INDUSTRY (MSS)

MSS SP-110 (2010) Ball Valves Threaded,  
Socket-Welding, Solder Joint, Grooved and  
Flared Ends

MSS SP-25 (2013) Standard Marking System for Valves,  
Fittings, Flanges and Unions

MSS SP-58 (2009) Pipe Hangers and Supports -  
Materials, Design and Manufacture,  
Selection, Application, and Installation

MSS SP-67 (2017; Errata 1 2017) Butterfly Valves

MSS SP-70 (2011) Gray Iron Gate Valves, Flanged and

Threaded Ends

MSS SP-71	(2011; Errata 2013) Gray Iron Swing Check Valves, Flanged and Threaded Ends
MSS SP-72	(2010a) Ball Valves with Flanged or Butt-Welding Ends for General Service
MSS SP-78	(2011) Cast Iron Plug Valves, Flanged and Threaded Ends
MSS SP-80	(2013) Bronze Gate, Globe, Angle and Check Valves
MSS SP-85	(2011) Gray Iron Globe & Angle Valves Flanged and Threaded Ends

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(2018) Enclosures for Electrical Equipment (1000 Volts Maximum)
NEMA MG 1	(2016; SUPP 2016) Motors and Generators
NEMA MG 11	(1977; R 2012) Energy Management Guide for Selection and Use of Single Phase Motors

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 31	(2016) Standard for the Installation of Oil-Burning Equipment
NFPA 54	(2018) National Fuel Gas Code
NFPA 90A	(2018) Standard for the Installation of Air Conditioning and Ventilating Systems

NSF INTERNATIONAL (NSF)

NSF 372	(2016) Drinking Water System Components - Lead Content
NSF/ANSI 14	(2017b) Plastics Piping System Components and Related Materials
NSF/ANSI 61	(2017) Drinking Water System Components - Health Effects

PLASTIC PIPE AND FITTINGS ASSOCIATION (PPFA)

PPFA Fire Man	(2016) Firestopping: Plastic Pipe in Fire Resistive Construction
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PLUMBING AND DRAINAGE INSTITUTE (PDI)

PDI WH 201	(2010) Water Hammer Arresters Standard
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SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE J1508 (2009) Hose Clamp Specifications

U.S. DEPARTMENT OF ENERGY (DOE)

Energy Star (1992; R 2006) Energy Star Energy  
Efficiency Labeling System (FEMP)

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA SM 9223 (2004) Enzyme Substrate Coliform Test

PL 93-523 (1974; A 1999) Safe Drinking Water Act

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

10 CFR 430 Energy Conservation Program for Consumer  
Products

40 CFR 141.80 National Primary Drinking Water  
Regulations; Control of Lead and Copper;  
General Requirements

UNDERWRITERS LABORATORIES (UL)

UL 1951 (2011; Reprint Aug 2017) UL Standard for  
Safety Electric Plumbing Accessories

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability eNotebook, in conformance to Section 01 33 29.00 06 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00.00 06 SUBMITTAL PROCEDURES:

SD-03 Product Data

Recycled Content for Steel Pipe; S

Recycled Content for Cast Iron Pipe; S

Fixtures

List of installed fixtures with manufacturer, model, and flow rate.

Flush Valve Water Closets

WaterSense Label for Flush Valve Water Closet; S

Flush Valve Urinals

WaterSense Label for Urinal; S

Wall Hung Lavatories

WaterSense Label for Lavatory Faucet; S

Kitchen Sinks

Drinking-Water Coolers; G

Energy Star Label for Electric Water Cooler; S

WaterSense Label for Showerhead; S

Water Heaters; G

Energy Star Label for Gas Instantaneous Water Heater; S

Pumps; G

Backflow Prevention Assemblies; G

Shower Faucets; G

A copy of qualified procedures and a list of names and identification symbols of qualified welders and welding operators.

Vibration-Absorbing Features; G

Details of vibration-absorbing features, including arrangement, foundation plan, dimensions and specifications.

#### SD-06 Test Reports

Tests, Flushing and Disinfection

Test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, completion and testing of the installed system. Each test report shall indicate the final position of controls.

Test of Backflow Prevention Assemblies; G.

Certification of proper operation shall be as accomplished in accordance with state regulations by an individual certified by the state to perform such tests. If no state requirement exists, the Contractor shall have the manufacturer's representative test the device, to ensure the unit is properly installed and performing as intended. The Contractor shall provide written documentation of the tests performed and signed by the individual performing the tests.

#### SD-07 Certificates

Materials and Equipment

Where equipment is specified to conform to requirements of the ASME Boiler and Pressure Vessel Code, the design, fabrication, and installation shall conform to the code.

### 1.3 STANDARD PRODUCTS

Specified materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacture of such products. Specified equipment shall essentially duplicate equipment that has performed satisfactorily at least two years prior to bid opening. Standard products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2 year period.

#### 1.3.1 Alternative Qualifications

Products having less than a two-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

#### 1.3.2 Service Support

The equipment items shall be supported by service organizations. Submit a certified list of qualified permanent service organizations for support of the equipment which includes their addresses and qualifications. These service organizations shall be reasonably convenient to the equipment installation and able to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

#### 1.3.3 Manufacturer's Nameplate

Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

#### 1.3.4 Modification of References

In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction", or words of similar meaning, to mean the Contracting Officer.

##### 1.3.4.1 Definitions

For the International Code Council (ICC) Codes referenced in the contract documents, advisory provisions shall be considered mandatory, the word "should" shall be interpreted as "shall." Reference to the "code official" shall be interpreted to mean the "Contracting Officer." For Navy owned property, references to the "owner" shall be interpreted to mean the "Contracting Officer." For leased facilities, references to the "owner" shall be interpreted to mean the "lessor." References to the "permit holder" shall be interpreted to mean the "Contractor."

##### 1.3.4.2 Administrative Interpretations

For ICC Codes referenced in the contract documents, the provisions of Chapter 1, "Administrator," do not apply. These administrative

requirements are covered by the applicable Federal Acquisition Regulations (FAR) included in this contract and by the authority granted to the Officer in Charge of Construction to administer the construction of this project. References in the ICC Codes to sections of Chapter 1, shall be applied appropriately by the Contracting Officer as authorized by his administrative cognizance and the FAR.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

Handle, store, and protect equipment and materials to prevent damage before and during installation in accordance with the manufacturer's recommendations, and as approved by the Contracting Officer. Replace damaged or defective items.

#### 1.5 REGULATORY REQUIREMENTS

Unless otherwise required herein, plumbing work shall be in accordance with ICC IPC.

#### 1.6 PROJECT/SITE CONDITIONS

The Contractor shall become familiar with details of the work, verify dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

#### 1.7 INSTRUCTION TO GOVERNMENT PERSONNEL

When specified in other sections, furnish the services of competent instructors to give full instruction to the designated Government personnel in the adjustment, operation, and maintenance, including pertinent safety requirements, of the specified equipment or system. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work.

Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Government for regular operation. The number of man-days (8 hours per day) of instruction furnished shall be as specified in the individual section. When more than 4 man-days of instruction are specified, use approximately half of the time for classroom instruction. Use other time for instruction with the equipment or system.

When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instruction to acquaint the operating personnel with the changes or modifications.

#### 1.8 ACCESSIBILITY OF EQUIPMENT

Install all work so that parts requiring periodic inspection, operation, maintenance, and repair are readily accessible. Install concealed valves, expansion joints, controls, dampers, and equipment requiring access, in locations freely accessible through access doors.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

Materials for various services shall be in accordance with TABLES I and

II. Steel pipe shall contain a minimum of 25 percent recycled content, with a minimum of 16 percent post-consumer recycled content. Provide data identifying percentage of recycled content for steel pipe. Pipe schedules shall be selected based on service requirements. Pipe fittings shall be compatible with the applicable pipe materials. Plastic pipe, fittings, and solvent cement shall meet NSF/ANSI 14 and shall be NSF listed for the service intended. Plastic pipe, fittings, and solvent cement used for potable hot and cold water service shall bear the NSF seal "NSF-PW." Polypropylene pipe and fittings shall conform to dimensional requirements of Schedule 40, Iron Pipe size and shall comply with NSF/ANSI 14, NSF/ANSI 61 and ASTM F2389. Polypropylene piping that will be exposed to UV light shall be provided with a Factory applied UV resistant coating. Pipe threads (except dry seal) shall conform to ASME B1.20.1. Grooved pipe couplings and fittings shall be from the same manufacturer. Material or equipment containing a weighted average of greater than 0.25 percent lead shall not be used in any potable water system intended for human consumption, and shall be certified in accordance with NSF/ANSI 61, Annex G or NSF 372. In line devices such as water meters, building valves, check valves, meter stops, valves, fittings and back flow preventers shall comply with PL 93-523 and NSF/ANSI 61, Section 8. End point devices such as drinking water fountains, lavatory faucets, kitchen and bar faucets, residential ice makers, supply stops and end point control valves used to dispense water for drinking must meet the requirements of NSF/ANSI 61, Section 9. Hubless cast-iron soil pipe shall not be installed underground, under concrete floor slabs, or in crawl spaces below kitchen floors. Cast-iron pipe shall contain a minimum of 95 percent recycled content. Provide data identifying percentage of recycled content for cast iron pipe. Plastic pipe shall not be installed in air plenums. Plastic pipe shall not be installed in a pressure piping system in buildings greater than three stories including any basement levels.

#### 2.1.1.1 Pipe Joint Materials

Grooved pipe and hubless cast-iron soil pipe shall not be used underground. Solder containing lead shall not be used with copper pipe. Cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Institute. Joints and gasket materials shall conform to the following:

- a. Coupling for Cast-Iron Pipe: for hub and spigot type ASTM A74, AWWA C606. For hubless type: CISPI 310
- b. Coupling for Steel Pipe: AWWA C606.
- c. Couplings for Grooved Pipe: Ductile Iron ASTM A536 (Grade 65-45-12). Copper ASTM A536.
- d. Flange Gaskets: Gaskets shall be made of non-asbestos material in accordance with ASME B16.21. Gaskets shall be flat, 1/16 inch thick, and contain Aramid fibers bonded with Styrene Butadiene Rubber (SBR) or Nitro Butadiene Rubber (NBR). Gaskets shall be the full face or self centering flat ring type. Gaskets used for hydrocarbon service shall be bonded with NBR.
- e. Brazing Material: Brazing material shall conform to AWS A5.8/A5.8M, BCuP-5.
- f. Brazing Flux: Flux shall be in paste or liquid form appropriate for use with brazing material. Flux shall be as follows: lead-free; have

a 100 percent flushable residue; contain slightly acidic reagents; contain potassium borides; and contain fluorides.

- g. Solder Material: Solder metal shall conform to ASTM B32.
- h. Solder Flux: Flux shall be liquid form, non-corrosive, and conform to ASTM B813, Standard Test 1.
- i. PTFE Tape: PTFE Tape, for use with Threaded Metal or Plastic Pipe.
- j. Rubber Gaskets for Cast-Iron Soil-Pipe and Fittings (hub and spigot type and hubless type): ASTM C564.
- k. Rubber Gaskets for Grooved Pipe: ASTM D2000, maximum temperature 230 degrees F.
- l. Flexible Elastomeric Seals: ASTM D3139, ASTM D3212 or ASTM F477.
- m. Bolts and Nuts for Grooved Pipe Couplings: Heat-treated carbon steel, ASTM A183.
- n. Solvent Cement for Transition Joints between ABS and PVC Nonpressure Piping Components: ASTM D3138.
- o. Plastic Solvent Cement for ABS Plastic Pipe: ASTM D2235.
- p. Plastic Solvent Cement for PVC Plastic Pipe: ASTM D2564 and ASTM D2855.
- q. Plastic Solvent Cement for CPVC Plastic Pipe: ASTM F493.
- r. Flanged fittings including, but not limited to, flanges, bolts, nuts and bolt patterns shall be in accordance with ASME B16.5 class 150 and shall have the manufacturer's trademark affixed in accordance with MSS SP-25. Flange material shall conform to ASTM A105/A105M. Blind flange material shall conform to ASTM A516/A516M cold service and ASTM A515/A515M for hot service. Bolts shall be high strength or intermediate strength with material conforming to ASTM A193/A193M.
- s. Plastic Solvent Cement for Styrene Rubber Plastic Pipe: ASTM D3122.
- t. Press fittings for Copper Pipe and Tube: Copper press fittings shall conform to the material and sizing requirements of ASME B16.51 and performance criteria of IAPMO PS 117. Sealing elements for copper press fittings shall be EPDM, FKM or HNBR. Sealing elements shall be factory installed or an alternative supplied fitting manufacturer. Sealing element shall be selected based on manufacturer's approved application guidelines.
- u. Copper tubing shall conform to ASTM B88, Type K, L or M.
- v. Heat-fusion joints for polypropylene piping: ASTM F2389.

#### 2.1.2 Miscellaneous Materials

Miscellaneous materials shall conform to the following:

- a. Water Hammer Arrester: PDI WH 201. Water hammer arrester shall be diaphragm or piston type.
- b. Copper, Sheet and Strip for Building Construction: ASTM B370.
- c. Asphalt Roof Cement: ASTM D2822/D2822M.
- d. Hose Clamps: SAE J1508.
- e. Supports for Off-The-Floor Plumbing Fixtures: ASME A112.6.1M.
- f. Metallic Cleanouts: ASME A112.36.2M.
- g. Plumbing Fixture Setting Compound: A preformed flexible ring seal molded from hydrocarbon wax material. The seal material shall be nonvolatile nonasphaltic and contain germicide and provide watertight, gastight, odorproof and verminproof properties.
- h. Coal-Tar Protective Coatings and Linings for Steel Water Pipelines: AWWA C203.
- i. Hypochlorites: AWWA B300.
- j. Liquid Chlorine: AWWA B301.
- k. Gauges - Pressure and Vacuum Indicating Dial Type - Elastic Element: ASME B40.100.
- l. Thermometers: ASTM E1. Mercury shall not be used in thermometers.

2.1.3 Pipe Insulation Material

Insulation shall be as specified in Section 23 07 00 THERMAL INSULATION FOR MECHANICAL SYSTEMS.

2.2 PIPE HANGERS, INSERTS, AND SUPPORTS

Pipe hangers, inserts, and supports shall conform to MSS SP-58.

2.3 VALVES

Valves shall be provided on supplies to equipment and fixtures. Valves 2-1/2 inches and smaller shall be bronze with threaded bodies for pipe and solder-type connections for tubing. Valves 3 inches and larger shall have flanged iron bodies and bronze trim. Pressure ratings shall be based upon the application. Grooved end valves may be provided if the manufacturer certifies that the valves meet the performance requirements of applicable MSS standard. Valves shall conform to the following standards:

Description	Standard
Butterfly Valves	MSS SP-67
Cast-Iron Gate Valves, Flanged and Threaded Ends	MSS SP-70

Cast-Iron Swing Check Valves, Flanged and Threaded Ends	MSS SP-71
Ball Valves with Flanged Butt-Welding Ends for General Service	MSS SP-72
Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends	MSS SP-110
Cast-Iron Plug Valves, Flanged and Threaded Ends	MSS SP-78
Bronze Gate, Globe, Angle, and Check Valves	MSS SP-80
Steel Valves, Socket Welding and Threaded Ends	ASME B16.34
Cast-Iron Globe and Angle Valves, Flanged and Threaded Ends	MSS SP-85
Backwater Valves	ASME A112.14.1
Vacuum Relief Valves	ANSI Z21.22/CSA 4.4
Water Pressure Reducing Valves	ASSE 1003
Water Heater Drain Valves	ASME BPVC SEC IV, Part HLW-810: Requirements for Potable-Water Heaters Bottom Drain Valve
Trap Seal Primer Valves	ASSE 1018
Temperature and Pressure Relief Valves for Hot Water Supply Systems	ANSI Z21.22/CSA 4.4
Temperature and Pressure Relief Valves for Automatically Fired Hot Water Boilers	ASME CSD-1 Safety Code No., Part CW, Article 5

2.3.1 Wall Faucets

Wall faucets with vacuum-breaker backflow preventer shall be brass with 3/4 inch male inlet threads, hexagon shoulder, and 3/4 inch hose connection. Faucet handle shall be securely attached to stem.

### 2.3.2 Wall Hydrants (Frostproof)

ASSE 1019 with vacuum-breaker backflow preventer shall have a nickel-brass or nickel-bronze wall plate or flange with nozzle and detachable key handle. A brass or bronze operating rod shall be provided within a galvanized iron casing of sufficient length to extend through the wall so that the valve is inside the building, and the portion of the hydrant between the outlet and valve is self-draining. A brass or bronze valve with coupling and union elbow having metal-to-metal seat shall be provided. Valve rod and seat washer shall be removable through the face of the hydrant. The hydrant shall have 3/4 inch exposed hose thread on spout and 3/4 inch male pipe thread on inlet.

### 2.3.3 Relief Valves

Water heaters and hot water storage tanks shall have a combination pressure and temperature (P&T) relief valve. The pressure relief element of a P&T relief valve shall have adequate capacity to prevent excessive pressure buildup in the system when the system is operating at the maximum rate of heat input. The temperature element of a P&T relief valve shall have a relieving capacity which is at least equal to the total input of the heaters when operating at their maximum capacity. Relief valves shall be rated according to ANSI Z21.22/CSA 4.4. Relief valves for systems where the maximum rate of heat input is less than 200,000 Btuh shall have 3/4 inch minimum inlets, and 3/4 inch outlets. Relief valves for systems where the maximum rate of heat input is greater than 200,000 Btuh shall have 1 inch minimum inlets, and 1 inch outlets. The discharge pipe from the relief valve shall be the size of the valve outlet.

### 2.3.4 Thermostatic Mixing Valves

Provide thermostatic mixing valve for lavatory faucets. Mixing valves, thermostatic type, pressure-balanced or combination thermostatic and pressure-balanced shall be line size and shall be constructed with rough or finish bodies either with or without plating. Each valve shall be constructed to control the mixing of hot and cold water and to deliver water at a desired temperature regardless of pressure or input temperature changes. The control element shall be of an approved type. The body shall be of heavy cast bronze, and interior parts shall be brass, bronze, corrosion-resisting steel or copper. The valve shall be equipped with necessary stops, check valves, unions, and sediment strainers on the inlets. Mixing valves shall maintain water temperature within 5 degrees F of any setting.

## 2.4 FIXTURES

Plastic in contact with hot water shall be suitable for 180 degrees F water temperature.

### 2.4.1 Automatic Controls

Provide automatic, sensor operated faucets and flush valves to comply with ASSE 1037 and UL 1951 for lavatory faucets, urinals, and water closets. Flushing and faucet systems shall consist of solenoid-activated valves with light beam sensors. Flush valve for water closet shall include an override pushbutton. Flushing devices shall be provided as described in paragraph FIXTURES AND FIXTURE TRIMMINGS.

#### 2.4.2 Flush Valve Water Closets

Refer to drawings.

Water closets must meet the EPA WaterSense product definition specified in [http://www.epa.gov/watersense/partners/product\\_program\\_specs.html](http://www.epa.gov/watersense/partners/product_program_specs.html) and must be EPA WaterSense labeled products. Provide data identifying WaterSense label for flush valve water closet.

#### 2.4.3 Flush Valve Urinals

Refer to drawings.

ASME A112.19.2/CSA B45.1, white vitreous china, wall-mounted, wall outlet, siphon jet, integral trap, and extended side shields. Provide urinal with the rim 17 inches above the floor. Provide urinal with the rim 24 inches above the floor. Water flushing volume of the urinal and flush valve combination shall not exceed 0.125 gallons per flush. Urinals must meet the specifications of [http://www.epa.gov/watersense/partners/product\\_program\\_specs.html](http://www.epa.gov/watersense/partners/product_program_specs.html) and must be EPA WaterSense labeled products. Provide data identifying WaterSense label for urinal.

#### 2.4.4 Wheelchair Flush Valve Type Urinals

Refer to drawings.

Urinals must meet the specifications of [http://www.epa.gov/watersense/partners/product\\_program\\_specs.html](http://www.epa.gov/watersense/partners/product_program_specs.html) and must be EPA WaterSense labeled products. Provide data identifying WaterSense label for wheelchair flush valve urinal.

#### 2.4.5 Wall Hung Lavatories

Refer to drawings. Lavatory faucets must meet the specifications of [https://www.epa.gov/watersense/partners/product\\_program\\_specs.html](https://www.epa.gov/watersense/partners/product_program_specs.html) and be EPA WaterSense Label for Lavatory Faucet. Provide data identifying WaterSense Label for Lavatory Faucet.

#### 2.4.6 Countertop Lavatories

Refer to drawings. Lavatory faucets must meet the specifications of [https://www.epa.gov/watersense/partners/product\\_program\\_specs.html](https://www.epa.gov/watersense/partners/product_program_specs.html) and be EPA watersense label of faucets. Provide data identifying watersense label for faucet.

#### 2.4.7 Kitchen Sinks

Refer to drawings.

#### 2.4.8 Drinking-Water Coolers

Refer to drawings. Provide data identifying Energy Star label for electric water cooler.

#### 2.4.9 Precast Terrazzo Mop Sinks

Refer to drawings.

## 2.5 BACKFLOW PREVENTERS

Backflow prevention devices must be approved by the State or local regulatory agencies. If there is no State or local regulatory agency requirements, the backflow prevention devices must be listed by the Foundation for Cross-Connection Control & Hydraulic Research, or any other approved testing laboratory having equivalent capabilities for both laboratory and field evaluation of backflow prevention devices and assemblies.

Reduced pressure principle assemblies, double check valve assemblies, atmospheric (nonpressure) type vacuum breakers, and pressure type vacuum breakers shall be meet the above requirements.

Backflow preventers with intermediate atmospheric vent shall conform to ASSE 1012. Reduced pressure principle backflow preventers shall conform to ASSE 1013. Hose connection vacuum breakers shall conform to ASSE 1011. Pipe applied atmospheric type vacuum breakers shall conform to ASSE 1001. Pressure vacuum breaker assembly shall conform to ASSE 1020. Air gaps in plumbing systems shall conform to ASME A112.1.2.

## 2.6 DRAINS

### 2.6.1 Floor and Shower Drains

Floor and shower drains shall consist of a galvanized body, integral seepage pan, and adjustable perforated or slotted chromium-plated bronze, nickel-bronze, or nickel-brass strainer, consisting of grate and threaded collar. Floor drains shall be cast iron except where metallic waterproofing membrane is installed. Drains shall be of double drainage pattern for embedding in the floor construction. The seepage pan shall have weep holes or channels for drainage to the drainpipe. The strainer shall be adjustable to floor thickness. A clamping device for attaching flashing or waterproofing membrane to the seepage pan without damaging the flashing or waterproofing membrane shall be provided when required. Drains shall be provided with threaded connection. Between the drain outlet and waste pipe, a neoprene rubber gasket conforming to ASTM C564 may be installed, provided that the drain is specifically designed for the rubber gasket compression type joint. Floor and shower drains shall conform to ASME A112.6.3.

### 2.6.2 Shower Faucets and Drain Fittings

Refer to drawings. Provide data identifying WaterSense label for showerhead.

### 2.6.3 Area Drains

Area drains shall be plain pattern with polished stainless steel perforated or slotted grate and bottom outlet. The drain shall be square with a 12 inch nominal overall width or diameter and 10 inch nominal overall depth. Drains shall be cast iron with manufacturer's standard coating. Grate shall be easily lifted out for cleaning. Outlet shall be suitable for inside caulked connection to drain pipe. Drains shall conform to ASME A112.6.3.

### 2.6.4 Floor Sinks

Floor sinks shall be square, with 12 inch nominal overall width or

diameter and 10 inch nominal overall depth. Floor sink shall have an acid-resistant enamel interior finish with cast-iron body, ABS sediment bucket, and perforated grate of cast iron in industrial areas and stainless steel in finished areas. The outlet pipe size shall be as indicated or of the same size as the connecting pipe.

## 2.7 TRAPS

Unless otherwise specified, traps shall be plastic per ASTM F409 or copper-alloy adjustable tube type with slip joint inlet and swivel. Traps shall be without a cleanout. Tubes shall be copper alloy with walls not less than 0.032 inch thick within commercial tolerances, except on the outside of bends where the thickness may be reduced slightly in manufacture by usual commercial methods. Inlets shall have rubber washer and copper alloy nuts for slip joints above the discharge level. Swivel joints shall be below the discharge level and shall be of metal-to-metal or metal-to-plastic type as required for the application. Nuts shall have flats for wrench grip. Outlets shall have internal pipe thread, except that when required for the application, the outlets shall have sockets for solder-joint connections. The depth of the water seal shall be not less than 2 inches. The interior diameter shall be not more than 1/8 inch over or under the nominal size, and interior surfaces shall be reasonably smooth throughout. A copper alloy "P" trap assembly consisting of an adjustable "P" trap and threaded trap wall nipple with cast brass wall flange shall be provided for lavatories. The assembly shall be a standard manufactured unit and may have a rubber-gasketed swivel joint.

## 2.8 WATER HEATERS

### 2.8.1 General

Water Heaters shall be rack mounted condensing natural tankless gas type. Capable of producing water temperatures between 98°F and 185°F. Maximum flow rate of 9.8 GPM at 30°F temperature rise. Primary heat exchanger constructed of copper, secondary heat exchanger constructed of stainless steel. Safety features will include: flame failure lockout, boiling protection lockout, thermal overheat protection, internal freeze protection, leak detection sensor, blocked flue lockout protection. Unit to meet emissions requirements of SCAQMD 2012 with NOX emissions not exceeding 20PPM. Thermal efficiency of 94% with maximum BTUH input of 199,000 BTUH per unit. Capable of storing and displaying a history of up to 9 diagnostic maintenance codes. Provide energy star label for gas instantaneous water heater.

### 2.8.2 Common Vent

Shall have an 8" diameter for both intake and exhaust. Shall include a precision-made check valve to prevent exhaust gases from penetrating non-operating water heaters. CVENT will be constructed of a CSA-certified and tested translucent polypropylene (PPTL) venting material. Certified to ANSI Z21.10.3/CSA 4.3. Various sections will be self-locking and sealing where no use of cement or glue is required. Intake header shall be convertible from a PPTL to a schedule 40 PVC for extended vent runs.

### 2.8.3 TRS - Tankless Rack System

To be constructed of marine grade powder coated aluminum. Free standing configuration. Unit's water trunk lines are constructed of 2 - 2 ½ inch diameter rigid copper. Unit's gas line is 1 ¼ - 1 ½ inch diameter NPT

powder coated schedule 40 steel. Pre-piped at the factory and delivered to the jobsite such that final connections are required onsite. Unit configurations are compatible with a Common Venting (CVENT) system. TRS arrangements shall have an input range as indicated on drawings. TRS shall be electronically manifolded with a maximum turndown ratio of 327:1.

## 2.9 PUMPS

### 2.9.1 Sump Pumps

Sump pumps shall be of capacities indicated. The pumps shall be of the automatic, electric motor-driven, submerged type, complete with necessary control equipment and with a split or solid cast-iron or steel cover plate. The pumps shall be direct-connected by an approved flexible coupling to a vertical electric motor having a continuous oiling device or packed bearings sealed against dirt and moisture. Motors shall be totally enclosed, fan-cooled of sizes as indicated and shall be equipped with an across-the-line magnetic controller in a NEMA 250, Type 1 enclosure. Integral size motors shall be the premium efficiency type in accordance with NEMA MG 1. Each pump shall be fitted with a high-grade thrust bearing mounted above the floor. Each shaft shall have an alignment bearing at each end, and the suction inlet shall be between 3 and 6 inches above the sump bottom. The suction side of each pump shall have a strainer of ample capacity. A float switch assembly, with the switch completely enclosed in a NEMA 250, Type 1 enclosure, shall start and stop each motor at predetermined water levels. Duplex pumps shall be equipped with an automatic alternator to change the lead operation from one pump to the other, and for starting the second pump if the flow exceeds the capacity of the first pump. The discharge line from each pump shall be provided with a union or flange, a nonclog swing check valve, and a stop valve in an accessible location near the pump.

### 2.9.2 Circulating Pumps

Domestic hot water circulating pumps shall be electrically driven, single-stage, centrifugal, with mechanical seals, suitable for the intended service. Pump and motor shall be integrally mounted on a cast-iron or steel subbase, close-coupled with an overhung impeller, or supported by the piping on which it is installed. The shaft shall be one-piece, heat-treated, corrosion-resisting steel with impeller and smooth-surfaced housing of bronze.

Motor shall be totally enclosed, fan-cooled and shall have sufficient horsepower for the service required. Each pump motor shall be equipped with an across-the-line magnetic controller in a NEMA 250, Type 1 enclosure with "START-STOP" switch in cover.

Integral size motors shall be premium efficiency type in accordance with NEMA MG 1. Pump motors smaller than 1 hp Fractional horsepower pump motors shall have integral thermal overload protection in accordance with Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Guards shall shield exposed moving parts.

### 2.9.3 Flexible Connectors

Flexible connectors shall be provided at the suction and discharge of each pump that is 1 hp or larger. Connectors shall be constructed of neoprene, rubber, or braided bronze, with Class 150 standard flanges. Flexible connectors shall be line size and suitable for the pressure and

temperature of the intended service.

## 2.10 DOMESTIC WATER SERVICE METER

Cold water meters 2 inches and smaller shall be positive displacement type conforming to AWWA C700. Cold water meters 2-1/2 inches and larger shall be turbine type conforming to AWWA C701. Meter register may be round or straight reading type. Meter shall be provided with a pulse generator, remote readout register and all necessary wiring and accessories.

Meters must be connected to the base wide energy and utility monitoring and control system (if this system exists) using the installation's advanced metering protocols.

## 2.11 ELECTRICAL WORK

Provide electrical motor driven equipment specified complete with motors, motor starters, and controls as specified herein and in Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM. Provide internal wiring for components of packaged equipment as an integral part of the equipment. Provide single-phase, fractional-horsepower alternating-current motors, including motors that are part of a system, corresponding to the applications in accordance with NEMA MG 11. Provide motors in accordance with NEMA MG 1 and of sufficient size to drive the load at the specified capacity without exceeding the nameplate rating of the motor.

Motors shall be rated for continuous duty with the enclosure specified. Motor duty requirements shall allow for maximum frequency start-stop operation and minimum encountered interval between start and stop. Motor torque shall be capable of accelerating the connected load within 20 seconds with 80 percent of the rated voltage maintained at motor terminals during one starting period. Motor bearings shall be fitted with grease supply fittings and grease relief to outside of the enclosure.

Controllers and contactors shall have auxiliary contacts for use with the controls provided. Manual or automatic control and protective or signal devices required for the operation specified and any control wiring required for controls and devices specified, but not shown, shall be provided. For packaged equipment, the manufacturer shall provide controllers, including the required monitors and timed restart.

Power wiring and conduit for field installed equipment shall be provided under and conform to the requirements of Section 26 20 00 INTERIOR DISTRIBUTION SYSTEM.

## 2.12 MISCELLANEOUS PIPING ITEMS

### 2.12.1 Escutcheon Plates

Provide one piece or split hinge metal plates for piping entering floors, walls, and ceilings in exposed spaces. Provide chromium-plated on copper alloy plates or polished stainless steel finish in finished spaces. Provide paint finish on plates in unfinished spaces.

### 2.12.2 Pipe Sleeves

Provide where piping passes entirely through walls, ceilings, roofs, and floors. Sleeves are not required where drain, waste, and vent (DWV) piping passes through concrete floor slabs located on grade, except where

penetrating a membrane waterproof floor.

#### 2.12.2.1 Sleeves in Masonry and Concrete

Provide steel pipe sleeves or schedule 40 PVC plastic pipe sleeves. Sleeves are not required where drain, waste, and vent (DWV) piping passes through concrete floor slabs located on grade. Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in the core-drilled hole are completely grouted smooth.

#### 2.12.2.2 Sleeves Not in Masonry and Concrete

Provide 26 gage galvanized steel sheet or PVC plastic pipe sleeves.

#### 2.12.3 Pipe Hangers (Supports)

Provide MSS SP-58 Type 1 with adjustable type steel support rods, except as specified or indicated otherwise. Attach to steel joists with Type 19 or 23 clamps and retaining straps. Attach to Steel W or S beams with Type 21, 28, 29, or 30 clamps. Attach to steel angles and vertical web steel channels with Type 20 clamp with beam clamp channel adapter. Attach to horizontal web steel channel and wood with drilled hole on centerline and double nut and washer. Attach to concrete with Type 18 insert or drilled expansion anchor. Provide Type 40 insulation protection shield for insulated piping.

#### 2.12.4 Nameplates

Provide 0.125 inch thick melamine laminated plastic nameplates, black matte finish with white center core, for equipment, gages, thermometers, and valves; valves in supplies to faucets will not require nameplates. Accurately align lettering and engrave minimum of 0.25 inch high normal block lettering into the white core. Minimum size of nameplates shall be 1.0 by 2.5 inches. Key nameplates to a chart and schedule for each system. Frame charts and schedules under glass and place where directed near each system. Furnish two copies of each chart and schedule.

#### 2.12.5 Labels

Provide labels for sensor operators at flush valves and faucets. Include the following information on each label:

- a. Identification of the sensor and its operation with graphic or written description.
- b. Range of the sensor.

### PART 3 EXECUTION

#### 3.1 GENERAL INSTALLATION REQUIREMENTS

Piping located in air plenums shall conform to NFPA 90A requirements. Piping located in shafts that constitute air ducts or that enclose air ducts shall be noncombustible in accordance with NFPA 90A. Installation of plastic pipe where in compliance with NFPA may be installed in accordance with PPFA Fire Man. The plumbing system shall be installed complete with necessary fixtures, fittings, traps, valves, and accessories. Water and drainage piping shall be extended 5 feet outside the building, unless otherwise indicated. A full port ball valve and

drain shall be installed on the water service line inside the building approximately 6 inches above the floor from point of entry. Piping shall be connected to the exterior service lines or capped or plugged if the exterior service is not in place. Sewer and water pipes shall be laid in separate trenches, except when otherwise shown. Exterior underground utilities shall be at least 12 inches below the average local frost depth or as indicated on the drawings. If trenches are closed or the pipes are otherwise covered before being connected to the service lines, the location of the end of each plumbing utility shall be marked with a stake or other acceptable means. Valves shall be installed with control no lower than the valve body.

### 3.1.1 Water Pipe, Fittings, and Connections

#### 3.1.1.1 Utilities

The piping shall be extended to fixtures, outlets, and equipment. The hot-water and cold-water piping system shall be arranged and installed to permit draining. The supply line to each item of equipment or fixture, except faucets, flush valves, or other control valves which are supplied with integral stops, shall be equipped with a shutoff valve to enable isolation of the item for repair and maintenance without interfering with operation of other equipment or fixtures. Supply piping to fixtures, faucets, hydrants, shower heads, and flushing devices shall be anchored to prevent movement.

#### 3.1.1.2 Cutting and Repairing

The work shall be carefully laid out in advance, and unnecessary cutting of construction shall be avoided. Damage to building, piping, wiring, or equipment as a result of cutting shall be repaired by mechanics skilled in the trade involved.

#### 3.1.1.3 Protection of Fixtures, Materials, and Equipment

Pipe openings shall be closed with caps or plugs during installation. Fixtures and equipment shall be tightly covered and protected against dirt, water, chemicals, and mechanical injury. Upon completion of the work, the fixtures, materials, and equipment shall be thoroughly cleaned, adjusted, and operated. Safety guards shall be provided for exposed rotating equipment.

#### 3.1.1.4 Mains, Branches, and Runouts

Piping shall be installed as indicated. Pipe shall be accurately cut and worked into place without springing or forcing. Structural portions of the building shall not be weakened. Aboveground piping shall run parallel with the lines of the building, unless otherwise indicated. Branch pipes from service lines may be taken from top, bottom, or side of main, using crossover fittings required by structural or installation conditions. Supply pipes, valves, and fittings shall be kept a sufficient distance from other work and other services to permit not less than 1/2 inch between finished covering on the different services. Bare and insulated water lines shall not bear directly against building structural elements so as to transmit sound to the structure or to prevent flexible movement of the lines. Water pipe shall not be buried in or under floors unless specifically indicated or approved. Changes in pipe sizes shall be made with reducing fittings. Use of bushings will not be permitted except for use in situations in which standard factory fabricated components are

furnished to accommodate specific accepted installation practice. Change in direction shall be made with fittings, except that bending of pipe 4 inches and smaller will be permitted, provided a pipe bender is used and wide sweep bends are formed. The center-line radius of bends shall be not less than six diameters of the pipe. Bent pipe showing kinks, wrinkles, flattening, or other malformations will not be acceptable.

#### 3.1.1.5 Pipe Drains

Pipe drains indicated shall consist of 3/4 inch hose bibb with renewable seat and full port ball valve ahead of hose bibb. At other low points, 3/4 inch brass plugs or caps shall be provided. Disconnection of the supply piping at the fixture is an acceptable drain.

#### 3.1.1.6 Expansion and Contraction of Piping

Allowance shall be made throughout for expansion and contraction of water pipe. Each hot-water and hot-water circulation riser shall have expansion loops or other provisions such as offsets and changes in direction where indicated and required. Risers shall be securely anchored as required or where indicated to force expansion to loops. Branch connections from risers shall be made with ample swing or offset to avoid undue strain on fittings or short pipe lengths. Horizontal runs of pipe over 50 feet in length shall be anchored to the wall or the supporting construction about midway on the run to force expansion, evenly divided, toward the ends. Sufficient flexibility shall be provided on branch runouts from mains and risers to provide for expansion and contraction of piping. Flexibility shall be provided by installing one or more turns in the line so that piping will spring enough to allow for expansion without straining. If mechanical grooved pipe coupling systems are provided, the deviation from design requirements for expansion and contraction may be allowed pending approval of Contracting Officer.

#### 3.1.1.7 Thrust Restraint

Plugs, caps, tees, valves and bends deflecting 11.25 degrees or more, either vertically or horizontally, in waterlines 4 inches in diameter or larger shall be provided with thrust blocks, where indicated, to prevent movement. Thrust blocking shall be concrete of a mix not leaner than: 1 cement, 2-1/2 sand, 5 gravel; and having a compressive strength of not less than 2000 psi after 28 days. Blocking shall be placed between solid ground and the fitting to be anchored. Unless otherwise indicated or directed, the base and thrust bearing sides of the thrust block shall be poured against undisturbed earth. The side of the thrust block not subject to thrust shall be poured against forms. The area of bearing will be as shown. Blocking shall be placed so that the joints of the fitting are accessible for repair. Steel rods and clamps, protected by galvanizing or by coating with bituminous paint, shall be used to anchor vertical down bends into gravity thrust blocks.

#### 3.1.1.8 Commercial-Type Water Hammer Arresters

Commercial-type water hammer arresters shall be provided on hot- and cold-water supplies and shall be located as generally indicated, with precise location and sizing to be in accordance with PDI WH 201. Water hammer arresters, where concealed, shall be accessible by means of access doors or removable panels. Commercial-type water hammer arresters shall conform to ASSE 1010. Vertical capped pipe columns will not be permitted.

### 3.1.2 Joints

Installation of pipe and fittings shall be made in accordance with the manufacturer's recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Joints shall be made up with fittings of compatible material and made for the specific purpose intended.

#### 3.1.2.1 Threaded

Threaded joints shall have American Standard taper pipe threads conforming to ASME B1.20.1. Only male pipe threads shall be coated with graphite or with an approved graphite compound, or with an inert filler and oil, or shall have a polytetrafluoroethylene tape applied.

#### 3.1.2.2 Mechanical Couplings

Mechanical couplings may be used in conjunction with grooved pipe for aboveground, ferrous or non-ferrous, domestic hot and cold water systems, in lieu of unions, brazed, soldered, welded, flanged, or threaded joints.

Mechanical couplings are permitted in accessible locations including behind access plates. Flexible grooved joints will not be permitted, except as vibration isolators adjacent to mechanical equipment. Rigid grooved joints shall incorporate an angle bolt pad design which maintains metal-to-metal contact with equal amount of pad offset of housings upon installation to ensure positive rigid clamping of the pipe.

Designs which can only clamp on the bottom of the groove or which utilize gripping teeth or jaws, or which use misaligned housing bolt holes, or which require a torque wrench or torque specifications will not be permitted.

Grooved fittings and couplings, and grooving tools shall be provided from the same manufacturer. Segmentally welded elbows shall not be used. Grooves shall be prepared in accordance with the coupling manufacturer's latest published standards. Grooving shall be performed by qualified grooving operators having demonstrated proper grooving procedures in accordance with the tool manufacturer's recommendations.

The Contracting Officer shall be notified 24 hours in advance of test to demonstrate operator's capability, and the test shall be performed at the work site, if practical, or at a site agreed upon. The operator shall demonstrate the ability to properly adjust the grooving tool, groove the pipe, and to verify the groove dimensions in accordance with the coupling manufacturer's specifications.

#### 3.1.2.3 Unions and Flanges

Unions, flanges and mechanical couplings shall not be concealed in walls, ceilings, or partitions. Unions shall be used on pipe sizes 2-1/2 inches and smaller; flanges shall be used on pipe sizes 3 inches and larger.

#### 3.1.2.4 Grooved Mechanical Joints

Grooves shall be prepared according to the coupling manufacturer's instructions. Grooved fittings, couplings, and grooving tools shall be products of the same manufacturer. Pipe and groove dimensions shall comply with the tolerances specified by the coupling manufacturer. The

diameter of grooves made in the field shall be measured using a "go/no-go" gauge, vernier or dial caliper, narrow-land micrometer, or other method specifically approved by the coupling manufacturer for the intended application. Groove width and dimension of groove from end of pipe shall be measured and recorded for each change in grooving tool setup to verify compliance with coupling manufacturer's tolerances. Grooved joints shall not be used in concealed locations.

#### 3.1.2.5 Cast Iron Soil, Waste and Vent Pipe

Bell and spigot compression and hubless gasketed clamp joints for soil, waste and vent piping shall be installed per the manufacturer's recommendations.

#### 3.1.2.6 Copper Tube and Pipe

- a. Brazed. Brazed joints shall be made in conformance with AWS B2.2/B2.2M, ASME B16.50, and CDA A4015 with flux and are acceptable for all pipe sizes. Copper to copper joints shall include the use of copper-phosphorus or copper-phosphorus-silver brazing metal without flux. Brazing of dissimilar metals (copper to bronze or brass) shall include the use of flux with either a copper-phosphorus, copper-phosphorus-silver or a silver brazing filler metal.
- b. Soldered. Soldered joints shall be made with flux and are only acceptable for piping 2 inches and smaller. Soldered joints shall conform to ASME B31.5 and CDA A4015. Soldered joints shall not be used in compressed air piping between the air compressor and the receiver.
- c. Copper Tube Extracted Joint. Mechanically extracted joints shall be made in accordance with ICC IPC.
- d. Press connection. Copper press connections shall be made in **strict** accordance with the manufacturer's installation instructions for manufactured rated size. The joints shall be pressed using the tool(s) approved by the manufacturer **of that joint**. Minimum distance between fittings shall be in accordance with the manufacturer's requirements.

#### 3.1.2.7 Plastic Pipe

Acrylonitrile-Butadiene-Styrene (ABS) pipe shall have joints made with solvent cement. PVC and CPVC pipe shall have joints made with solvent cement elastomeric, threading, (threading of Schedule 80 Pipe is allowed only where required for disconnection and inspection; threading of Schedule 40 Pipe is not allowed), or mated flanged.

#### 3.1.2.8 Polypropylene Pipe

Joints for polypropylene pipe and fittings shall be made by heat fusion welding socket-type or butt-fusion type fittings and shall comply with ASTM F2389.

#### 3.1.2.9 Other Joint Methods

#### 3.1.3 Dissimilar Pipe Materials

Connections between ferrous and non-ferrous copper water pipe shall be

made with dielectric unions or flange waterways. Dielectric waterways shall have temperature and pressure rating equal to or greater than that specified for the connecting piping. Waterways shall have metal connections on both ends suited to match connecting piping. Dielectric waterways shall be internally lined with an insulator specifically designed to prevent current flow between dissimilar metals. Dielectric flanges shall meet the performance requirements described herein for dielectric waterways. Connecting joints between plastic and metallic pipe shall be made with transition fitting for the specific purpose.

### 3.1.4 Pipe Sleeves and Flashing

Pipe sleeves shall be furnished and set in their proper and permanent location.

#### 3.1.4.1 Sleeve Requirements

Unless indicated otherwise, provide pipe sleeves meeting the following requirements:

Secure sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, ceilings, roofs, and floors.

A modular mechanical type sealing assembly may be installed in lieu of a waterproofing clamping flange and caulking and sealing of annular space between pipe and sleeve. The seals shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve using galvanized steel bolts, nuts, and pressure plates. The links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and each nut. After the seal assembly is properly positioned in the sleeve, tightening of the bolt shall cause the rubber sealing elements to expand and provide a watertight seal between the pipe and the sleeve. Each seal assembly shall be sized as recommended by the manufacturer to fit the pipe and sleeve involved.

Sleeves shall not be installed in structural members, except where indicated or approved. Rectangular and square openings shall be as detailed. Each sleeve shall extend through its respective floor, or roof, and shall be cut flush with each surface, except for special circumstances. Pipe sleeves passing through floors in wet areas such as mechanical equipment rooms, lavatories, kitchens, and other plumbing fixture areas shall extend a minimum of 4 inches above the finished floor.

Unless otherwise indicated, sleeves shall be of a size to provide a minimum of 1/4 inch clearance between bare pipe or insulation and inside of sleeve or between insulation and inside of sleeve. Sleeves in bearing walls and concrete slab on grade floors shall be steel pipe or cast-iron pipe. Sleeves in nonbearing walls or ceilings may be steel pipe, cast-iron pipe, galvanized sheet metal with lock-type longitudinal seam, or plastic.

Except as otherwise specified, the annular space between pipe and sleeve, or between jacket over insulation and sleeve, shall be sealed as indicated with sealants conforming to ASTM C920 and with a primer, backstop material and surface preparation as specified in Section 07 92 00.00 48 JOINT SEALANTS. The annular space between pipe and sleeve, between bare insulation and sleeve or between jacket over insulation and sleeve shall

not be sealed for interior walls which are not designated as fire rated.

Sleeves through below-grade walls in contact with earth shall be recessed 1/2 inch from wall surfaces on both sides. Annular space between pipe and sleeve shall be filled with backing material and sealants in the joint between the pipe and concrete or masonry wall as specified above. Sealant selected for the earth side of the wall shall be compatible with dampproofing/waterproofing materials that are to be applied over the joint sealant. Pipe sleeves in fire-rated walls shall conform to the requirements in Section 07 84 00 FIRESTOPPING.

#### 3.1.4.2 Flashing Requirements

Pipes passing through roof shall be installed through a 16 ounce copper flashing, each within an integral skirt or flange. Flashing shall be suitably formed, and the skirt or flange shall extend not less than 8 inches from the pipe and shall be set over the roof or floor membrane in a solid coating of bituminous cement. The flashing shall extend up the pipe a minimum of 10 inches. For cleanouts, the flashing shall be turned down into the hub and caulked after placing the ferrule. Pipes passing through pitched roofs shall be flashed, using lead or copper flashing, with an adjustable integral flange of adequate size to extend not less than 8 inches from the pipe in all directions and lapped into the roofing to provide a watertight seal. The annular space between the flashing and the bare pipe or between the flashing and the metal-jacket-covered insulation shall be sealed as indicated. Flashing for dry vents shall be turned down into the pipe to form a waterproof joint. Pipes, up to and including 10 inches in diameter, passing through roof or floor waterproofing membrane may be installed through a cast-iron sleeve with caulking recess, anchor lugs, flashing-clamp device, and pressure ring with brass bolts. Flashing shield shall be fitted into the sleeve clamping device. Pipes passing through wall waterproofing membrane shall be sleeved as described above. A waterproofing clamping flange shall be installed.

#### 3.1.4.3 Waterproofing

Waterproofing at floor-mounted water closets shall be accomplished by forming a flashing guard from soft-tempered sheet copper. The center of the sheet shall be perforated and turned down approximately 1-1/2 inches to fit between the outside diameter of the drainpipe and the inside diameter of the cast-iron or steel pipe sleeve. The turned-down portion of the flashing guard shall be embedded in sealant to a depth of approximately 1-1/2 inches; then the sealant shall be finished off flush to floor level between the flashing guard and drainpipe. The flashing guard of sheet copper shall extend not less than 8 inches from the drainpipe and shall be lapped between the floor membrane in a solid coating of bituminous cement. If cast-iron water closet floor flanges are used, the space between the pipe sleeve and drainpipe shall be sealed with sealant and the flashing guard shall be upturned approximately 1-1/2 inches to fit the outside diameter of the drainpipe and the inside diameter of the water closet floor flange. The upturned portion of the sheet fitted into the floor flange shall be sealed.

#### 3.1.4.4 Optional Counterflashing

Instead of turning the flashing down into a dry vent pipe, or caulking and sealing the annular space between the pipe and flashing or metal-jacket-covered insulation and flashing, counterflashing may be accomplished by utilizing the following:

- a. A standard roof coupling for threaded pipe up to 6 inches in diameter.
- b. A tack-welded or banded-metal rain shield around the pipe.

#### 3.1.4.5 Pipe Penetrations of Slab on Grade Floors

Where pipes, fixture drains, floor drains, cleanouts or similar items penetrate slab on grade floors, except at penetrations of floors with waterproofing membrane as specified in paragraphs FLASHING REQUIREMENTS and WATERPROOFING, a groove 1/4 to 1/2 inch wide by 1/4 to 3/8 inch deep shall be formed around the pipe, fitting or drain. The groove shall be filled with a sealant as specified in Section 07 92 00.00 48 JOINT SEALANTS.

#### 3.1.4.6 Pipe Penetrations

Provide sealants for all pipe penetrations. All pipe penetrations shall be sealed to prevent infiltration of air, insects, and vermin.

#### 3.1.5 Fire Seal

Where pipes pass through fire walls, fire-partitions, fire-rated pipe chase walls or floors above grade, a fire seal shall be provided as specified in Section 07 84 00 FIRESTOPPING.

#### 3.1.6 Supports

##### 3.1.6.1 General

Hangers used to support piping 2 inches and larger shall be fabricated to permit adequate adjustment after erection while still supporting the load. Pipe guides and anchors shall be installed to keep pipes in accurate alignment, to direct the expansion movement, and to prevent buckling, swaying, and undue strain. Piping subjected to vertical movement when operating temperatures exceed ambient temperatures shall be supported by variable spring hangers and supports or by constant support hangers. In the support of multiple pipe runs on a common base member, a clip or clamp shall be used where each pipe crosses the base support member. Spacing of the base support members shall not exceed the hanger and support spacing required for an individual pipe in the multiple pipe run. Threaded sections of rods shall not be formed or bent.

##### 3.1.6.2 Pipe Supports and Structural Bracing

Structural steel required for reinforcement to properly support piping, headers, and equipment, but not shown, shall be provided. Material used for supports shall be as specified in Section 05 12 00 STRUCTURAL STEEL.

##### 3.1.6.3 Pipe Hangers, Inserts, and Supports

Installation of pipe hangers, inserts and supports shall conform to MSS SP-58 except as modified herein.

- a. Types 5, 12, and 26 shall not be used.
- b. Type 3 shall not be used on insulated pipe.
- c. Type 18 inserts shall be secured to concrete forms before concrete is

placed. Continuous inserts which allow more adjustment may be used if they otherwise meet the requirements for type 18 inserts.

- d. Type 19 and 23 C-clamps shall be torqued per MSS SP-58 and shall have both locknuts and retaining devices furnished by the manufacturer. Field-fabricated C-clamp bodies or retaining devices are not acceptable.
- e. Type 20 attachments used on angles and channels shall be furnished with an added malleable-iron heel plate or adapter.
- f. Type 24 may be used only on trapeze hanger systems or on fabricated frames.
- g. Type 39 saddles shall be used on insulated pipe 4 inches and larger when the temperature of the medium is 60 degrees F or higher. Type 39 saddles shall be welded to the pipe.
- h. Type 40 shields shall:
  - (1) Be used on insulated pipe less than 4 inches.
  - (2) Be used on insulated pipe 4 inches and larger when the temperature of the medium is 60 degrees F or less.
  - (3) Have a high density insert for all pipe sizes. High density inserts shall have a density of 8 pcf or greater.
- i. Horizontal pipe supports shall be spaced as specified in MSS SP-58 and a support shall be installed not over 1 foot from the pipe fitting joint at each change in direction of the piping. Pipe supports shall be spaced not over 5 feet apart at valves. Operating temperatures in determining hanger spacing for PVC or CPVC pipe shall be 120 degrees F for PVC and 180 degrees F for CPVC. Horizontal pipe runs shall include allowances for expansion and contraction.
- j. Vertical pipe shall be supported at each floor, except at slab-on-grade, at intervals of not more than 15 feet nor more than 8 feet from end of risers, and at vent terminations. Vertical pipe risers shall include allowances for expansion and contraction.
- k. Type 35 guides using steel, reinforced polytetrafluoroethylene (PTFE) or graphite slides shall be provided to allow longitudinal pipe movement. Slide materials shall be suitable for the system operating temperatures, atmospheric conditions, and bearing loads encountered. Lateral restraints shall be provided as needed. Where steel slides do not require provisions for lateral restraint the following may be used:
  - (1) On pipe 4 inches and larger when the temperature of the medium is 60 degrees F or higher, a Type 39 saddle, welded to the pipe, may freely rest on a steel plate.
  - (2) On pipe less than 4 inches a Type 40 shield, attached to the pipe or insulation, may freely rest on a steel plate.
  - (3) On pipe 4 inches and larger carrying medium less than 60 degrees F a Type 40 shield, attached to the pipe or insulation, may freely rest on a steel plate.

- l. Pipe hangers on horizontal insulated pipe shall be the size of the outside diameter of the insulation. The insulation shall be continuous through the hanger on all pipe sizes and applications.
- m. Where there are high system temperatures and welding to piping is not desirable, the type 35 guide shall include a pipe cradle, welded to the guide structure and strapped securely to the pipe. The pipe shall be separated from the slide material by at least 4 inches or by an amount adequate for the insulation, whichever is greater.
- n. Hangers and supports for plastic pipe shall not compress, distort, cut or abrade the piping, and shall allow free movement of pipe except where otherwise required in the control of expansion/contraction.

#### 3.1.6.4 Structural Attachments

Attachment to building structure concrete and masonry shall be by cast-in concrete inserts, built-in anchors, or masonry anchor devices. Inserts and anchors shall be applied with a safety factor not less than 5. Supports shall not be attached to metal decking. Supports shall not be attached to the underside of concrete filled floor or concrete roof decks unless approved by the Contracting Officer. Masonry anchors for overhead applications shall be constructed of ferrous materials only.

#### 3.1.7 Welded Installation

Plumbing pipe weldments shall be as indicated. Changes in direction of piping shall be made with welding fittings only; mitering or notching pipe to form elbows and tees or other similar type construction will not be permitted. Branch connection may be made with either welding tees or forged branch outlet fittings. Branch outlet fittings shall be forged, flared for improvement of flow where attached to the run, and reinforced against external strains. Beveling, alignment, heat treatment, and inspection of weld shall conform to ASME B31.1. Weld defects shall be removed and repairs made to the weld, or the weld joints shall be entirely removed and rewelded. After filler metal has been removed from its original package, it shall be protected or stored so that its characteristics or welding properties are not affected. Electrodes that have been wetted or that have lost any of their coating shall not be used.

#### 3.1.8 Pipe Cleanouts

Pipe cleanouts shall be the same size as the pipe except that cleanout plugs larger than 4 inches will not be required. A cleanout installed in connection with cast-iron soil pipe shall consist of a long-sweep 1/4 bend or one or two 1/8 bends extended to the place shown. An extra-heavy cast-brass or cast-iron ferrule with countersunk cast-brass head screw plug shall be caulked into the hub of the fitting and shall be flush with the floor. Cleanouts in connection with other pipe, where indicated, shall be T-pattern, 90-degree branch drainage fittings with cast-brass screw plugs, except plastic plugs shall be installed in plastic pipe. Plugs shall be the same size as the pipe up to and including 4 inches. Cleanout tee branches with screw plug shall be installed at the foot of soil and waste stacks, at the foot of interior downspouts, on each connection to building storm drain where interior downspouts are indicated, and on each building drain outside the building. Cleanout tee branches may be omitted on stacks in single story buildings with slab-on-grade construction or where less than 18 inches of crawl space is provided under the floor. Cleanouts on pipe concealed in partitions shall

be provided with chromium plated bronze, nickel bronze, nickel brass or stainless steel flush type access cover plates. Round access covers shall be provided and secured to plugs with securing screw. Square access covers may be provided with matching frames, anchoring lugs and cover screws. Cleanouts in finished walls shall have access covers and frames installed flush with the finished wall. Cleanouts installed in finished floors subject to foot traffic shall be provided with a chrome-plated cast brass, nickel brass, or nickel bronze cover secured to the plug or cover frame and set flush with the finished floor. Heads of fastening screws shall not project above the cover surface. Where cleanouts are provided with adjustable heads, the heads shall be cast iron or plastic.

### 3.2 WATER HEATERS AND HOT WATER STORAGE TANKS

#### 3.2.1 Relief Valves

No valves shall be installed between a relief valve and its water heater or storage tank. The P&T relief valve shall be installed where the valve actuator comes in contact with the hottest water in the heater. Whenever possible, the relief valve shall be installed directly in a tapping in the tank or heater; otherwise, the P&T valve shall be installed in the hot-water outlet piping. A vacuum relief valve shall be provided on the cold water supply line to the hot-water storage tank or water heater and mounted above and within 6 inches above the top of the tank or water heater.

#### 3.2.2 Installation of Gas-Fired Water Heater

Installation shall conform to NFPA 54 for gas fired and NFPA 31 for oil fired. Storage water heaters that are not equipped with integral heat traps and having vertical pipe risers shall be installed with heat traps directly on both the inlet and outlet. Circulating systems need not have heat traps installed. An acceptable heat trap may be a piping arrangement such as elbows connected so that the inlet and outlet piping make vertically upward runs of not less than 24 inches just before turning downward or directly horizontal into the water heater's inlet and outlet fittings. Commercially available heat traps, specifically designed by the manufacturer for the purpose of effectively restricting the natural tendency of hot water to rise through vertical inlet and outlet piping during standby periods may also be approved.

#### 3.2.3 Heat Traps

Piping to and from each water heater and hot water storage tank shall be routed horizontally and downward a minimum of 2 feet before turning in an upward direction.

#### 3.2.4 Connections to Water Heaters

Connections of metallic pipe to water heaters shall be made with dielectric unions or flanges.

#### 3.2.5 Expansion Tank

A pre-charged expansion tank shall be installed on the cold water supply between the water heater inlet and the cold water supply shut-off valve. The Contractor shall adjust the expansion tank air pressure, as recommended by the tank manufacturer, to match incoming water pressure.

### 3.2.6 Direct Fired and Domestic Water Heaters

Notify the Contracting Officer when any direct fired domestic water heater over 400,000 BTU/hour is operational and ready to be inspected and certified.

### 3.3 FIXTURES AND FIXTURE TRIMMINGS

Polished chromium-plated pipe, valves, and fittings shall be provided where exposed to view. Angle stops, straight stops, stops integral with the faucets, or concealed type of lock-shield, and loose-key pattern stops for supplies with threaded, sweat or solvent weld inlets shall be furnished and installed with fixtures. Where connections between copper tubing and faucets are made by rubber compression fittings, a beading tool shall be used to mechanically deform the tubing above the compression fitting. Exposed traps and supply pipes for fixtures and equipment shall be connected to the rough piping systems at the wall, unless otherwise specified under the item. Floor and wall escutcheons shall be as specified. Drain lines and hot water lines of fixtures for handicapped personnel shall be insulated and do not require polished chrome finish. Plumbing fixtures and accessories shall be installed within the space shown.

#### 3.3.1 Fixture Connections

Where space limitations prohibit standard fittings in conjunction with the cast-iron floor flange, special short-radius fittings shall be provided. Connections between earthenware fixtures and flanges on soil pipe shall be made gastight and watertight with a closet-setting compound or neoprene gasket and seal. Use of natural rubber gaskets or putty will not be permitted. Fixtures with outlet flanges shall be set the proper distance from floor or wall to make a first-class joint with the closet-setting compound or gasket and fixture used.

#### 3.3.2 Flushometer Valves

Flushometer valves shall be secured to prevent movement by anchoring the long finished top spud connecting tube to wall adjacent to valve with approved metal bracket. Flushometer valves for water closets shall be installed 39 inches above the floor, except at water closets intended for use by the physically handicapped where flushometer valves shall be mounted at approximately 30 inches above the floor and arranged to avoid interference with grab bars. In addition, for water closets intended for handicap use, the flush valve handle shall be installed on the wide side of the enclosure.

#### 3.3.3 Height of Fixture Rims Above Floor

Lavatories shall be mounted with rim 31 inches above finished floor. Wall-hung drinking fountains and water coolers shall be installed with rim 42 inches above floor. Wall-hung service sinks shall be mounted with rim 28 inches above the floor. Installation of fixtures for use by the physically handicapped shall be in accordance with ICC A117.1 COMM.

#### 3.3.4 Shower Outfits

The area around the water supply piping to the mixing valves and behind the escutcheon plate shall be made watertight by caulking or gasketing.

### 3.3.5 Fixture Supports

Fixture supports for off-the-floor lavatories, urinals, water closets, and other fixtures of similar size, design, and use, shall be of the chair-carrier type. The carrier shall provide the necessary means of mounting the fixture, with a foot or feet to anchor the assembly to the floor slab. Adjustability shall be provided to locate the fixture at the desired height and in proper relation to the wall. Support plates, in lieu of chair carrier, shall be fastened to the wall structure only where it is not possible to anchor a floor-mounted chair carrier to the floor slab.

#### 3.3.5.1 Support for Solid Masonry Construction

Chair carrier shall be anchored to the floor slab. Where a floor-anchored chair carrier cannot be used, a suitable wall plate shall be imbedded in the masonry wall.

#### 3.3.5.2 Support for Concrete-Masonry Wall Construction

Chair carrier shall be anchored to floor slab. Where a floor-anchored chair carrier cannot be used, a suitable wall plate shall be fastened to the concrete wall using through bolts and a back-up plate.

#### 3.3.5.3 Support for Steel Stud Frame Partitions

Chair carrier shall be used. The anchor feet and tubular uprights shall be of the heavy duty design; and feet (bases) shall be steel and welded to a square or rectangular steel tube upright. Wall plates, in lieu of floor-anchored chair carriers, shall be used only if adjoining steel partition studs are suitably reinforced to support a wall plate bolted to these studs.

#### 3.3.5.4 Support for Wood Stud Construction

Where floor is a concrete slab, a floor-anchored chair carrier shall be used. Where entire construction is wood, wood crosspieces shall be installed. Fixture hanger plates, supports, brackets, or mounting lugs shall be fastened with not less than No. 10 wood screws, 1/4 inch thick minimum steel hanger, or toggle bolts with nut. The wood crosspieces shall extend the full width of the fixture and shall be securely supported.

### 3.3.6 Backflow Prevention Devices

Plumbing fixtures, equipment, and pipe connections shall not cross connect or interconnect between a potable water supply and any source of nonpotable water. Backflow preventers shall be installed where indicated and in accordance with ICC IPC at all other locations necessary to preclude a cross-connect or interconnect between a potable water supply and any nonpotable substance. In addition backflow preventers shall be installed at all locations where the potable water outlet is below the flood level of the equipment, or where the potable water outlet will be located below the level of the nonpotable substance. Backflow preventers shall be located so that no part of the device will be submerged. Backflow preventers shall be of sufficient size to allow unrestricted flow of water to the equipment, and preclude the backflow of any nonpotable substance into the potable water system. Bypass piping shall not be provided around backflow preventers. Access shall be provided for maintenance and testing. Each device shall be a standard commercial unit.

### 3.3.7 Access Panels

Access panels shall be provided for concealed valves and controls, or any item requiring inspection or maintenance. Access panels shall be of sufficient size and located so that the concealed items may be serviced, maintained, or replaced. Access panels shall be as specified in Section 05 50 13 MISCELLANEOUS METAL FABRICATIONS.

### 3.3.8 Traps

Each trap shall be placed as near the fixture as possible, and no fixture shall be double-trapped. Traps installed on cast-iron soil pipe shall be cast iron. Traps installed on steel pipe or copper tubing shall be recess-drainage pattern, or brass-tube type. Traps installed on plastic pipe may be plastic conforming to ASTM D3311. Traps for acid-resisting waste shall be of the same material as the pipe.

## 3.4 VIBRATION-ABSORBING FEATURES

Mechanical equipment, including compressors and pumps, shall be isolated from the building structure by approved vibration-absorbing features, unless otherwise shown. Each foundation shall include an adequate number of standard isolation units. Each unit shall consist of machine and floor or foundation fastening, together with intermediate isolation material, and shall be a standard product with printed load rating. Piping connected to mechanical equipment shall be provided with flexible connectors. Isolation unit installation shall limit vibration to 20 percent of the lowest equipment rpm.

## 3.5 WATER METER REMOTE READOUT REGISTER

The remote readout register shall be mounted at the location indicated or as directed by the Contracting Officer.

## 3.6 IDENTIFICATION SYSTEMS

### 3.6.1 Identification Tags

Identification tags made of brass, engraved laminated plastic, or engraved anodized aluminum, indicating service and valve number shall be installed on valves, except those valves installed on supplies at plumbing fixtures. Tags shall be 1-3/8 inch minimum diameter, and marking shall be stamped or engraved. Indentations shall be black, for reading clarity. Tags shall be attached to valves with No. 12 AWG, copper wire, chrome-plated beaded chain, or plastic straps designed for that purpose.

### 3.6.2 Pipe Color Code Marking

Color code marking of piping shall be as specified in Section 09 90 00 PAINTS AND COATINGS.

### 3.6.3 Color Coding Scheme for Locating Hidden Utility Components

Scheme shall be provided in buildings having suspended grid ceilings. The color coding scheme shall identify points of access for maintenance and operation of operable components which are not visible from the finished space and installed in the space directly above the suspended grid ceiling. The operable components shall include valves, dampers, switches,

linkages and thermostats. The color coding scheme shall consist of a color code board and colored metal disks. Each colored metal disk shall be approximately 3/8 inch in diameter and secured to removable ceiling panels with fasteners. The fasteners shall be inserted into the ceiling panels so that the fasteners will be concealed from view. The fasteners shall be manually removable without tools and shall not separate from the ceiling panels when panels are dropped from ceiling height. Installation of colored metal disks shall follow completion of the finished surface on which the disks are to be fastened. The color code board shall have the approximate dimensions of 3 foot width, 30 inches height, and 1/2 inch thickness. The board shall be made of wood fiberboard and framed under glass or 1/16 inch transparent plastic cover. Unless otherwise directed, the color code symbols shall be approximately 3/4 inch in diameter and the related lettering in 1/2 inch high capital letters. The color code board shall be mounted and located in the mechanical or equipment room.

### 3.7 ESCUTCHEONS

Escutcheons shall be provided at finished surfaces where bare or insulated piping, exposed to view, passes through floors, walls, or ceilings, except in boiler, utility, or equipment rooms. Escutcheons shall be fastened securely to pipe or pipe covering and shall be satin-finish, corrosion-resisting steel, polished chromium-plated zinc alloy, or polished chromium-plated copper alloy. Escutcheons shall be either one-piece or split-pattern, held in place by internal spring tension or setscrew.

### 3.8 PAINTING

Painting of pipes, hangers, supports, and other iron work, either in concealed spaces or exposed spaces, is specified in Section 09 90 00 PAINTS AND COATINGS.

#### 3.8.1 Painting of New Equipment

New equipment painting shall be factory applied or shop applied, and shall be as specified herein, and provided under each individual section.

##### 3.8.1.1 Factory Painting Systems

Manufacturer's standard factory painting systems may be provided subject to certification that the factory painting system applied will withstand 125 hours in a salt-spray fog test, except that equipment located outdoors shall withstand 500 hours in a salt-spray fog test. Salt-spray fog test shall be in accordance with ASTM B117, and for that test the acceptance criteria shall be as follows: immediately after completion of the test, the paint shall show no signs of blistering, wrinkling, or cracking, and no loss of adhesion; and the specimen shall show no signs of rust creepage beyond 0.125 inch on either side of the scratch mark.

The film thickness of the factory painting system applied on the equipment shall not be less than the film thickness used on the test specimen. If manufacturer's standard factory painting system is being proposed for use on surfaces subject to temperatures above 120 degrees F, the factory painting system shall be designed for the temperature service.

##### 3.8.1.2 Shop Painting Systems for Metal Surfaces

Clean, pretreat, prime and paint metal surfaces; except aluminum surfaces

need not be painted. Apply coatings to clean dry surfaces. Clean the surfaces to remove dust, dirt, rust, oil and grease by wire brushing and solvent degreasing prior to application of paint, except metal surfaces subject to temperatures in excess of 120 degrees F shall be cleaned to bare metal.

Where more than one coat of paint is specified, apply the second coat after the preceding coat is thoroughly dry. Lightly sand damaged painting and retouch before applying the succeeding coat. Color of finish coat shall be aluminum or light gray.

- a. Temperatures Less Than 120 Degrees F: Immediately after cleaning, the metal surfaces subject to temperatures less than 120 degrees F shall receive one coat of pretreatment primer applied to a minimum dry film thickness of 0.3 mil, one coat of primer applied to a minimum dry film thickness of one mil; and two coats of enamel applied to a minimum dry film thickness of one mil per coat.
- b. Temperatures Between 120 and 400 Degrees F: Metal surfaces subject to temperatures between 120 and 400 degrees F shall receive two coats of 400 degrees F heat-resisting enamel applied to a total minimum thickness of 2 mils.
- c. Temperatures Greater Than 400 Degrees F: Metal surfaces subject to temperatures greater than 400 degrees F shall receive two coats of 600 degrees F heat-resisting paint applied to a total minimum dry film thickness of 2 mils.

### 3.9 TESTS, FLUSHING AND DISINFECTION

#### 3.9.1 Plumbing System

The following tests shall be performed on the plumbing system in accordance with ICC IPC, except that the drainage and vent system final test shall include the smoke test. The Contractor has the option to perform a peppermint test in lieu of the smoke test. If a peppermint test is chosen, the Contractor must submit a testing procedure and reasons for choosing this option in lieu of the smoke test to the Contracting Officer for approval.

- a. Drainage and Vent Systems Test. The final test shall include a smoke test.
- b. Building Sewers Tests.
- c. Water Supply Systems Tests.

##### 3.9.1.1 Test of Backflow Prevention Assemblies

Backflow prevention assembly shall be tested using gauges specifically designed for the testing of backflow prevention assemblies.

Backflow prevention assembly test gauges shall be tested annually for accuracy in accordance with the requirements of State or local regulatory agencies. If there is no State or local regulatory agency requirements, gauges shall be tested annually for accuracy in accordance with the requirements of University of Southern California's Foundation of Cross Connection Control and Hydraulic Research or the American Water Works

Association Manual of Cross Connection (Manual M-14), or any other approved testing laboratory having equivalent capabilities for both laboratory and field evaluation of backflow prevention assembly test gauges. Report form for each assembly shall include, as a minimum, the following:

Data on Device	Data on Testing Firm
Type of Assembly	Name
Manufacturer	Address
Model Number	Certified Tester
Serial Number	Certified Tester No.
Size	Date of Test
Location	
Test Pressure Readings	Serial Number and Test Data of Gauges

If the unit fails to meet specified requirements, the unit shall be repaired and retested.

### 3.9.2 Defective Work

If inspection or test shows defects, such defective work or material shall be replaced or repaired as necessary and inspection and tests shall be repeated. Repairs to piping shall be made with new materials. Caulking of screwed joints or holes will not be acceptable.

### 3.9.3 System Flushing

#### 3.9.3.1 During Flushing

Before operational tests or disinfection, potable water piping system shall be flushed with hot potable water. Sufficient water shall be used to produce a water velocity that is capable of entraining and removing debris in all portions of the piping system. This requires simultaneous operation of all fixtures on a common branch or main in order to produce a flushing velocity of approximately 4 fps through all portions of the piping system. In the event that this is impossible due to size of system, the Contracting Officer (or the designated representative) shall specify the number of fixtures to be operated during flushing. Contractor shall provide adequate personnel to monitor the flushing operation and to ensure that drain lines are unobstructed in order to prevent flooding of the facility. Contractor shall be responsible for any flood damage resulting from flushing of the system. Flushing shall be continued until entrained dirt and other foreign materials have been removed and until discharge water shows no discoloration. All faucets and drinking water fountains, to include any device considered as an end point device by NSF/ANSI 61, Section 9, shall be flushed a minimum of 0.25 gallons per 24 hour period, ten times over a 14 day period.

### 3.9.3.2 After Flushing

System shall be drained at low points. Strainer screens shall be removed, cleaned, and replaced. After flushing and cleaning, systems shall be prepared for testing by immediately filling water piping with clean, fresh potable water. Any stoppage, discoloration, or other damage to the finish, furnishings, or parts of the building due to the Contractor's failure to properly clean the piping system shall be repaired by the Contractor. When the system flushing is complete, the hot-water system shall be adjusted for uniform circulation. Flushing devices and automatic control systems shall be adjusted for proper operation according to manufacturer's instructions. Flow rates on fixtures must not exceed those stated in PART 2 of this Section. Unless more stringent local requirements exist, lead levels shall not exceed limits established by 40 CFR 141.80 (c)(1). The water supply to the building shall be tested separately to ensure that any lead contamination found during potable water system testing is due to work being performed inside the building.

### 3.9.4 Operational Test

Upon completion of flushing and prior to disinfection procedures, the Contractor shall subject the plumbing system to operating tests to demonstrate satisfactory installation, connections, adjustments, and functional and operational efficiency. Such operating tests shall cover a period of not less than 8 hours for each system and shall include the following information in a report with conclusion as to the adequacy of the system:

- a. Time, date, and duration of test.
- b. Water pressures at the most remote and the highest fixtures.
- c. Operation of each fixture and fixture trim.
- d. Operation of each valve, hydrant, and faucet.
- e. Pump suction and discharge pressures.
- f. Temperature of each domestic hot-water supply.
- g. Operation of each floor drain by flooding with water.
- h. Operation of each vacuum breaker and backflow preventer.

### 3.9.5 Disinfection

After all system components are provided and operational tests are complete, the entire domestic hot- and cold-water distribution system shall be disinfected. Before introducing disinfecting chlorination material, entire system shall be flushed with potable water until any entrained dirt and other foreign materials have been removed.

Water chlorination procedure shall be in accordance with AWWA C651 and AWWA C652 as modified and supplemented by this specification. The chlorinating material shall be hypochlorites or liquid chlorine. The chlorinating material shall be fed into the water piping system at a constant rate at a concentration of at least 50 parts per million (ppm). Feed a properly adjusted hypochlorite solution injected into the system with a hypochlorinator, or inject liquid

chlorine into the system through a solution-feed chlorinator and booster pump until the entire system is completely filled.

Test the chlorine residual level in the water at 6 hour intervals for a continuous period of 24 hours. If at the end of a 6 hour interval, the chlorine residual has dropped to less than 25 ppm, flush the piping including tanks with potable water, and repeat the above chlorination procedures. During the chlorination period, each valve and faucet shall be opened and closed several times.

After the second 24 hour period, verify that no less than 25 ppm chlorine residual remains in the treated system. The 24 hour chlorination procedure must be repeated until no less than 25 ppm chlorine residual remains in the treated system.

Upon the specified verification, the system including tanks shall then be flushed with potable water until the residual chlorine level is reduced to less than one part per million. During the flushing period, each valve and faucet shall be opened and closed several times.

Take additional samples of water in disinfected containers, for bacterial examination, at locations specified by the Contracting Officer

Test these samples for total coliform organisms (coliform bacteria, fecal coliform, streptococcal, and other bacteria) in accordance with EPA SM 9223. The testing method used shall be EPA approved for drinking water systems and shall comply with applicable local and state requirements.

Disinfection shall be repeated until bacterial tests indicate the absence of coliform organisms (zero mean coliform density per 100 milliliters) in the samples for at least 2 full days. The system will not be accepted until satisfactory bacteriological results have been obtained.

### 3.10 POSTED INSTRUCTIONS

Framed instructions under glass or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, shall be posted where directed. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system shall be prepared in typed form, framed as specified above for the wiring and control diagrams and posted beside the diagrams. The framed instructions shall be posted before acceptance testing of the systems.

### 3.11 PERFORMANCE OF WATER HEATING EQUIPMENT

Standard rating condition terms are as follows:

EF = Energy factor, minimum overall efficiency.

ET = Minimum thermal efficiency with 70 degrees F delta T.

SL = Standby loss is maximum (Btu/h) based on a 70 degrees F temperature difference between stored water and ambient requirements.

V = Rated volume in gallons

Q = Nameplate input rate in kW (Btu/h)

3.11.1 Instantaneous Water Heater

3.11.1.1 Gas

- a. Rating of 4,000 Btu/h/gal and greater and less than 2 gallons with an input greater than 50,000 Btu/h and less than 200,000 Btu/h shall have a minimum energy factor (EF) of 0.62-0.0019V per 10 CFR 430.
- b. Rating of 4,000 Btu/h/gal and greater and less than 10 gallons with an input of 200,000 Btu/h and greater shall have a minimum thermal efficiency (ET) of 80 percent per ANSI Z21.10.3/CSA 4.3
- c. Rating of 4,000 BTU/h/gal and greater and 10 gallons and greater with an input of 200,000 Btu/h and greater shall have a minimum thermal efficiency (ET) of 80 percent and the maximum SL shall be  $Q/800+110x(V^{1/2})$  per ANSI Z21.10.3/CSA 4.3

3.12 TABLES

TABLE I								
PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, VENT AND CONDENSATE DRAIN PIPING SYSTEMS								
Item #	Pipe and Fitting Materials	SERVICE A	SERVICE B	SERVICE C	SERVICE D	SERVICE E	SERVICE F	SERVICE G
1	Cast iron soil pipe and fittings, hub and spigot, ASTM A74 with compression gaskets. Pipe and fittings shall be marked with the CISPI trademark.	X	X	X	X	X		
2	Cast iron soil pipe and fittings hubless, CISPI 301 and ASTM A888. Pipe and fittings shall be marked with the CISPI trademark.		X	X	X	X		
3	Cast iron drainage fittings, threaded, ASME B16.12 for use with Item 10	X		X	X			

TABLE I								
PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, VENT AND CONDENSATE DRAIN PIPING SYSTEMS								
Item #	Pipe and Fitting Materials	SERVICE A	SERVICE B	SERVICE C	SERVICE D	SERVICE E	SERVICE F	SERVICE G
4	Cast iron screwed fittings (threaded) ASME B16.4 for use with Item 10				X	X		
5	Grooved pipe couplings, ferrous and non-ferrous pipe ASTM A536 And ASTM A47/A47M	X	X		X	X		
6	Ductile iron grooved joint fittings for ferrous pipe ASTM A536 and ASTM A47/A47M for use with Item 5	X	X		X	X		
7	Bronze sand casting grooved joint pressure fittings for non-ferrous pipe ASTM B584, for use with Item 5	X	X		X	X		
8	Wrought copper grooved joint pressure fittings for non-ferrous pipe ASTM B75/B75M C12200, ASTM B152/B152M, C11000, ASME B16.22 ASME B16.22 for use with Item 5	X	X					
9	Malleable-iron threaded fittings, galvanized ASME B16.3 for use with Item 10				X	X		

TABLE I								
PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, VENT AND CONDENSATE DRAIN PIPING SYSTEMS								
Item #	Pipe and Fitting Materials	SERVICE A	SERVICE B	SERVICE C	SERVICE D	SERVICE E	SERVICE F	SERVICE G
10	Steel pipe, seamless galvanized, ASTM A53/A53M, Type S, Grade B	X			X	X		
11	Seamless red brass pipe, ASTM B43				X	X		X
12	Bronzed flanged fittings, ASME B16.24 for use with Items 11 and 14				X	X		X
13	Cast copper alloy solder joint pressure fittings, ASME B16.18 for use with Item 14				X	X		X
14	Seamless copper pipe, ASTM B42						X	X
15	Cast bronze threaded fittings, ASME B16.15				X	X		
16	Copper drainage tube, (DWV), ASTM B306	X*	X	X*	X	X		X
17	Wrought copper and wrought alloy solder-joint drainage fittings. ASME B16.29	X	X	X	X	X		X
18	Cast copper alloy solder joint drainage fittings, DWV, ASME B16.23	X	X	X	X	X		X
19	Acrylonitrile-Butadiene (ABS) plastic drain, waste, and vent pipe and fittings ASTM D2661, ASTM F628	X	X	X	X	X	X	

TABLE I								
PIPE AND FITTING MATERIALS FOR DRAINAGE, WASTE, VENT AND CONDENSATE DRAIN PIPING SYSTEMS								
It #	Pipe and Fitting Materials	SERVICE A	SERVICE B	SERVICE C	SERVICE D	SERVICE E	SERVICE F	SERVICE G
20	Polyvinyl Chloride plastic drain, waste and vent pipe and fittings, ASTM D2665, ASTM F891, (Sch 40) ASTM F1760	X	X	X	X	X	X	X
21	Process glass pipe and fittings, ASTM C1053						X	
22	High-silicon content cast iron pipe and fittings (hub and spigot, and mechanical joint), ASTM A518/A518M		X			X	X	
23	Polypropylene (PP) waste pipe and fittings, ASTM D4101						X	
24	Filament-wound reinforced thermosetting resin (RTRP) pipe, ASTM D2996						X	
<p>SERVICE:</p> <p>A - Underground Building Soil, Waste and Storm Drain                      B - Aboveground Soil, Waste, Drain In Buildings                      C - Underground Vent                      D - Aboveground Vent                      E - Interior Rainwater Conductors Aboveground                      F - Corrosive Waste And Vent Above And Belowground                      G - Condensate Drain Aboveground</p> <p>* - Hard Temper</p>								

TABLE II					
PIPE AND FITTING MATERIALS FOR PRESSURE PIPING SYSTEMS					
Item #	Pipe and Fitting Materials	SERVICE A	SERVICE B	SERVICE C	SERVICE D
1	Seamless copper pipe, ASTM B42	X	X		X
2	Seamless copper water tube, ASTM B88, ASTM B88M	X**	X**	X**	X***
3	Cast bronze threaded fittings, ASME B16.15 for use with Items 5 and 7	X	X		X
4	Wrought copper and bronze solder-joint pressure fittings, ASME B16.22 for use with Items 5, 7 and 8	X	X	X	X
5	Cast copper alloy solder-joint pressure fittings, ASME B16.18 for use with Item 8	X	X	X	X
<p>SERVICE:</p> <p>A - Cold Water Service Aboveground</p> <p>B - Hot and Cold Water Distribution                      180 degrees F Maximum Aboveground</p> <p>C - Compressed Air Lubricated</p> <p>D - Cold Water Service Belowground</p> <p>Indicated types are minimum wall thicknesses.</p> <p>** - Type L - Hard</p> <p>*** - Type K - Hard temper with brazed joints only or type K-soft temper without joints in or under floors</p> <p>**** - In or under slab floors only brazed joints</p>					

TABLE III				
STANDARD RATING CONDITIONS AND MINIMUM PERFORMANCE RATINGS FOR WATER HEATING EQUIPMENT				
<u>FUEL</u>	<u>STORAGE CAPACITY GALLONS</u>	<u>INPUT RATING</u>	<u>TEST PROCEDURE</u>	<u>REQUIRED PERFORMANCE</u>
C. Instantaneous Water Heater				
Gas	4,000 (btu/h)/gal and 2 gal max.	50,000 Btu/h min 200,000 Btu/h max.	10 CFR 430	EF = 0.62-0.0019V
Gas	4,000 (btu/h)/gal and 2 gal max.	200,000 Btu/h min.	ANSI Z21.10.3/CS	ET = 80 percent
Gas	4,000 (btu/h)/gal and 2 gal max.	200,000 Btu/h min.	ANSI Z21.10.3/CS	ET = 80 percent SL = (Q/800+110x(V <sup>1/2</sup> ))
<p>TERMS:</p> <p>EF = Energy factor, minimum overall efficiency.                      ET = Minimum thermal efficiency with 70 degrees F delta T.                      SL = Standby loss is maximum Btu/h based on a 70 degree F temperature difference between stored water and ambient requirements.                      V = Rated storage volume in gallons                      Q = Nameplate input rate in Btu/h</p>				

-- End of Section --